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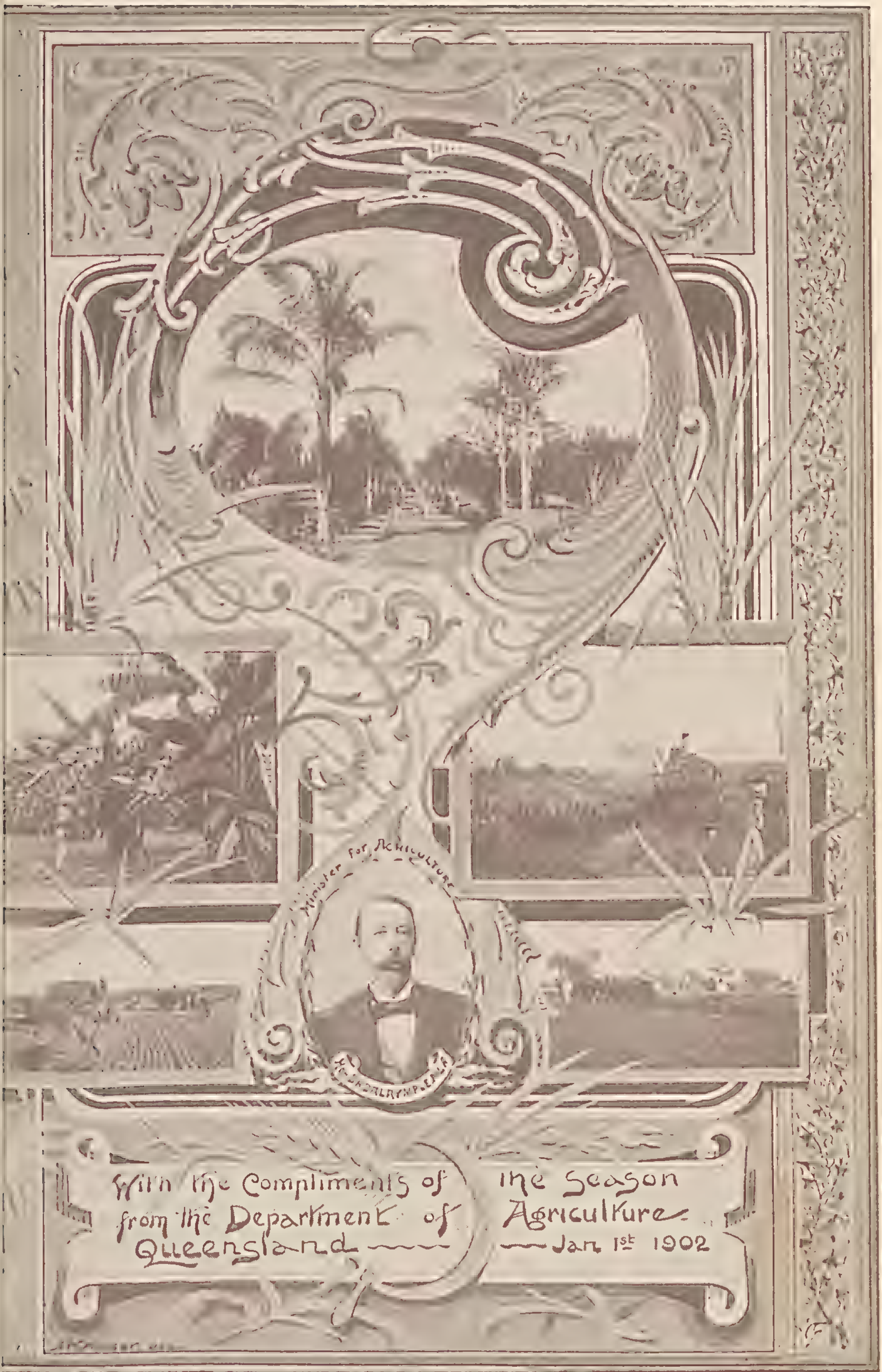

Minister for Agriculture
With the Compliments of the Season
from the Department of Agriculture
Queensland —— Jan. 1st 1902

To Our Readers.

The *Queensland Agricultural Journal* is now entering upon the fifth year of publication, and continues to meet with the unqualified approval of its readers, who comprise not only Queenslanders, but residents in every part of the globe. Thus we hear of its being found on the tables of South American farmers, in the town and country homes of India, China, Egypt, North America, and even in the Soudan is it read and appreciated. It has, from the outset, been our aim to fill its pages with useful and instructive articles bearing upon agricultural, pastoral, and horticultural pursuits from the pens of contributors, who are specialists in the various subjects they write upon. There is one way however, in which the *Journal* can be rendered even more interesting to the rural population, and that is by short articles from farmers and others, giving their own experience of new methods of cultivation, of new products, of the effects of manures, of irrigation, &c. Many good inventions and ingenious contrivances for labour-saving emanate from the workers on the land. Information concerning these will always be welcomed by the editor. Farmers are a busy people, and after a hard day's work are apt to be too tired to sit down and write. Again, many who would like to write do not do so because they think they are not equal to writing a newspaper article. We do not ask for the article. All we ask for is the idea. Give us the rough substance: we will do the dressing-up part. There is many a gem of thought, many a brilliant idea, lost to the world because the originator of it is possessed with the idea that he cannot clothe it in sufficiently fine language. If you have a good idea, never mind the language or the composition or the spelling. Leave that to us, and let your ideas be given to the world. Think how many people will benefit by any valuable new idea. Every month we send out nearly 6,000 *Journals* to various households. It is reasonable to suppose that at least four persons will look at each *Journal*. Thus 24,000 people are benefited. We hope that during this year we shall receive many communications from farmers on matters of interest to their profession.

The year 1902 opens with great promise. The wheat harvest has been a record for Queensland. With reduced railway rates and fair prices for wheat and barley, with genial rains and absence of pests, the outlook for the coming year is full of hope.

The yield of sugar has been most satisfactory on the whole, and the young cane gives evidence of vigorous growth, foreshadowing a large return by the end of this year.

Fruit culture is extending in all parts of the State. Coffee and rice growing are making rapid strides in the North and South respectively, and in a very few years this State will be quite able to supply its own requirements of these two staples. Would that we could add that cotton-growing has again been added to our industries. As we have frequently pointed out, there is no reason why cotton-growing should not pay as well as or much better indeed than wheat, maize, or many other crops now mainly grown by the farmers. If locally-grown cotton were to be obtained in sufficient quantities to keep a mill going, an incentive would be provided to once more establish the manufacture of cotton goods in Ipswich.

Then we have the dairying industry, which is yearly increasing, and is no longer conducted on the slipshod plan of bygone years. Factories and creameries have sprung up in all directions. Cold storage is provided on at least two of the coastal steamers, thanks to the persistent efforts of the Department of Agriculture, backed by the assistance of the butter producers and shippers. Queensland butter more than holds its own in the British markets, as is testified by a comparison between the product of Denmark and the Australasian States.

The opportunity afforded to intending settlers by the throwing open of the rich lands repurchased from the squatters has been availed of to such an extent that all these lands, devoted not long since to the raising of sheep and cattle, now constitute the homes of hundreds of thriving farmers.

We would that we could congratulate the Western pastoralists on a final breakup of the disastrous drought, which has wrought such dire ruin in many parts of Queensland. Unhappily, the wished-for consummation has not yet come to pass; and even when luxuriant grass and herbs once more cover the plains of the Warrego and elsewhere in the West, a long time must elapse before the flocks and herds are made up to their original numbers.

Meanwhile we can but rejoice at the success which has attended the labours of one portion of the rural community, and extend our sympathy to those who are still struggling with adverse circumstances, heartily trusting that the coming year may be fraught with bounteous rains, plentiful crops, and sure markets.

Agriculture.

FIRST STEPS IN AGRICULTURE.

8th Lesson.

SECOND STAGE.

By A.J.B.

We have briefly considered Fallowing, Rotation, and Green-manuring as means of increasing the fertility of the soil. In this lesson we will take an elementary view of SUBSOILING and DRAINING, which were touched upon in the 3rd and 7th Lessons of the First Book.

When we speak of a subsoil, we mean that portion of the soil lying at from 6 to 12 inches from the surface. (Lesson 3, I.) In many cases, if this subsoil is brought to the surface, it is found to be wanting in fertility for a considerable time, until it has been exposed to the influences of the air, rain, sun, and frost. You often notice a difference in the colour of the surface and subsoils, and the latter is often heavier if it contains much clay, or lighter if it is composed of gravel or limestone.

The subsoil may, in many instances, be as rich as the surface soil, and scarcely be distinguishable from it in colour or even in texture. Take as an instance some of the wonderfully fertile scrub soils of Queensland or the black volcanic soils. There is practically, in such cases, no subsoil until a very great depth of rich surface soil has been passed through, although you must remember that we only call the soil to a depth of from 8 to 12 inches a true surface soil.

A gravelly subsoil should never be brought to the surface; indeed, it is dangerous to bring up a clay subsoil, as it may contain poisonous elements injurious to any crop sown or planted on it.

The real object of subsoiling is to loosen the subsoil, to break it up without bringing it to the surface, and thus afford more room for the rootlets to go down in search of plant food and water. By constant ploughing, what is called a "PLOUGH PAN" forms on the surface of the subsoil, owing to the friction of the bottom part of the plough in sliding over it, and also to the treading of men and horses. Now, this hard layer prevents the passage of water, and is too hard for the rootlets to penetrate it. The water lying on it becomes stagnant, and the crop, as you have already been told, suffers from the cold, wet soil. The subsoil plough breaks up this hard layer, and not only is a passage thus made for water, but more room is given to the roots to strike downwards, and hence more plant food is made available.

Subsoil ploughing is very hard work for horses, from four to six horses being required for the work.

We will now consider the very important matter of DRAINAGE.

Now, first of all, what does drainage mean? (Lesson 6, I.) It means, generally, the carrying off of superabundant or stagnant water from the land, and it is done by means of ditches and trenches. The objects to be attained by drainage are fourfold. First, as I have just told you, to get rid of the water by running it off through the soil. Secondly, to give more plant food by lowering the water-level and thus deepening the soil. Third, and this will seem strange to you, to *retain* the moisture in the soil. Fourth, to aerate the soil—*i.e.*, to allow the air to circulate freely underneath the surface. You probably wonder why I tell you that you must drain to get rid of the water, and yet drain to keep it in the soil. I will explain this later on.

We will consider each of these objects. We want to get rid of the superabundant water. Why? Because stagnant water keeps the soil cold and sour, and thus spoils it for crop-producing. This, you will remember, was explained to you in Lessons 3, 6, and 7 of the First Book. I there gave you the simplest example of drainage, by showing you the use of the hole in a flower pot. Well, the drainage of big fields is only the same thing on a larger scale. Next, by lowering the water-level, you give more plant-food. How? All soils have what you know is called a *subsoil.* Now, in stiff or very flat lands, the surplus water rests on this subsoil, and renders it like wet mortar in wet weather, and like brick in dry weather. In neither case can the roots of the plant thrive in it. But carry away the water by means of drains. What happens then? The surplus moisture sinks into them; the soil they have been drawn from becomes aerated and friable; hence the roots can go down into it in search of nourishment, and, after a time, the soil suited for a crop is deepened right down to the depth of the drains, the water-level having been lowered to this extent.

Again, drainage *retains* moisture in the soil. This is shown clearly during a drought. The soil being deepened and warmed by the removal of the cold, stagnant water, this deepened and warmed soil will retain a certain amount of moisture in a dry season. In such a season and on such a drained soil, the roots go down, and can stand long-continued dry weather.

I will give you a proof of this. A sugar-planter in North Queensland drained a large area of land, and when he had finished the work, which cost him a great deal of money, there came a drought, and his neighbours laughed, and said he had foolishly wasted his money; but, as the growing season went on, it was seen, to everyone's surprise, that this planter's cane grew beautifully, whilst on the undrained land the cane was very poor. Now, here is a clear proof that drainage is a good thing, whether the season be wet or dry. The depth of the soil is so much greater that the roots can penetrate, and consequently the plants have more mouths and a longer reach to suck up moisture and plant food from the aerated and consequently sweetened subsoil.

The influence of drainage in aerating and warming the soil is now acknowledged by all good farmers, and it has over and over again been proved that a drained soil will be ready for cropping at least a fortnight sooner than an undrained one, because the under soil is warmed. I think I have already shown you how rain carries whatever fertilising material it meets with into the soil. Now, you can quite understand how, if the water-level is near the surface, these materials cannot be retained in the soil. They are either wasted away or are evaporated by the succeeding hot sun, because they remain so near the surface.

There is not the slightest danger of making the land too dry by drainage if it is done in the right way. In our first lesson in the First Book, I showed you a little experiment with a lump of loaf sugar, and explained to you that the water rose right through the dry part which you held in your hand, because the sugar was full of little passages through which the water crept up till the whole piece was wet. This occurs through what is called CAPILLARY ATTRACTION. What does that mean? you ask. It means the power to suck up and carry to the surface either moisture or plant food in solution. The soil is full of little passages, just like your hair, which, perhaps you know, is hollow. Hence the term *capillary*, from the Latin *capillus*, a hair. The finer you make the soil, the greater number of these passages, and the stronger the attraction. As the water evaporates from the surface, the water below rises up to take its place and carries with it much fertilising matter in solution, which is left in the soil as the water evaporates, for the benefit of the crop. You can easily prove this by making a solution of salt and water. Put this into a dish, and cover it with a bit of tin full of holes. On the tin place a quantity of dry earth, and set it out in the sun. The water will be evaporated through the soil, and the salt will remain in it, and some will appear lying on the surface of the soil.

There is one point I want you to particularly notice. The smaller the little tubes are in diameter, the higher the water will rise through them. Therefore, if you want Nature to help you to make your soil fertile, thoroughly cultivate it till it is as fine as you can possibly make it.

In a future lesson, I will explain to you how draining should be done.

The lands which most require draining are: Swamps, and low places—soft places where springs ooze out; sandy soils with clay subsoils—stiff, clay soils. The last need draining most of all arable land, as it renders them easier to work, and, when drained, horses can be put onto them much sooner after heavy rain than if they were left undrained.

I recommend you to study this subject closely. Go out onto the farms, and look at the crops on dry and wet land. You will not fail to notice that it will pay the farmer to drain his land.

Questions on Lesson 8.

1. What is meant by a *subsoil?* In what does it differ from the *surface soil?*
2. Should the subsoil on a farm be brought to the surface? Why not?
3. What is the object of subsoiling?
4. What is meant by a "plough-pan"? What causes it? How is it broken up?
5. What is meant by drainage?
6. What are the objects and effects of draining?
7. How do you explain the fact that draining will *remove* moisture in the soil, and yet assist in *retaining* it?
8. Explain the term "capillary attraction"? What is the effect of it on a soil?
9. Describe an experiment proving your last answer?
10. What lands require draining?

9TH LESSON.

SECOND STAGE.

Closely connected with draining is IRRIGATION. To IRRIGATE land means to run a quantity of water over it. You may also irrigate land with liquid manure. The object of irrigation is to supply sufficient moisture to plants to ensure their growth. The amount of moisture required by plants is well known, and if that amount is not supplied by ordinary rainfall it must be supplied by art, or the crops will not thrive. Take an ordinary maize crop. From the time it appears above ground until the corn has hardened on the cob, it demands as much water as would cover the soil it grows on to a depth of 14 inches. You have most probably seen a RAIN GAUGE at the school. A rain gauge is a simple instrument which enables a farmer or anyone else to find out how many inches of rain fall in a day, a week, a month, or a year. Suppose you want to begin farming in some district. It is very important that you should know how much rain falls in the year, and during what months it falls in greatest or smallest quantities. All you have to do, then, is to take up the table of rainfall which is given in this *Journal*, and you get the information at once, thanks to Mr. Clement Wragge, the Government Meteorologist. There are districts in Queensland which possess magnificent farming soil, but, owing to the small annual rainfall, crops are very difficult to raise. In such a case it may be possible to *irrigate* the land. When you water your garden (which it is to be hoped you have started) by means of a watering-pot, you are irrigating the garden. The Chinese gardeners raise fine vegetables in the driest parts of Queensland by irrigation. But it is plain that you cannot irrigate 100 acres with a watering-pot. You must take some other means. Two things required are—PLENTY OF WATER, and some method of bringing it on to the land. If the land is on a hill above the water supply, irrigation will be a most expensive business, and will only pay on a very large scale. At Bingera, near Bundaberg, where Messrs. Gibson and Howes have expended £40,000 on irrigation works, the water of the river whence the supply is drawn is far below the canefields. But for the farmer of 100 or 200 acres such a position will not pay to irrigate.

I told you in the last lesson that drainage and irrigation were closely connected. So they are in this way: If your farm lies very low, before you irrigate you must drain the land, otherwise you will do more harm than good by deluging the land with water, which is only partly used by the crops, whilst the unused portion lies on the subsoil, and, being unable to get away, becomes stagnant, and the crops will consequently be poor.

There is one thing that few farmers know in connection with watering plants. Just ask somebody this question: "What good does watering plants do them?" The answer you will probably get will be: "Oh! it makes them grow!" "Anything else?" you then ask. "Well, no," is the reply, "I don't see what else is wanted."

If you give the matter a moment's thought, you will see that there is something else wanted, and that something else the water supplies. Think of the quantities of visible and invisible substances floating about in the air, which are carried down to the fields by the rain. Think of the quantities of soluble plant food in the soil only waiting for water to dissolve them to pass through the roots of the plant into its various organs. Think of the numberless substances—animal, vegetable, and mineral—contained in river and well water. Why, when you water your crops, you are actually manuring them without knowing it, and there are cases in which you may obtain certain good crops without any other manure but river—or, better still, reservoir—water.

So you see irrigation supplies both the needful moisture and also plant food. Further, it does not require a very wise man to see that irrigation assists the action of manure. Put some dry farmyard manure or bonedust on the soil of your garden in summer. There the manure will lie, doing little or no good to the plants. But let a shower of rain come, or do you water the manure every day. The water will dissolve some of the elements of it, and these, being in solution, are taken up by the roots. Here is a list of some of the advantages of irrigation:—

It softens the consistence of the soil, rendering it more penetrable by the roots of the plants. It facilitates decomposition of organic or inorganic matter in the soil, promoting germination. It modifies the temperature of the soil. It furnishes more water to the plant and soil. It supplies moisture at the time most needed by plants and soil. It supplies moisture to the crops which require excessive moisture. It encourages early and rapid growth. It insures a larger crop and more crops. It insures a better quality to the crop of fruit. It furnishes a systematic method instead of irregularity. It permits of a greater variety of crops. It almost wholly eliminates risk from the operation of transplanting. It economises time and labour. It adds much to the health, comfort, leisure, and life of a farmer. It economises space, and is used to level the soil. It increases the area of fertile soil. It increases the quality of the soil by its deposits of sediment. It increases the commercial value of the soil. It increases the average rainfall. It favourably affects the climate. It gives greater security and permanence to the farm investment. It elevates agriculture to a higher plane. It advances the farmer to a higher rank.

Water is absolutely necessary to plants and fruits to keep all the cells and tissues of every part in a state of moisture and motion. When the soil has no longer sufficient moisture to keep up this state of cell movement, the latter become hard, the flow of sap becomes less, and, finally, the plant wilts and dies. But even should it revive after a shower or after being irrigated, it has already so suffered that it will rarely recover its original healthy action.

The question as to how much water plants require has been answered by many scientific experimenters. Professor Storer, a very learned agricultural lecturer in an American university, tells us that enormous quantities of water are required for cultivated crops. In every 100 lb. of succulent (juicy) fruits and vegetables, such as melons, cucumbers, lettuce, asparagus, as much as 95 lb. of water have been shown by analysis to be present in them. In ordinary roots and vegetables, 90 lb.; in young grass, 80 lb. to 90 lb.; in grain plants in blossom, 75 lb.; and even in mature leaves of trees, 60 lb. in every 100 lb. Now, 1 inch of rain is equal to over 4½ gallons of water on every square yard, or 22,617 gallons (or 101 tons) to the acre. Therefore, a rainfall such as we have in Northern Queensland of over 100 inches per annum, or, as in Southern Queensland, 50, 40, 20 inches, will give an enormous weight of water per acre. The great trouble with rainfall is that it is not evenly distributed throughout the year. We have alternately in this State a wet and a dry season. For the first three months of the year in the North it rains daily and nightly; then for nine months there are only occasional rains and thunderstorms, and the land becomes parched and dry. Just think what wonderful crops we could grow if the rain came only when it was wanted! But then such regular rains would not suit every farmer. When one man wants fine weather to make hay or to harvest his wheat, another wants rain for his corn, or sugar-cane, or sweet potatoes; so that it is much better as it is, and we must take the seasons as we find them.

In artificial irrigation enormous quantities of water are poured over the land. To give a hayfield a proper drenching, Professor Storer says that an amount of water is used which, if it were spread out evenly, would form a layer 4 inches deep over the field, and that for 4 acres 86,400 cubic feet are run over the land in twenty-four hours, and this is repeated twelve times in the season at intervals of a fortnight. Now, there is a little calculation for you to find out how many gallons this makes. All you have to do is to reduce the cubic feet to cubic inches by multiplying by 1,728, then divide by 277¼, because 277¼ cubic inches equal 1 gallon. What is the result? Five thousand three hundred and eighty-five gallons, and this repeated twelve times is equal to 64,620 gallons.

With regard to irrigating other crops, such as sugar-cane, wheat, root crops, &c., the running of the water over the surface of the ploughed land cannot be practised without injury to the soil, because it puddles it up; and when the sun has baked the surface it is so hard that plants do not grow properly, and even the water run on afterwards mostly runs off the surface. So that some other method has to be adopted. For ploughed land, undergroud drainage is necessary. Such underground drainage is done in various ways, which I will explain to you in a special chapter on How to Drain. Suffice to say here that, by these underground drains, far less water is needed, because it is not evaporated so quickly by the sun, the water cannot lie on the surface and become stagnant, there are no ditches on the surface, and the soil does not become alternately puddled and baked.

The kind of water used in irrigation is of the greatest importance. Some of our bore waters are so impregnated with mineral salts that they would ruin the land if applied in quantities. In the case of alkaline waters, the alkaline matter accumulates by degrees on the surface, and very soon nothing will grow on land irrigated with such water. You may see how true this is by examining the alkaline patches on some of the soils on the Darling Downs, where various crops have regularly failed to grow.

Questions on Lesson 9.

1. What is the meaning of Irrigation?
2. State the object of irrigation.
3. What is a Rain Gauge?
4. What two things are needed for irrigation?
5. Under what circumstances would irrigation be too expensive for a farmer to undertake?
6. In what manner are drainage and irrigation connected?
7. Does irrigation supply a crop with anything but water?
8. How does water keep life in plants?
9. What amount of water is contained in melons, cucumbers, lettuce, grass, grain in blossom?
10. How many gallons of water per acre are supplied by one inch of rain?
11. Why are underground drains employed?
12. Explain why you should be particular as to the kind of water you use in irrigation.
13. Are there any waters in Queensland which would be injurious to crops?
14. Which water is best for irrigation purposes? Why?

10TH LESSON.

SECOND STAGE.

In the First Book and in the preceding nine lessons of this Second Book, I have, I hope, given you sufficient elementary instruction to enable you to comprehend what is to follow.

Let us now suppose that you have a small garden, on which you intend to put into practice what you have so far learned. The first thing to do is to decide what you intend to produce in the shape of vegetables. I say nothing about flower gardening; that branch of horticulture is a very different business to that of vegetable-growing, and requires considerable care and attention, besides a special knowledge of flowering plants and of the operations of budding, grafting, pruning, hybridising, which are not required in producing the ordinary market vegetables.

Having, then, decided to grow what the Americans call "garden truck"—that is, peas, beans, cabbages, cauliflowers, lettuces, radishes, and even potatoes—your first business will be to break up the soil. You will, of course, have taken care that you have a fair water supply, either from a freshwater creek, water-hole, dam, or tank. The object of breaking up the soil, as you have learned, is to get a deep bed for the roots of the plants, and the object of TILLAGE is to reduce the soil to a fine state of TILTH. In a small garden this is best done with a spade or digging fork. Start by digging to a depth of, say, 8 inches. Throw the soil forward, and dig on from one side of the garden to the other, throwing the soil forward. You will then have a trench, which you fill in as you start on the next "SPIT," throwing the sods in so as to bury the grass, which, as you know, will act as a manure by and by. When the whole garden has been thus roughly dug up, leave it in the rough state, so that it may get the benefit of the sun, air, rain, or frost to pulverise, sweeten, and mellow it. You will soon begin to see the effect of these agents acting on the rough surface—in the crumbling of the surfaces of the rough clods. Then is your time to set to work and thoroughly till the soil, turning it over and over and stirring it till you have so completely broken it up that it forms a deep, soft seed bed. Now you may lay out your beds. Long, narrow beds are preferable to large square or oblong ones, because you can work at the former without treading down and hardening the soft soil, which you would do in the case of large beds. If you look at a Chinaman's garden you will see that all the vegetable beds are narrow. Watch him at work, cultivating or watering: he never walks on the beds, because they are narrow enough to allow of being worked and watered from the pathways.

If you intend to grow cabbages and cauliflowers, and other vegetables which require planting out, make small seed beds, and sow the seeds thinly in rows about 6 inches apart. Some market gardeners sow the seed BROADCAST, but by sowing in rows you are able to work the soil between the plants, keeping down the weeds and preserving the fine tilth, and hence preventing the evaporation of moisture at the same time. Remember that seeds should not be covered deeply. Usually a covering of fine soil equal in depth to the size of the seed is sufficient. It is also well, before sowing, to give the bed a thorough good drenching with water—not just a surface sprinkling. On the following morning give it another good watering, and in the evening sow the seed, protecting it from the heat of the sun by sticking in some small branches here and there, till the young plants have sprung up and gained strength. In this way you sow cabbage, cauliflower, lettuce, beetroot, celery, endive, leeks, onions, and other vegetables which require planting out. It is best to make small sowings at different times, so that you may have a constant succession of vegetables coming on as the older ones are removed. Carrots, turnips, peas, beans, parsnips, radishes, vegetable marrow, cucumbers, melons, &c., are sown in beds, but are not transplanted. The important point in connection with these is thinning them out. You cannot sow their small seeds so evenly that they will all come up at equal distances, unless you use a seed drill. Now, light and air are absolutely necessary for the proper development of vegetables, and every plant should have its proper share of these.

Beginners are very apt to sow peas and beans too close together. French beans should be sown in drills quite 2 feet apart, and 1 foot apart in the rows; peas in rows 2 feet apart, but about 6 or 7 inches only in the rows.

A very good rule is to keep all plants at such a distance that when full grown they just about touch each other. Nothing is gained by over-crowding. On the contrary, the plants will not thrive, and disease generally follows over-crowding. So thin out radishes to 4 inches apart, turnips to 6 inches, carrots to 4 or 5 inches.

When sowing marrows, cucumbers, and melons, sow five or six seeds in a ring, in beds from 6 to 10 feet apart, and when they are well up thin them out to two plants. Pumpkins require much more room, and only one plant should be left.

Now, just a few words on planting out. Take cabbages and cauliflowers first. The bed to which the young plants are to be transferred must be rich, moist, well-drained, thoroughly well tilled, and heavily manured unless your soil is naturally rich scrub or black soil.

When transplanting, nip off the extreme ends of the roots, as this will help to make lateral roots. In rich soil plant them with a dibble from 2 to 3 feet apart, according to the variety. Press the soil firmly round the roots. The after work consists in constantly working the soil between them to get a mellow surface, the advantage of which is that the soil is kept warmer during the night and cooler during the day, and also a mellow surface confines a large quantity of air laden with moisture, according to the day temperature. During the night the vapour is condensed—that is, turned into water again, which goes down and invigorates the roots. If the surface is left untilled, the dew and moisture-laden vapour instead of going into the soil are evaporated by the early morning sun.

The transplanting of celery is done differently. Having raised your plants from the seed, as soon as the rough leaf is a little advanced, make another bed by covering it with a couple of inches of well-decomposed manure, and digging it in with about 3 inches of soil. Then water it well, after smoothing the surface, and in the evening plant out your celery plants 6 inches apart. This is the first proceeding. Now get ready another bed by digging trenches 1 foot deep and 1 foot wide, 4 feet apart from centre to centre. Put about 4 inches of good manure at the bottom, and mix it well with the bottom soil. Then water it well, and also water the seedling bed, to which you transferred the young plants. Then take up each plant with a ball of earth attached to it, and plant them in the middle of the trench 12 inches apart, and water again. Keep the hot sun off them by a shade of some kind. They will be 8 or 10 inches high now. There is another operation yet to be done. You know that good celery is very white and crisp. Keep on watering and manuring the plants with liquid manure not too strong, soapsuds, dishwater, &c., not forgetting to stir the soil between them. Then, when they are full grown, gather the leaves together and tie the plant up. This is to prevent the earth getting in whilst you fill in the trench, till only 6 inches of the head of the plants appear above the ground. This must only be done in dry weather. The celery being thus protected from the light remains perfectly white as to its leaf stalks, and is said to be "BLANCHED."

Remember, when vegetables are ripe, gather them, even if you have no use for them. Peas, beans, cucumbers, marrows, &c., will cease bearing if the matured fruit is not taken off.

Do not burn the weeds and decayed vegetables and plants. Either dig them under or form a COMPOST heap in a convenient corner of the garden. Put all the rubbish and kitchen waste into this heap. Water it with soapsuds, kitchen slop, &c. Put a little lime, or, better still, potash in it. Turn it over frequently, and by and by you will find all this rubbish turned into useful plant food. You will now naturally ask: "Why must the compost heap be turned over frequently?" The object of turning it over is to secure fermentation. Every time you fork it over, a new fermentation sets in, and the contents are exposed to the influences of the air. Remember, I am telling you now about garden work—not field work. The compost heap is for the garden. More rough methods are used for the field; in fact, it would not pay a farmer to waste time over such highly refined manure.

In vegetable gardening you want to get plenty of humus into the soil. There is no absolute need of any ROTATION so long as the land is kept in good heart. You can try a little artificial manure now and then just by way of experiment.

I have given you this little chapter on gardening for the purpose of affording you a means of carrying out the instructions already given, and that which is to come.

Questions on Lesson 10.

1. Having chosen your ground for a market garden and fenced it, what is the first thing to be done?
2. What implements are required?
3. Why should you lay out your garden in long narrow beds?
4. Describe the method of raising a crop of cabbages, cauliflowers, beetroot, onions, &c.
5. Distinguish between crops which require transplanting and those which may be sown on permanent beds.
6. How should cucumbers, melons, and pumpkins be sown?
7. What precautions must be observed in planting out cabbages and cauliflowers, and in treating beans, peas, turnips, &c.
8. Describe the method of growing celery. How would you blanch it?
9. When vegetables are ripe what is to be done with them to ensure further crops?
10. What is a compost heap? How would you make one?

A THRIVING SETTLEMENT—LOWOOD.

Amongst the many pretty and thriving agricultural townships of Queensland may be included the village of Lowood, which is picturesquely situated on the eastern slope of the Rosewood Scrub. It overlooks a wide stretch of fine agricultural and pastoral land as far as the banks of the Upper Brisbane River, and received its first impetus about fourteen or fifteen years ago as the result of the construction of the branch railway line from Ipswich to Esk, the terminus of the first section of the line.

At Lowood and in the immediate neighbourhood, which includes Tarampa and Minden, there is a population of about 2,000 persons, and some 800 are settled within a radius of 2 miles. The average area of the agricultural farms is 80 acres, and, judging by appearances, all the farmers appear to be in very comfortable circumstances.

The dairying industry is a very important one here, and is expanding rapidly. Consequently with dairying, pig-raising is on the increase. Regular consignments of pigs are made every Saturday to Brisbane, the animals being sent in to auction by the farmers on Fridays. The usual crops are grown, such as maize, potatoes, onions, lucerne, and other green fodder. Very large consignments are made every day of these articles of produce, as much as 500 bags of maize being despatched in one day.

Poultry are not neglected, as may be inferred from the fact that 1,000 dozens of eggs are sent away weekly.

Every month three cattle sales are held, and large cattle-yards are now being built in the main street.

Plate I.

Lowood. Looking East.

Lowood. Looking West.

LOWOOD.

Plate II.

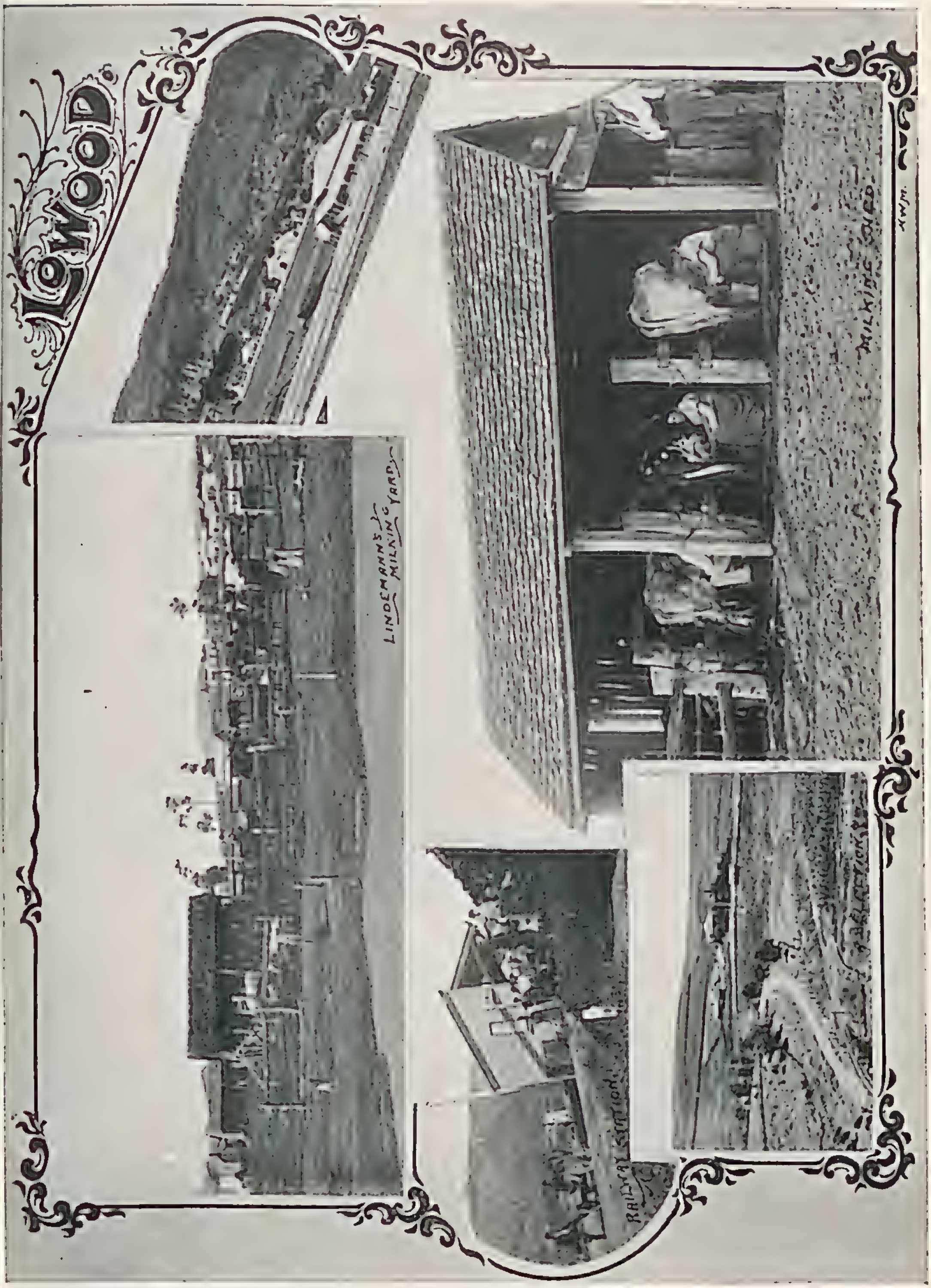
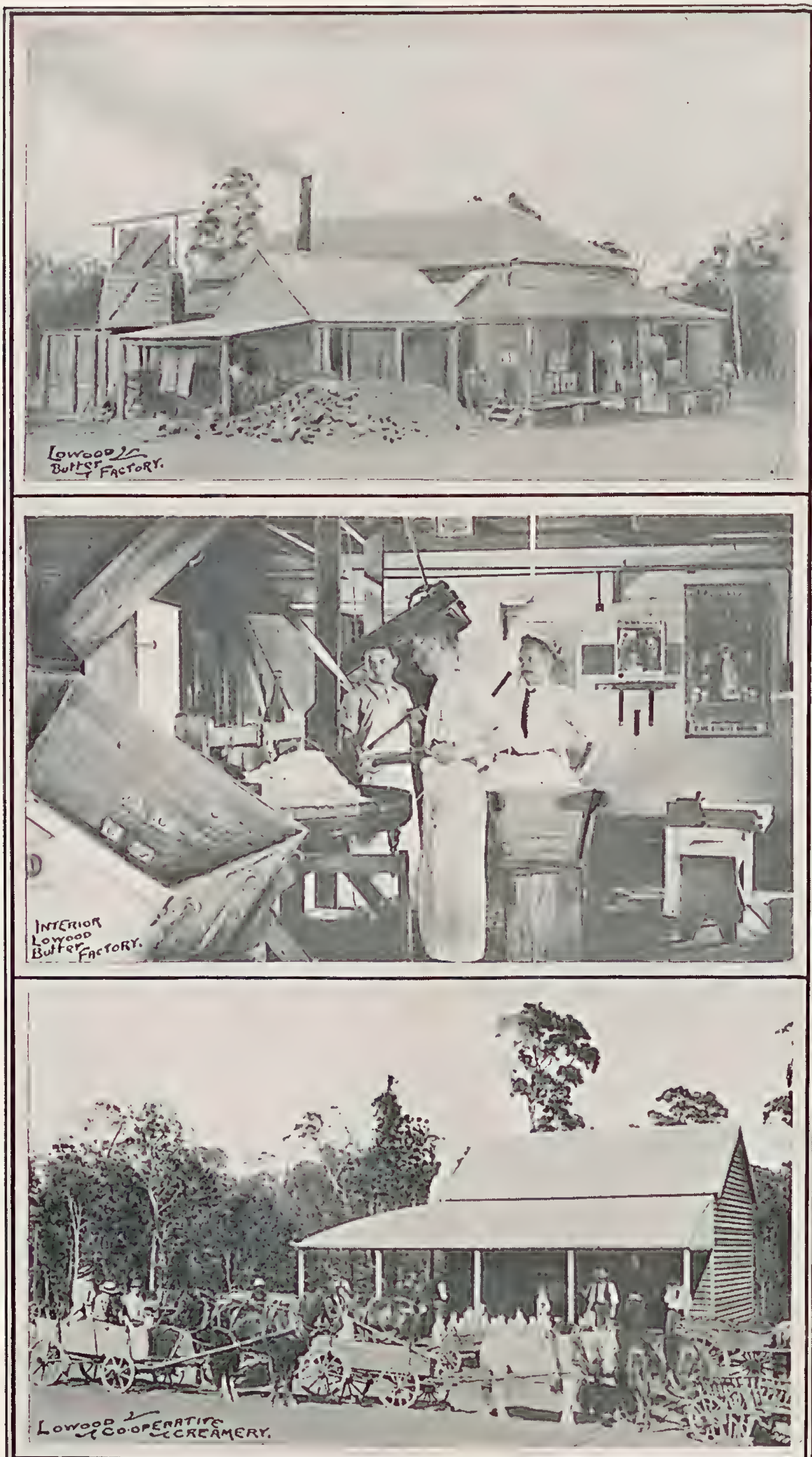

LOWOOD
LINDEMANN'S MILKING YARD
MILKING SHED
RAILWAY STATION

Plate III.



LOWOOD.

Four miles from the village is a butter factory under the management of Mr. Deitz, which was started eight years ago, and is a paying concern, about 1½ tons of butter being turned out daily. There is ample cold-storage room provided, and the butter is made by means of one 600-lb. concussion churn, one of 300-lb. capacity, and one 150-lb. butter worker.

The factory business is increasing so much that a large factory is to be built in the village near the railway station.

On the western side is the Lowood Co-operative Creamery, at which 400 to 500 lb. of cream are produced daily.

Some attention is paid to viticulture, Mr. Sutteridge having a thriving vineyard, and which in the season returns some 150 cases of grapes per acre. Some wine is also made, and honey also is produced.

Mr. Lindemann's dairy, at the rear of the station, turns out about 40 gallons of milk at each milking. The separator is driven by an oil engine.

Lowood possesses a well-equipped State school with an average attendance of 150 children. The teacher is Mr. Lawson, who also holds the rank of captain in the 4th Regiment.

Military matters and rifle-shooting are not neglected. Sergeant-Major Bailey, of the Fourth Darling Downs Regiment, is the instructor. Lowood has the honour of having a representative of its military in South Africa—Lieutenant-Colonel Flewell Smith, who went out in command of one of the late contingents, and now holds an important military command in the Dark Continent.

At one time a considerable timber business was carried on at Lowood, and there is a large sawmill, with extensive moulding machinery, in the place.

Altogether, Lowood is a very thriving village, and all industries are on the up-grade. Our illustrations were taken by our artist, Mr. H. W. Mobsby, and, although necessarily of small dimensions owing to the exigencies of space, afford a very fair idea of the place and of the beauty of the surroundings.

FLAXGROWING.

With freetrade between the States of the Commonwealth, it behoves our farmers to have more than one string to their bow, so that, in the event of large importations of one class of agricultural products, the competition with Southern producers may not be so severely felt as if only one or two classes of crops, such as wheat and maize, potatoes and maize, or lucerne, are grown. Amongst the crops for which there is an unlimited market, we may consider flax as one of the most remunerative.

In January last year we gave the experience of Messrs. Woolfe Brothers, of Traralgon, who grew a crop of 70 acres for a net return, including the Government bonus of £2 per acre and of £5 per ton on flax manufactured, of £9 2s. per acre. Messrs. Woolfe Brothers, however, only grew for seed, and the net return was shown at £5 12s. per acre, the flax being pulled by hand. By the use of the reaper and binder the return would have been greater.

Last year those gentlemen put 170 acres under flax, and the resulting crop averaged £16 per acre, leaving a net profit, after paying wages and including the Government bonus of £2 per acre, of £7 per acre.

Writing to the *Leader* on this subject, Mr. Hermann Woolfe says :—

As to the land adapted for flax, any good black, grey, or chocolate soil which will grow a good crop of barley, wheat, or potatoes, will grow flax, good potato land for choice. When to sow? In our district, Gippsland, near Traralgon, we find the months of April, May, and June the most suitable, as this gives the crop the full benefit of the spring weather, and likewise ensures the seed getting ripe before the caterpillars are able to do any serious harm. Should the pest attack the crop during the blooming stage, or before the seed is nearly ripe, they will probably take all the seed, although not doing any appreciable harm to the fibre. Cultivation of the land, and how much seed to be sown to the acre? The land should be worked until thoroughly fine and level. Sow the seed broadcast over the last stroke of the harrow, and roll down flat? or should it happen to be very dry, harrow the seed with very fine harrows, and roll down. We have always found the best results obtain from the former method. The seed will perish if covered too deep. At the rate of 60 lb. of seed to the acre is the best quantity to sow for our present purpose, that is, both seed and fibre. In time, when finer fibre will be required, up to 100 lb. of seed will be necessary, but fine fibre must always be grown at the expense of the seed yield, while not necessarily increasing the weight of the fibre obtained, only the quality would be better, other things being equal.

The real work begins at the harvesting. No doubt the European method of pulling the flax will give the best results where it is possible to do so. A good crop of flax can be pulled and stooked at the rate of 25s. per acre. Assuming that we could get sufficient hands to pull our crop, we should not hesitate about giving that price, because we estimate the loss of fibre when cut with a reaper and binder at 15s. per acre, and as the work of manufacturing is absolutely the same whether a crop is pulled or cut, the loss through cutting would actually pay for pulling the crop, especially as we have found flax a very hard crop to cut so close to the ground, and consider it well worth 10s. per acre. What compels us to try and cut the flax is the difficulty of getting men enough to pull the crop, and we look on the binder as a kind of safety-valve should the men go on strike. We have proved to the manufacturer that flax fibre is in no way injured by cutting, excepting the loss of 3 inches of its natural length, which is not much, provided the flax is over 3 feet high. Below that limit we would not cut flax at any price if we wished to use it for fibre. Messrs. Miller and Co. are prepared to pay within a fraction of the same price for cut flax as against pulled, and with this knowledge no one need be afraid of the harvesting of a large area, as we find that flax is the easiest crop to save in wet seasons, because the fibre cannot spoil, and the seed will stand more rain than any other kind of grain before shelling out. In any case the sheaves of flax should be as small as a binder will tie to facilitate threshing, and should be stooked in long rows to dry. The drying takes about three weeks, on account of the oily nature of the plant. When dry, stack like any other crop.

As to threshing the crop, in this operation, the grower must bear in mind that the straw must not be torn about unnecessarily, and only the heads subjected to the operation. After trying to do the work by hand we have now adopted a simple made machine, with which we can thresh the crop at the cost of 1s. per bushel, without in any way injuring the fibre.

With regard to yield of seed per acre. Up to 1900 we grew during six seasons an average of 13 bushels per acre, allowing a loss of 2 bushels to the ravages of the caterpillars. The average price during that time was a little over £13 per ton, going as high as £18 per ton this last season. A bushel of flax weighs 56 lb.

The next operation is the retting. After being threshed the straw must either be stacked for future operation or, if convenient, at once carted out to the paddock where the retting is to be done. The method we adopt is that known as dew retting, as distinct from water retting. The latter method we found utterly impossible here, on account of the water in most localities being too hard and brackish, and even where this is not the case it would cost a great deal more, while the risk of spoiling the fibre is very much greater. The work of dew retting consists of spreading the flax straw in nice straight rows, about an inch thick, on a clean paddock, grass for preference, but stubble will do. The difference between water and dew retting is simply that by immersing the straw in waterholes (or bogs), always keeping the stuff covered with water, it will ret in from seven to ten days, according to the softness of the water and the temperature of the weather. When sufficiently retted it must then be taken out of the pit and spread in the usual way to dry and bleach. This is a most objectionable and arduous work on account of the wet and slimy state it comes out of the water, while, at the same time, if this work is not done expeditiously the stuff will heat and totally spoil. Dew retting, on the other hand, is a simple and interesting work, suitable for young lads or elderly people. The spreading can be done at any time, but should be done in such a way as to permit any stuff which has been out three weeks to be turned over, so as to allow both sides to be evenly retted. When the fibre is sufficiently retted (which on an average takes about six weeks, according to whether the weather is moist or dry), the first opportunity of a few fine days must be taken to dry the stuff and cart to the mill, where it should either be stored in a barn or stacked outside, and well thatched. Any fine day will dry the stuff if turned a day before, and when gathering it up we find that each man should gather as much as he can hold in his arms, and tie with binder twine round the bundle. On the other hand, should the weather be unfavourable, we gather up armfuls and stand it up in the shape of a sugar-loaf. It will stand readily in that form, and by that means we prevent it from spoiling in bad weather. As a rule, however, this work can be avoided by either doing the retting in the early autumn, say April and May, or in early spring, when a few fine days can be expected with confidence. On an average, the whole work of retting has cost us £1 per acre.

Now comes the breaking and scutching. When the flax is retted the grower's work is supposed to be done, and in Europe he generally sells his retted straw to the millowner or else pays him so much per stone for scutching. This system may be all right in Europe, where a lot of small farmers grow a few acres each, but in this country, where farming has to be done on a fairly large scale to make a living, a farmer will grow at least 15 acres, and then, after he has learned the details of the business, it will pay him to get his own plant and manufacture the crop during his spare time. A plant like ours, capable of treating 3 acres of flax per week (about 17 cwt. of clean fibre), will cost £100, without driving power, and on many farms that already exists for other purposes. We find the oil engine very suitable to do the work, or a large horseworks would do equally well. About 3 h.p. is what is required for our plant.

In breaking and scutching flax the straw is first passed through the breaker, which is composed of two pairs of 6-inch iron rollers, corrugated like cogwheels. These rollers break the woody stem inside the fibre in little bits like chaff. From there the handfuls are passed on to the scutchers, where it is subjected to rapidly revolving beaters, which clean out all the broken fibre and the particles of tow still adhering to the fibre. It is then packed in bales ready for market. The broken fibres are cleaned by shaking the pieces out of them, and this is sold as tow, which is worth about one-seventh of the value of clean fibre. In well-retted straw the proportion of tow to fibre should be as one in seven. The more retted or rotten the straw is the greater the quantity of tow. In the early stages of the industry I have known cases where there was more tow than fibre, and that is the one thing growers must learn to guard against.

We have no hesitation in affirming that flaxgrowing ought to become one of the principal rural industries of such States as Victoria, New South Wales, South Australia, and Tasmania. After having to do with dairying for a number of years we chose flaxgrowing as the more congenial and profitable, while at the same time the two industries are dependent on each other, inasmuch as the by-product of the flax—viz., linseed—is excellent feed for calves, and the oil cake is invaluable as feed for milch cows in the winter months.

Any intelligent farmer can grow and harvest the crop, but beyond that it will pay him to come and have a look at our machinery for threshing and manufacturing the fibre. We will always be pleased to give what advice we can to any *bonâ fide* grower, and point out many things personally that it is difficult to put on paper. The greatest difficulty for growers who know nothing about the manufacturing would be the necessity of getting a man who could superintend the retting and work the machines for breaking and scutching. At present there are only about ten men in Victoria able to do this, including ourselves. Anyone, however, taking a personal interest in the work could master all the principol features in a month, which would enable him to go on, and with care and discretion allow him to turn out good fibre successfully. One competent and practical man is sufficient to work a mill. In any circumstances we would advise farmers not to attempt the manufacture of fibre without first making the fullest inquiries from the men already in the industry. This will save a great deal of worry and money. The address of all flaxgrowers can always be obtained from Mr. Miller, rope and twine maufacturer.

ONIONS.

We have received from Mr. Henry Richards, of Radley Farm, Warra, a sample of the finest onions of the White Spanish variety that we ever remember to have seen in Queensland. They might well be called the Champions of Australia. Those sent to us were a fair average sample of the whole crop. They scaled 2 lb. 4 oz. each, and had a circumference of from 18 to 19 inches. The flavour whether eaten raw or cooked is excellent, there being an almost entire absence of the strong, biting principle in them. Mr. Richards describes the appearance of the crop as being like a field of large Swede turnips.

The seed was sown during the first week of April last year, in drills 14 inches apart, with the Planet Junior, and the land was cultivated four times on account of much wet weather. We have no information about the description of soil they were grown in, but whatever it was it must be admirably adapted to onion-growing. The crop is expected to reach 8 tons per acre, notwithstanding the loss of about half the crop owing to various causes.

After seven years' experience of onion-growing, Mr. Richards considers that he has now secured a variety which is especially suitable for the Dalby climate. This success should cheer the hearts of the farmers of that district, for onions are a good paying crop, and what one man can do by exercising care and intelligence others can.

The value of onions from a medicinal point of view cannot be over-estimated. They are not only a most wholesome vegetable either in the raw state or boiled, stewed, or fried, but they act on the kidneys, increasing their action; they increase the secretive and expulsive work of the cutaneous glands; they tone up the stomach and assist the digestive organs; they calm the nerves and induce sleep. They are not only very easily digested themselves, but they assist in digesting other food. In hot weather the virtues of the onion should be availed of to a far greater extent than is the case at present. Some people cannot bear the strong flavour, but much of this objectionable feature may be eliminated by boiling, stewing, or roasting. Yet people will not hesitate to take quantities of medicines far more nauseating than the strongest of strong onions. Onions, eschalots, apples, celery, parsnips, and many other vegetables and fruits if eaten regularly will keep the body in better health than half the drugs in a chemist's shop.

ROOTS OF THE MAIZE PLANT.

The advantages of maize as a fodder crop in a dry season is shown by some interesting experiments carried out a few years ago at the North Dakota Agricultural College, in order to ascertain the distance to which the root penetrated the soil to procure its nourishment. For this purpose an iron frame was constructed in the shape of a cube 5 or 6 feet in each of its dimensions, and was filled with shelves of wire-netting placed one above the other, with intervening spaces of about 2 inches. These frames were sunk in the ground entirely beneath the surface. Maize and wheat were then planted on the ground, and, as the plants grew, the roots were not obstructed by the layers of wire-netting embedded in the soil beneath, but forced their way readily through the meshes. In the autumn the frames were dug out and the soil washed away with water. The netting held the roots and rootlets in the very position in which they grew, and a valuable object lesson for the study of root growth was presented. The roots of the maize plants had gone beyond the 6-feet limit, and some of the roots were broken off in removing the frame. In the case of the wheat, the rootlets had, in some cases, gone down to a depth of 4 feet.

FARMING THEN AND NOW.

Mr. W. Sandover, of the Western Australian firm of W. Sandover and Co., recently returned to London from a trip to America, and in the course of an interview with a representative of the *British Australasian* gave his impressions of American methods of farming contrasted with Australian. He said:—"In Kansas every one uses drills now; the broadcast seedsowers have all been thrown on the scrap heap. By using seed drills and phosphates the crops can be almost doubled. While travelling through this farm country I was shown some very interesting figures. Forty years ago, to produce 1 bushel of wheat from beginning to end required three hours' labour. Now it only takes ten minutes. The cost of the human labour to produce this bushel was 1s. 6d. then. Now it is under 1¾d. A ton of hay forty years ago, cut with a scythe and gathered in by hand rakes, required thirty-five and a-half hours of human labour. To-day, with horsemowers, horserakes, and horsepresses, it only takes eleven and a-half hours of human labour, and the cost of labour per ton of hay has fallen from 12s. 3d. to 5s. 6d. Agricultural labour is expensive in America, so they invented machinery. Agricultural labour is more expensive in Australia, so that is the greater reason for farmers there to adopt machinery. It will help the labourers, too, for more land will be cultivated, and many of them will be able themselves to acquire and work farms. Ah! There is another point of interest to Australians visiting America—the cheapness of the transit. Much of the prosperity of American farmers is due to the very low rates at which the railways carry their wheat. Railways are close to almost every farmer's door. These railways, of course, are run for a profit, and they are able to charge a low tariff on account of the quantity of cargo they carry. The Australian railways belonging to the Government should not be run as revenue producers; their earnings should only cover interest and sinking fund, and every inducement should be given to the farmers."—*Adelaide Observer.*

SCIENCE AND AGRICULTURE.

SOME RECENT EXPERIMENTS.

Agricultural and horticultural experiments are now conducted so generally in all parts of the world, and so multitudinous are the results and reports on them, that but few obtain the publicity they deserve. Quite a number of reports have been received from abroad; and as some of these are of a decidedly useful and interesting character a few notes on the more important cannot be otherwise than valuable to our own farmers and gardeners.

ELECTRICITY AND PLANT GROWTH.

Russia provides us, in the first place, with some interesting and successful results in connection with the use of electricity in hastening the germination of seeds and plant growth. These experiments have been carried out near St. Petersburg by Dr. Spyeshneff and Prof. Kravkoff. In the first set of experiments seeds were electrified and afterwards sown, when it was found that not only did the seeds germinate more rapidly than seed from the same parcels not electrified, but that the crops they produced were from double to six times arger. In a second series of experiments potatoes and turnips were grown in a soil electrified by means of copper and zinc plates, the latter being placed vertically in the land and connected by wires. The crops so grown were three times as heavy as some grown from the same seed, and treated exactly the same, except that the soil was non-electrified. In a third series, barley was grown under a network of wires through which a constant current was run. The barley so grown ripened twelve days earlier than that grown on an adjoining test plot. Very elaborate investigations were also made in order to determine the exact effect of electric currents running through soils. These showed that the temperature of the soil was raised to a very marked extent. At first the moisture decreased, but afterwards increased. Taking the whole period of a crop's growth, the electrifying of a soil made it warmer and more moist for the whole period. The decomposition of vegetable matter was also considerably hastened.

LARGE *v.* SMALL POTATOES FOR SEED.

A number of German stations last year made experiments on a plan drawn up by Dr. Fischer, to determine whether large or small potatoes were best for use as seed. Whether planted whole or cut, the large potatoes gave the biggest yields in every case; but when the financial results were looked into, it was found that the biggest profit was made by planting whole large potatoes; and the next largest profit from whole small ones. Large potatoes cut resulted in a small loss, while the loss was still greater from small potatoes cut. These results were after taking the cost of the seed into account, the value of the large seed being greater than that of the small seed.—*English Mechanic and World of Science.*

DO AGRICULTURAL COLLEGES DO ANY GOOD?

The President of the Board of Agriculture, Mr. R. W. Hanbury, speaking at the opening ceremony of the Harper-Adams Agricultural College, England, on the needs of agriculture, said that his own conviction was that these agricultural colleges were doing, and would continue to do, a great deal of good. He would like to see more of them. He had often heard farmers say that the experiments in connection with these colleges did not pay; and they asked what was the use of sons learning that to which no profit accrued? That at first sight seemed right; but he did not think it fair to judge college farms by a purely financial result. They did not profess to be worked in the way an ordinary farm was worked; but had to be so managed as to be an example in cultivation to all the farms in the district. It was generally said that the farmer was the only man who had anything to learn, but he did not quite agree with that. There were others associated with the cultivation of the soil who needed educating as much as the farmer. Landlords, as a rule, wanted education, and land agents wanted a great deal of the same treatment.

PLOUGHING MATCH AT CURRAJONG.

A correspondent has kindly furnished the following report of what appears to have been a most successful ploughing match, held under the auspices of the Currajong and Gin Gin Agricultural and Pastoral Society:—

The match took place in the paddock of A. Sanders, Esq., Walla road, on Thursday, 21st November, and, taken from any point of view, must be regarded as an unqualified and most encouraging success. The weather was fine, but the day was oppressively hot—in fact, about the very hottest experienced during

Plate IV.

SOME OF THE COMPETITORS.

Plate V.

the present season—and must have proved very trying both to the competitors and the equally hard-working gentlemen of the committee, but especially so to those of the fairer sex, whose enthusiasm regarding the various contests induced them to brave for long hours together the almost vertical rays of a pitiless sun. The ploughing match brought together ten competitors, and the largest crowd of holiday-makers ever seen in this district. It is impossible to give the exact number, as the gates were thrown open at 3 o'clock, but it is computed that there were from 500 to 600 people present. The Education Department had granted a holiday to the district schools, and, judging by the number of children present, the committee's application for the holiday was appreciated. The competitors had their teams decorated with gay ribbons, which, together with the bright summer costumes of the ladies, presented quite an animated scene, which all agree in saying will mark an epoch in the annals of the district. The committee, who each had separate duties allotted to them, worked well together, and did their best to carry out the programme to the satisfaction of both visitors and competitors, and that they succeeded was the unanimous verdict of all present. The judges—Messrs. W. Gibson, of Gibson and Howes, Bingera Sugar Plantation; B. Workman, of Sharon; and A. C. Walker, Bingera Cattle Station—gave universal satisfaction in their decisions, which were rendered very difficult by the high standard of the work done, especially when taken with the hardness of the ground, which, from lack of moisture and the intense heat of the preceding few weeks, was baked as hard as a brick, and in the opinion of a novice was quite unploughable. Four classes were contested, viz.—

Champion Class, open to all comers being previous winners of first prizes in any match in Queensland. The winner, Mr. J. Presswood, did excellent work with a plough made by W. Lund, of Gin Gin. The second prize fell to Mr. T. Bramley, who used a plough specially ordered from Pittsworth. No third prize was awarded.

In the swing plough class, J. Hunter came first; F. Mittlehauser, 2; J. Bramley, 3; who used ploughs made by A. E. Brash, of Bundaberg.

Wheel Plough Class.—J. Kitchen, 1; J. Powell, 2; J. Lovett, 3.

Yankee Plough Class.—G. Handly, 1. No other prize awarded.

The prize for the best turnout was taken by Messrs. Cran Bros., of Mon Repos Sugar Plantation, who exhibited, in charge of Mr. J. Bell, a beautiful pair of bays, which were the admiration of all present.

Best outs and ins was secured by J. Powell, of Bundaberg; best crown, T. Bramley, of Watawa. The committee added a few items to their programme to fill in the afternoon, which were all well contested. That for the best-looking ploughman, to be judged by three ladies, created much merriment. The exhibition of mares and foals proved very interesting, as did also a plough-horse race, the winner to draw a ton 50 yards in three pulls. The log-chopping contest also created a deal of interest, bets being freely exchanged. The log provided by an old hand was so hard and tough as to completely turn the edge of one competitor's axe. This event was timed and judged by Mr. P. McLean, Agricultural Adviser, who also, from his experience in conducting an exhibition of this kind, gave valuable advice and assistance to the committee, which was greatly appreciated.

Invitations were extended to the Hon. W. B. O'Connell, Minister for Lands, the Hon. D. H. Dalrymple, Minister for Agriculture, and Mr. W. H. Browne, leader of the Opposition, but, owing to stress of parliamentary duties, they were unfortunately unable to be present, which proved a disappointment to many, and particularly so to the society. However, the latter is so satisfied with the success of this meeting that the members feel encouraged to try to do still better next time.

The illustrations are from excellent photographs taken on the ground by a local amateur.

MANURING.

There are nearly 500,000 acres of land under cultivation in Queensland. Of this area there were, in 1900-1901, 108,000 acres in round numbers under sugar-cane; 85,000 acres under wheat and other cereals; 128,000 acres under maize; 14,500 acres under potatoes (English and sweet); 43,000 acres were mown for hay; 41,000 for green fodder; 21,000 acres under vines, bananas, pineapples, citrus and other fruits. Here we have a total of 440,500 acres; the balance, or 59,500 acres, is devoted to coffee, tobacco, arrowroot, and pumpkins. The area under pumpkins is given in the Registrar-General's figures for 1901 as 14,232 acres, but, although maize and pumpkins are shown separately, it must be remembered that pumpkins are rarely sown as a separate field crop. They are sown usually at the same time and on the same ground as maize, so that actually the area retained under pumpkins has already been included in the area under maize.

What have these statistics got to do with manuring? it may be asked. They have a very great deal to do with the subject. Articles are constantly appearing in all rural journals, instructing farmers how and when to manure their land, and what manures to use. How many farmers in this fertile Queensland have any need to manure their land?

Take the wheat farmers. The wheat lands are, as a whole, already too rich in natural humus, phosphates, nitrates, &c., to produce heavy grain crops. So rich, indeed, are the newest of these soils on the Darling Downs that wheat is not grown until a succession of maize and other crops have been produced on them. Of the 85,000 acres under wheat, it is safe to say that not 1,000 acres are ever manured. The same may be said of the maize, hay, and green fodder areas. Much of the land under fruit and vines rarely has any fertiliser applied to it, but, allowing that fruit trees and vines do receive some attention in this way, we should then only have 21,000 acres more or less fertilised; 59,000 acres of coffee, tobacco, &c., may be left out of the list of manured lands. There remain the 128,000 acres of sugar lands. Large areas of these lands are practically virgin soil, which are sufficiently fertile to produce good crops of cane. We may set it down that only half the sugar lands are manured, and then usually all that is done is to plough in a green crop of cow peas. So that out of 500,000 acres there are less than 100,000 which require or receive the aid of manure of any kind. This speaks volumes for the marvellous fertility of the Queensland soil. Is it any wonder that the agricultural fame of the State should attract farmers not only from all parts of Australia, but from Great Britain, Germany, and Russia?

The question of manure, then, has and for a long time will have little significance for the farmer from the Tweed to Cairns on the coast, and for those on the grand fertile tablelands beyond the Main Range from Stanthorpe to Barcaldine. They are there generally relieved of the great expense and labour attendant on the production, carrying out, and spreading of stable manure, or of purchasing artificial fertilisers.

In connection with green manuring, a few words may not be out of place. What fertilising property do legumes possess? They collect nitrogen from the air, store it away, and, when they are turned under, they supply a certain amount of humus and nitrogen to the soil. They do not, however, collect or supply any phosphoric acid or potash beyond the small quantity they may have taken from the soil. The *Journal of the Jamaica Agricultural Society* writes on this subject *inter alia*:—

There is no potash in the air in the form of gas, nor any phosphoric acid, but on stiff soils the vigorous roots of the legumes may seek out and unlock to some degree the stores of potash below, generally unavailable to surface-rooting crops, and place it in an assimilable form at the disposal of non-leguminous crops to follow. The nitrogen which legumes convert into plant food exists in the air, in inert forms—that is, in such form that it is useless as plant food. The pea plants, through the aid of certain lower organisms, take this nitrogen from the air and combine it with oxygen, making thereby a substance which is suitable as plant food. So far as is now known, only the leguminous plants possess this property.

From the above it follows that nitrogen may exist in such a state or condition that, though it may be present in abundant quantities, plants cannot make use of it. In effect, much may be said of potash and phosphoric acid. As these two plant-food elements exist in the soil naturally, they are of little use to growing plants. Plant food must be soluble in the water of the soil, in order to be available as plant food. Now, the natural soil may contain enough potash and phosphoric acid to grow a hundred crops, as shown by chemical analysis, yet fail to grow one. This is because this potash and phosphoric acid are locked up in the soil in rock particles which are insoluble in water; hence the fertiliser cannot take such form as to be useful as plant food.

The importance of this latter point is that legumes or clovers cannot assimilate nitrogen gas unless certain quantities of potash and phosphoric acid are present in the soil in available form. As legumes store up nitrogen, they form vegetable growth—the nitrogen is a part of this growth, and the quantity of this nitrogen stored depends directly upon the quantity of this growth. But this vegetable growth cannot be made without the proper amounts of potash and phosphoric acid to accompany the nitrogen. Hence, to grow fertiliser nitrogen through the use of legumes, potash and phosphoric acid are part of needful soil preparation, quite as much as the seed.

It may be well to look up here the relative quantities of potash and phosphoric acid needed. The following table shows the pounds of potash and phosphoric acid required for every 100 lb. of nitrogen stored up by the legumes.

Every 100 lb. of nitrogen requires:

	Potash. Lb.	Phosphoric Acid. Lb.
Clover	84 ...	21
Cow peas	69 ...	22
Alfalfa or lucerne	88 ...	17
Beggar weed	69 ...	26

It will be observed at once that the potash greatly exceeds the phosphoric acid, whereas, as a matter of fact, commercial fertilisers commonly show quite the opposite proportions. It is true that phosphoric acid tends to take forms in the soil which place it beyond the reach of growing plants. At the same time, equal parts of phosphoric acid and potash certainly restore the balance between the two elements, and even more than restore it.

There is another point to touch upon here. It is quite impossible for plants to take up all the plant food applied to the soil; indeed, the best authorities practically agree that 50 per cent. of efficiency is fairly good work. This means that to obtain 100 lb. of fertiliser nitrogen from the air the following quantities of potash and phosphoric acid must be used:—

	Potash. Lb.	Phosphoric Acid. Lb.
Clover	168 ...	42
Cow peas	138 ...	44
Alfalfa or lucerne	176 ...	34
Beggar weed	138 ...	52

The point arises, will it pay to use such quantities of plant food merely to grow fertiliser nitrogen—considering also that the phosphoric acid is made equal to the potash. The following table explains. Potash and phosphoric acid cost the farmer about 5 cents (2½d.) per lb., nitrogen 14 cents (7d.) The first column shows what the plant food costs at most, whilst column two shows what the nitrogen gained, to which must also be added the value of the potash and phosphoric acid contained in the crop.

	Cost. $		Gain. $
Clover	16 60	...	19 25
Cow peas	13 80	...	18 45
Alfalfa and lucerne	17 60	...	19 15
Beggar weed ...	13 80	...	18 75

The table shows that under the most favourable conditions legume nitrogen pays merely as a fertiliser problem. Of course the value of the crop as forage or for other purposes is an additional value gained. Certainly it is important to note that this legume nitrogen is not all gain. It costs something, and, if the potash and phosphoric acid are lacking or improperly proportioned, growing legume fertiliser very easily becomes unprofitable. The planter must do his own thinking on this subject, and mix it with a good grade of common sense.

COMPARATIVE RETURNS OF RICE AND OTHER PRODUCTS.

		s. d.		£ s. d.
30 bushels of rice per acre	at	4 0	per bushel ...	6 0 0
30 „ wheat	„	2 10	„ ...	4 5 0
30 „ barley	„	3 0	„ ...	4 10 0
30 „ mazie	„	2 6	„ ...	3 15 0

From the above, it appears that rice is more profitable than any other cereal. There is also this in favour of rice: That in seasons when the average wheat yield would fall below 15 bushels, value, say, £2 2s. 6d., the yield of rice would be about 40 bushels, value £8, owing to the conditions of growth and absence of rust. It does not follow from this that farmers should give up maize and wheat growing, and rush into rice. That would be putting all the eggs into one basket. Besides, it is not all soils that are suitable for ricegrowing, whilst hundreds of thousands of acres are adapted to wheat, barley, oats, and maize culture.

Then consider potatoes. Although the average potato crop for 1900-1901 was not quite 2 tons, and the sweet potato crop a little over 5 tons per acre, that does not show that in favoured localities from 4 to 6 tons of English potatoes, and 8 tons ot sweet potatoes were harvested in the same year. Two tons of English potatoes per acre would in a plentiful year be equal in money value to 30 bushels of rice, 42½ bushels of wheat, 48 bushels of maize, or 40 bushels of barley.

The cost of seed, of preparing the ground, of after-cultivation, and of harvesting and preparing for market are factors which must be always taken into consideration in reckoning the net returns from any crop. For instance, 6 cwt. of seed are required for 1 acre of potatoes. Before hilling up, at least two cleanings will be required. That is to say, that each acre has to be worked over three times. But when the crop is ripe the only preparation for market consists in digging, gathering, grading, and bagging. In the case of maize, the cost of seed for an acre is trifling, but in a dropping season the ground will demand clearing and cultivating several times before the plants are beyond reach of injury from weeds. When the corn is ripe, much labour has to be expended on pulling, husking, threshing, and winnowing before the grain can finally be bagged.

If wheat be sown, about 1 bushel per acre will be required for seed, and the seed must be steeped in bluestone, but the only afterwork will consist in rolling it once, and if too rank it must be eaten down by sheep, which, however, is a gain to the farmer. Once ripe, much labour is wanted to fit it for market. First come the reaper and binder, then the stooking, followed by cartage to the stackyard, and stacking. The next operations consist of threshing, winnowing, and bagging. The same processes must be gone through in the case of oats, barley, and rice. The latter cereal demands the further processes of hulling and polishing.

The point to be arrived at is the comparative cost of all these operations. Taking as a basis for cereals an average yield of 30 bushels per acre, and for potatoes 3 tons per acre, the net return works out as follows:—

—	First Ploughing.	Second Ploughing.	Harrowing.	Planting or Drilling.	Harrowing and Disk Harrowing (twice).	Rolling.	Pulling Maize, Reaping, and Binding.	Stooking.	Cartage.	Husking Maize.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Maize	4 0	3 0	1 0	1 6	3 6	...	3 0	...	2 6	2 6
Wheat	4 0	3 0	0 9	1 0	0 9	0 9	8 0	1 0	2 6	...
Barley	4 0	3 0	0 9	1 0	0 9	0 9	8 0	1 0	2 6	...
Rice	4 0	3 0	0 9	1 0	0 9	0 9	8 0	1 0	2 6	...
						Hilling, Digging, and Bagging.				Grading.
Potatoes	4 0	3 0	0 9	5 0	0 9	5 0	10 0	4 0	2 6	2 6

—	Stacking.	Threshing.	Hulling and Polishing.	Drawing to Rail.	Bags.	Seed.	Total Expenses.	Average Value of Crop.	Net Profit.
	s. d.	s. d.	£ s. d.	s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Maize	...	3 9	...	3 6	3 4	0 0 6	1 12 1	3 15 0	2 2 11
Wheat	3 0	8 6	...	1 8	2 6	0 4 0	2 1 5	*4 17 6	2 16 1
Barley	3 0	8 6	...	1 8	2 6	0 4 0	2 1 5	†5 2 6	3 1 1
Rice	...	...	1 12 0	1 6	2 6	0 6 0	3 3 9	‡12 0 0	8 16 3
Potatoes	...	...	...	6 0	12 6	1 10 0	4 6 0	12 0 0	7 14 0

* Including straw and chickwheat. † Including straw, &c. ‡ Including straw.

WHEAT IN KANSAS.

An enthusiastic description of the advanced methods of the Kansas farmer is given by Mr. W. Sandover, a Western Australian merchant, who has just made a trip through the United States. He states that by the use of manures, the best labour-saving implements, and a general exercise of intelligence, the average grain yield of wheat in Kansas has been raised to about 29 bushels per acre. In districts where the land is particularly rich, the return is sometimes as much as 50 bushels. Forty years ago the production of 1 bushel of wheat required an average of 3 hours' work. Now it takes only 10 minutes. The cost of manual labour was then about 1s. 6d. per bushel; now it is only 1¾d. The estimate of the Kansas grain crop this year is 100,000,000 bushels, which will be worth about £10,000,000. This will mean a return to the farmers of at least £2 per acre. Mr. Sandover says that at Buffalo £3,400,000 has been spent in the erection of grain elevators. One of these, when he was there, emptied 350,000 bushels of oats out of a vessel in 16 hours. Each elevator loads 500 railway cars a day.—*Pastoralists' Review.*

Dairying.

EVOLUTION OF THE COW.

BY J. VAN WAGENAN,
At New York Dairymen's Association.

I want to try and interest you for a few minutes in the evolution of dairying as it has taken place in our memories, as it is going on around us to-day, and as it will probably go on for years to come.

First, I want to speak of the cow, because (the Chicago and Kansas City packers always excepted) no one has been able to engage in the dairy business without taking the cow into partnership.

So note this:—That in the cow, in modern times, there has been evolution from two different causes, along two distinct lines. First, the cow has been changing in an unconscious effort to fit herself to her changing environment; and, secondly, she has been changing because of man's selection in his effort to bring her to a new ideal.

If there is one primary and unchallenged doctrine of Darwinism, it is that all life is a struggle for existence and that only the fittest survive. In a state of nature the vast majority of individuals perish, leaving no progeny to hand down their characteristics to future generations. In the long run only those survive who are particularly fitted for and are victorious in the struggle.

And before men took a hand in her destiny, what was the fit cow? It was not the one with incurved, waxy horns. It was not the one with incurved thighs and a prominent pelvic arch. It was not the one with big milk veins and double chest extensions. It was not the cow that could give 1,000 gallons of milk, producing 400 lb. of butter, in twelve months. But it was the cow who could beat off the wild beast that would devour her young. It was the cow who had hardiness and vitality to live through the time when vegetation was buried deep under the winter snow. It was the cow who, when there was not food enough for all, had strength and stamina enough to be among those who survived the famine. In short, the best cow of that day was the one who was enabled to overcome the daily and almost hourly vicissitudes of that time.

But man has changed all that. When we domesticate the cow and provide her with food and shelter against the cold; when we kill the offspring of others, then we have reversed the economy of nature, and no longer put a premium on hardiness and brute strength. And so, for thousands of years, the cow has been dropping off some of her old characteristics and has been assuming some new ones. So here we have changes due to environment.

And then we have another vast series of changes due to man's conscious selection. Note here that man's conscious selection of the cow has not always been towards the same ideals. It is perhaps strange, but I think true, that it was beef, rather than milk, which first attracted the attention of breeders. It is 150 years since Bakewell brought the now extinct Longhorns to great perfection, and bred Old Comely, with the fat on her sirloin 6 inches thick. It is more than 100 years since the careful recording of Shorthorn pedigrees was begun. It is ninety years since the Shorthorn bull Comet sold for 1,000 guineas, but it is less than fifty years since we began to keep records of production or to record the pedigrees of animals bred for milk instead of beef production.

The most evident development of the cow is in accord with the constantly growing conviction that she must be selected along special lines for special purposes. We are coming by common consent to believe that the most profitable dairy cow is one built with a certain physical conformation and temperament, and that this same conformation is not consistent with the most economical production of beef.

It is told of Booth, the great Shorthorn breeder, that he used to walk down behind those magnificent mountains of flesh, where every calf stood between two cows, and striking his hand upon their padded rumps, would say: "What do a few quarts of milk from a cow amount to?" And to-day the intelligent dairyman asks: "What do a hundred or two pounds more or less of inferior beef amount to?"

THE COW: BREEDS, AND MANAGEMENT.

By "CROSSBRED," in the *Pastoralists' Review.*

Any farmer who is commencing a dairy farm in a new district has generally to make up his mind as to what breed of cows he will adopt. A great many squatters influence this selection, but the one that will carry the most weight with everyone is the particular breed which he has been used to most of his life. It hardly needs explaining that the treatment necessary for the different breeds will vary to a certain extent, and this variation, perhaps, amounts to a good deal more than those who have not had much experience would think. For instance, the kind of treatment which would go down with a Shorthorn would never do for an excitable and nervous Ayrshire.

Which is the Best Dairy Cow?

Taking the show of the British Dairy Farmers' Association as some sort of a guide, we find that the breeds recognised there are the following:—Shorthorn, Jersey, Guernsey, Ayrshire, Red Poll, Kerry, and Dutch.

Of course, it may be added that in any given district the breed native to that district should, if possible, be the one adopted, unless the farmer has grave reasons for a change in this respect. There are various influences bearing on the selection of the breed in addition to those already mentioned, for instance, as the sort of dairying that is going to be carried on—whether butter, cheese, or milk trade—as no one would keep a Dutch cow for butter-making, or a Jersey cow for selling new milk, but would, if possible, adopt a Jersey or Guernsey for butter and cream, and a Shorthorn or Dutch or Ayrshire for the milk trade. Again, the Ayrshire has shown itself exceedingly adapted for cheese-making, the explanation being given that while the milk by analysis may be similar in composition to that of another breed, yet, as the butter globules are comparatively smaller than in the case of the Jersey or Guernsey, they are more easily entangled in the curd in the process of cheese-making, and thus the cheese is more easily made, and of a more even quality than with the former. This particular item is largely due to skill, for we read of trials held at the last Chicago Exhibition that the best cheese was made from Jersey milk, but it took a great deal more skill to make this cheese than would have been necessary with Ayrshire milk For general purposes, and taking England as an example, probably the Shorthorn cow is the best, as it yields a fairly large amount of fairly rich milk, while the animal fattens after use, and can easily be made fit for the butcher. As a matter of fact, the ultimate destiny of the old cows is important, because old cows are a by-product of a dairy farm, and the ability to sell them for a good price materially affects the sum total of the receipts.

No one would propose to do much in fattening a Jersey, but, on the other hand, the fattening of the Shorthorn is quite a feasible process.

A Standard of Milking Power.

It may be interesting to some to know the standard of milking power that has been proposed for the different breeds by the British Dairy Farmers' Association, and I therefore give it below:—

	Weight of Milk. Lb.	Butter Fat. Lb.
Shorthorn	8,500	1·25
Jersey	6,000	1·25
Guernsey	6,000	1·25
Ayrshire	7,500	1·00
Red Poll	7,000	1·00
Kerry and Dexter	4,500	0·75
Dutch	8,500	1·00

Selecting a Bull.

Supposing, then, that a certain breed is in use, it ought to be the object of the farmer to try and improve the quality of the individual animals of his herd, and the first thing to do is to select a good bull. By the term "good bull" is meant a great deal more in the case of dairy animals than merely having one of the proper symmetry and the proper points recognised as belonging to his breed; for if his progeny, or, at any rate, the female part of it, is intended to be reared for the milking of future herds, the milking quality of the strain to which he belongs is of the first importance, and, therefore, his pedigree in this direction must be satisfactory. A bull from a herd noted for good milking power, and the son of a dam which is also a good milker, is likely to leave progeny behind him with the milking power transmitted; therefore, the farmer who proposes to rear his own stock—and every farmer should do this as far as possible—will take great pains to make certain that the milking pedigree of the bull he employs is satisfactory, as well as the appearance of the animal itself. Many dairymen make a great mistake in this; they use any breed of an animal, so long as it proves to be a bull.

Selection of Cows.

Next to the selection of the bull comes the choice of the cows for milking power, and it is here that milk records and tests are of value. It is generally acknowledged that every dairy farmer who wishes to keep the average yield of his herd up to the mark, and wishes to try and improve the same, ought to test the animals periodically as regards their milking power. In practice this is most conveniently done by weighing the milk of each animal morning and evening once a fortnight. Daily tests are unnecessary. Weekly tests are good if one can spare the time, but, as far as useful and practical tests are concerned, fortnightly is quite sufficient.

From this test the best milking cows are found out, and it is wonderful how animals are discovered to be good milkers, when a whole twelvemonth is taken, which yet have never yielded a very large quantity at one time, while on the other hand animals which have yielded an enormous quantity over a short time, and have had great notice taken of them, are really poor milkers when their total yield for twelve months is summed up. The cow that yields a moderate quantity over nine, ten, or eleven months is the sort to have and breed from, and it is only by a record that this is found out. In addition to this, the quality of the milk must be taken into account also, and it is desirable to test this from time to time also.

Important Points in Management.

In order that a cow may give the greatest quantity of the richest milk, it is necessary that she should be subjected to gentle treatment, never be hounded by dogs, never struck with sticks, never even be roughly spoken to, but petted and made much of as far as possible. A cow differs from a child; the more you pet a child the more you are likely to spoil it, but a cow cannot get too much petting. Rough treatment of any kind, which upsets the nerves, has a reflex action on the milking power. We know that the power to secrete milk is intimately connected with the nervous organisation of the animal, and that anything which disturbs her, or ruffles her temper, has an adverse action on the secreting power of the udder, whereby, if she is unduly excited in any way, the forming of the milk in the vesicles is greatly interfered with, and if bad treatment is persisted in the cow will prematurely go dry.

Another point connected with the yield is the milking of the animal. It is a job that must be done every day, morning and evening, week day and Sunday, without intermission. It is not work that one may get his mate to do for him for a time, and it is not work that can be left over till next week. It must be done at a certain hour every day, or disastrous results will ensue, and, indeed, the milking of the cows is the greatest limitation connected with a dairy farm. Good milking should be quick; in fact, quick milking is always good milking. It has been shown by experiment that quick milking will not only extract more milk from the udder, but the milk will be of better quality than that obtained by slow, drawling work.

There are practically four different ways of milking a cow—the tugging *versus* the squeezing, and the wet *versus* the dry. The cow with strong, large teats may stand the strain put on her by the tuggers, but not those with delicate sore teats, and in any case it is a most objectionable system. The gentle squeezing, which never injures a sore teat, and permits the cow to chew her cud all the time, is the one to encourage. Some have advocated dry milking, but I do not think it very comfortable for either cow or attendant. Naturally, a calf sucks with a wet mouth, and it is a great deal easier to milk with a wet teat, and more comfortable for the cow. Squeezing with a wet hand is the best method to adopt. Of course the cow must be milked out clean every time, and, better still, "stripped."

Immediately connected with the formation of the milk is the temperature and general comfort of the animals. If they are too cold in winter, or too hot in summer, it operates against the milk yield, and therefore the arrangements of the buildings should be of such a nature to as far as possible keep the temperature comfortable. In summer the hot winds are much against the cows; therefore plantations are very necessary, which conduce very much to their comfort.

It is a very good thing in summer to wash their backs over with a concoction of sheep dip, as this tends to keep away the flies, which torment them so. Even a watering-can filled with water, to which a little sheep-dip is added, and the mixture sprinkled over their backs as they stand in their stalls will be most beneficial, and the trouble is not very great.

MOTTLED BUTTER.

For some four years past the Maryland Experiment Station has been investigating the cause of that uneven colouring in some butters which is generally spoken of as mottling, and has discovered the cause to be due to the uneven distribution of the salt. Popularly, mottles are supposed to be caused by (1) washing the butter in too cold a water, and (2) by excess of caseine. It is, however, shown that washing the butter with water below 40 degrees Fahr. does not cause mottles, but when it is used more working is necessary in order to distribute the salt evenly. It is also shown that the light-coloured streaks are not caused by an excess of caseine, but by the physical action of the excess of salt on the butter fat itself. This action causes more light to be admitted to that portion of the butter, and it is the light that causes the discolouration. The only way to prevent mottles is to work the butter so as to distribute the salt thoroughly; while, so far as cold water is concerned, its use is entirely beneficial. It maintains the texture of the grain, and gives the butter a very desirable firmness. But with it the working must be more thorough.

THE DAIRY HERD.

QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 30TH NOVEMBER, 1901.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire	25 April, 1901	618	3·5	24·22	
Blink ...	,, ...	2 Feb. ,,	480	3·8	20·42	
Bonny ...	,, ...	12 April ,,	359	4·0	16·08	
Isabelle ...	,, ...	7 Sept. ,,	639	3·7	26·48	
Laura ...	,, ...	28 Aug., 1900	433	3·6	17·35	With first calf
Linnet ...	,, ...	7 May, 1901	614	3·6	24·75	
Lavina ...	,, ...	11 Sept. ,,	1,139	3·8	48·47	
Lass ...	,, ...	24 Aug. ,,	679	3·7	28·17	With first calf
Renown ...	,, ...	29 Nov., 1900	224	3·8	9·53	With first calf
Ruby ...	,, ...	9 April, 1901	442	3·7	18·31	With first calf
Jeannie ...	,, ...	7 Oct. ,,	731	3·5	28·65	With first calf
Ream ..	,, ...	9 Nov. ,,	457	3·7	18·93	
Rosebud ...	,, ...	13 Nov. ,,	547	3·8	23·28	
Annie ...	,, ...	19 Nov. ,,	281	3·3	10·38	
Molly ...	Grade Ayrshire	5 Oct. ,,	548	3·6	22·09	With first calf
Bell ...	Jersey	15 Sept. ,,	380	4·4	18·72	With first calf
Connie ...	,, ...	8 Sept., 1900	371	4·0	16·62	
Content ...	,, ...	6 June, 1901	372	5·1	21·24	
Carrie ...	,, ...	31 Aug. ,,	589	4·0	26·38	
Eileen ...	,, ...	2 Sept., 1900	529	5·0	29·62	
Ivy ...	,, ...	24 Oct., 1091	642	4·2	30·19	
Playful ...	,, ...	14 July ,,	364	4·7	19·16	
Stumpy ...	,, ...	27 Aug., 1900	71	5·5	4·37	Dry, 11-11-01
Spec ...	,, ...	27 Aug., 1901	485	4·3	23·35	
Tiny ...	,, ...	5 Oct. ,,	430	4·6	22·15	With first calf
Effie ...	,, ...	18 Nov. ,,	285	4·0	12·76	
Blaze ...	Grade Jersey ...	27 Sept. ,,	420	4·2	19·75	With first calf
Pansy ...	,, ,, ...	28 Oct. ,,	781	4·0	34·98	
Bluey ...	,, ,, ...	9 Oct. ,,	490	3·6	19·75	With first calf
Countess ...	Shorthorn ...	18 June ,,	640	3·9	27·95	
Dott ...	,, ...	31 May ,,	518	3·7	21·46	With first calf
Gladdy ...	,, ...	29 April ,,	491	3·7	20·34	
Guinea ...	,, ...	18 July ,,	678	3·5	26·57	
Lady Vixen	,, ...	13 July ,,	498	3·5	19·52	With first calf
Maggie ...	,, ...	20 May ,,	423	4·0	18·95	
May ...	,, ...	16 July ,,	640	3·8	27·23	
Nestor ...	,, ...	3 July ,,	652	3·6	26·28	
Olga ...	,, ...	19 June ,,	244	4·8	13·11	With first calf
Plover ...	,, ...	3 July, 1900	46	5·1	2·62	Dry, 9-11-01
Queenie ...	,, ...	19 May, 1901	562	3·8	23·91	
Roany ...	,, ...	17 Mar. ,,	14	4·2	·65	With first calf; dry, 9-11-01
Rose ...	,, ...	10 April ,,	229	3·9	10·00	With first calf
Violet ...	,, ...	9 Oct., 1900	69	4·1	3·16	Dry, 13-11-01
Clara ...	Grade Shorthorn	14 June, 1901	473	3·6	19·07	With first calf
Eva ...	,, ,, ...	26 Oct. ,,	672	3·6	27·09	
Laurel ...	,, ,, ...	22 Aug. ,,	721	3·8	30·68	
Lucy ...	,, ,, ...	9 Sept. ,,	745	3·6	30·03	
Leopard ...	,, ,, ...	6 Oct. ,,	670	3·5	26·26	
Princess May	,, ,, ...	25 May ,,	415	4·4	20·45	
Peggie ...	,, ,, ...	29 May ,,	568	4·0	25·44	
Redmond ...	,, ,, ...	22 Aug. ,,	642	3·7	26·60	
Horney ...	,, ,, ...	22 Sept. ,,	419	3·6	16·89	With first calf
Stranger ...	,, ,, ...	6 Nov. ,,	520	3·7	21·54	
Curley ...	,, ,, ...	12 Nov. ,,	559	3·6	22·53	
Ada ...	South Coast ...	16 July ,,	645	4·3	31·06	With first calf
Dora ...	,, ,, ...	2 June ,,	442	3·6	17·82	With first calf
Grace ...	,, ,, ...	15 June ,,	546	3·8	23·23	With first calf
Trixey ...	,, ,, ...	4 July ,,	531	3·6	21·40	With first calf
Topsy ...	,, ,, ...	4 Oct. ,,	819	3·8	34·85	With first calf
Damsel ...	Holstein	19 Jan. ,,	82	4·2	3·85	With first calf; dry, 14-11 01
Devon ...	Devon	2 Nov. ,,	429	3·8	18·25	With first calf

The dairy herd was grazed on natural grasses only.

THE DAIRY HERD.

THE PROPERTY OF THE SCOTTISH AUSTRALIAN INVESTMENT COMPANY, LIMITED, TALGAI WEST, *VIA* HENDON.

RETURNS FROM 1ST TO 30TH NOVEMBER, 1901.

Name of Cow.	Breed.	Date of Calving.	Yield.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Lily	Holstein	14 May, 1901	856	4·1	39·01	Heifer in first calf
Victoria ...	Jersey	21 May ,,	592	4·6	30·61	
Jean ...	,, ...	30 May ,,	557	5·0	31·52	
Kate ...	,, ...	17 Aug. ,,	568	5·0	32·14	
Jubilee ...	,, ...	22 Nov. ,,	140	4·0	6·21	
Scarlet ...	Grade Jersey ...	15 May ,,	570	3·4	21·32	Heifer in first calf
Goldenspray	,, ...	25 June ,,	778	4·5	39·29	
Favourite ...	South Coast ...	6 May ,,	552	3·5	21·31	Heifer in first calf
Nowra ...	Shorthorn ...	26 Oct., 1900	352	3·8	14·82	Heifer in first calf
Primrose ...	,, ...	6 Feb., 1901	537	4·3	25·80	
Vanity ...	,, ...	3 March ,,	437	4·0	19·41	Heifer in first calf
Countess ..	,, ...	15 May ,,	562	3·7	23·98	
Bess	,, ...	27 May ,,	653	3·8	27·56	
Julia ...	,, ...	15 June ,,	606	4·0	26·91	
Edith ...	,, ...	17 June ,,	618	3·6	24·57	Heifer in first calf
Jeannie ...	,, ...	20 June ,,	507	3·4	18·96	Heifer in first calf
Rusty ...	,, ...	17 Aug. ,,	664	4·0	29·48	
Cowslip ...	,, ...	7 Oct. ,,	948	3·6	37·69	
Majestic ...	Grade Shorthorn	2 March ,,	641	4·0	28·46	
Jupiter ...	,, ,, ...	26 April ,,	290	4·4	14·29	Dried off, 25-11-1901
Nellie ...	,, ,, ...	29 April ,,	397	4·1	18·09	Heifer in first calf
Lizzie ...	,, ,, ..	3 May ,,	429	4·0	19·05	Heifer in first calf
Nessie ...	,, ,, ...	13 May ,,	404	4·1	18·41	Heifer in first calf
Dairymaid ...	,, ,, ...	24 June ,,	597	4·1	27·21	
Bridget ...	,, ,, ...	17 July ,,	612	3·7	25·03	
Midget ...	,, ,, ...	24 Aug. ,,	739	4·0	32·81	
Milkmaid ...	,, ,, ...	31 Aug. ,,	648	4·2	30·35	
Buttercup ...	,, ,, ...	4 Oct. ,,	968	3·7	39·59	
Hope ...	,, ,, ...	5 Oct. ,,	787	3·5	30·38	Heifer in first calf
Camelia ...	,, ,, ...	18 Oct. ,,	785	4·2	36·77	
Bunnie ...	,, ,, ...	5 Nov. ,,	768	3·4	28·73	
Revenue ...	,, ,, ...	11 Nov. ,,	496	3·8	20·89	Heifer in first calf
Eleanor ...	,, ,, ...	18 Nov. ,,	321	4·4	15·82	Heifer in first calf
Janie ...	Ayrshire	18 Oct. ,,	771	4·0	34·23	Heifer in first calf
Marjorie ...	Grade Ayrshire	10 Jan. ,,	441	3·9	19·07	
Mermaid ...	,, ,, ...	23 Jan. ,,	457	4·0	20·29	
Madam ...	,, ,, ...	13 March ,,	478	3·7	19·55	
Victory ...	,, ,, ...	6 July ,,	588	4·3	28·25	
Faith ...	,, ,, ...	15 July ,,	743	3·8	31·34	Heifer in first calf
Promise ...	,, ,, ...	26 July ,,	537	4·3	25·80	
Madeira ...	,, ,, ...	12 Sept. ,,	728	3·6	28·94	Heifer in first calf
Spec ...	,, ,, ...	2 Oct. ,,	763	3·6	30·33	

POUNDS OF MILK REQUIRED TO MAKE 1 LB. OF BUTTER.

People do not sufficiently appreciate the difference in the quality of milk, and the following table by Mr. F. W. Woll, Assistant Professor of Agricultural Chemistry at the Wisconsin University, which gives the following table showing the pounds of milk required to make 1 lb. of butter will amply repay study:—

Per cent. Fat in Milk.		Lb. of Milk per 1 lb. of Butter.	Per cent. Fat in Milk.		Lb. of Milk per 1 lb. of Butter.
2·8	...	31·1	5·0	...	17·4
3·0	...	29·0	5·2	...	16·7
3·2	...	27·2	5·4	...	16·1
3·4	...	25·5	5·6	...	15·5
3·6	...	24·2	5·8	...	15·0
3·8	...	22·9	6·0	...	14·5
4·0	...	21·7	6·2	...	14·0
4·2	...	20·7	6·4	...	13·6
4·4	...	19·8	6·6	...	13·2
4·6	...	18·9	6·8	...	12·8
4·8	...	18·1	7·0	...	12·4

THE SOW AND HER LITTER.

A few days before farrowing time get ready a nice, clean, dry sty, well littered down with hay. Put up the sow in this every day, and she will get used to the new surroundings and be contented. During this time feed her on weak pollard and water or bran. If she is an old, careful mother, the more she is left alone the better, but a young, restless sow will require watching; and take away the young as they are born and put them in a blanket in a basket. Return them to her as soon as all are born. If you have a sow given to eating her young, get rid of her as soon as possible; there is no remedy but the knife.

In a late issue of the *Journal* we described a method of preventing the sow from accidentally crushing some of her young ones. It is a very simple contrivance, being nothing more than a rail fastened to the bottom of the sides of the sty, about 6 inches above the floor, and standing out 5 or 6 inches from the side. By this means the little pigs can get clear of the mother as she lies down against the side or in the corner. It is good not to give the sow much bedding when farrowing, but when they are a week old let the little ones have as much as you like. As a full litter is a very heavy drain on the mother, the young pigs should be taught to begin to feed when about three or four weeks old. Make a shallow trough 3 inches high, 4 feet long, and 8 inches wide, so that they can get into it if they like. Then start them on pollard water, with milk or treacle. Feed them little and often, and gradually increase the quantity, changing the food to crushed corn, boiled corn, milk, oats, and boiled barley. Now let them have plenty of exercise. If they should take the mange, scrub them well with soapsuds, and then grease them with a mixture of coal oil and some other cheap oil. There should always be a paddock for the pig and her litter to run in. As soon as the young are thoroughly weaned, take the mother right away from them, so that she cannot hear them. Then it is your own fault if you don't turn them into good, early-maturing pigs. Keep them growing. A little neglect at this period will give them a serious set-back. The wretched, puny little pigs seen on many farms are the result of this neglect. They will never become good pigs, their digestive organs have been ruined, and yet they will consume more food than double the number of well-nurtured animals. The sow should be dried off gradually, and in from three to ten days of being dried off she will come into season again. She should then be put back to the boar, so that no time may be lost. You can always tell when a sow is going to farrow. Try her teats, and if milk comes freely you can rely upon her having her litter in from twelve to twenty hours.

YOUNG PIGS.

The article on this subject in *Country Life* chimes in very appropriately with our remarks on the care of the sow and her litter. That journal says:—Complaints of young pigs doing badly while with the sow are very common. Occasionally the complainant recognises that the sow is a poor milker, or "a bad mother," as the general run of pigbreeders express it; but in the majority of cases it is not even dreamed of that the pigs are doing badly because they do not get sufficient milk of proper quality to satisfy their growing requirements. A large number of pigs die young from no other cause than that they are starved—unable to get sufficient sustenance from their mother. Young pigs are difficult to rear by hand; they do not take kindly to cow's milk, or rather it does not suit them because it is deficient in fixed constituents, particularly in fat, and they do not pay for the new milk received. There is no greater nuisance on a farm than a litter of motherless pigs, or a lot that are practically orphaned because their mother has not enough milk for them. It is said that pedigree pigstock, like the pedigree cows above mentioned, are the worst offenders in the matter of deficient milk production, especially if the herd has been in-bred; but bad milkers and poor mothers are to be found among all breeds and classes of pigs, and require to be looked after in selecting breeders, and to be ruthlessly weeded out if the discovery of their imperfections is delayed until a litter of pigs has been spoiled or starved. In a general way, when engaged in breeding ordinary stock no second chance should be given a sow that has proved herself unable to bring up her pigs in a thoroughly satisfactory manner. There may be some hesitation in sacrificing a pedigree animal that has cost a lot of money, but if she does not look like a good suckler, or if she fails at a second try, she should at once be fatted for the butcher. She may have excellent points in other ways, but they cannot compensate for the loss which results from the dying off of half or perhaps three-fourths of each farrow. It is also advisable, at least where the progeny is to be kept to strengthen the herd, to select boars from dams which show thorough maternal capacity.

ANGORA GOATS.

We have persistently advocated the introduction of pure Angora goats into Queensland, and we have clearly shown that the mohair industry is a paying one, independently of the matter of goat skins and goat flesh. We are glad to see that *Country Life* takes up the question, and we take from that journal the following excellent article on the subject, a portion of which relating to the Kilkivan herd has already appeared in this *Journal*:—

Many people have been struck by the large number of goats to be seen in the townships along the Central Railway line, and at Dalby and Roma, and of late we have been besieged with inquiries as to whether grade Angoras could not be introduced in the place of these flocks. Without much care or attention Angoras give a better mutton, and yield a mohair which finds a very ready sale indeed. The mountainous areas of Queensland, the rough country which is not suitable for other stock, and especially the arid Western lands, would be very suitable for raising Angoras. The old saying, "A goat will live where a sheep will starve," is very true The goat is very hardy, a rough feeder, and the Angora is in no way inferior in constitution or in the capacity to live upon hard fare than the common types.

On timber country, overgrown more or less with gum and other members of the Eucalyptus tribe, it would take 3 acres to carry a sheep and grow a fleece, the return being 49d. (7 lb. at 7d. per lb.) In similar country the Angora will do well at one to the acre, returning 4 lb. of wool worth 12d., or, say, 48d. Three acres, therefore, return 144d. with Angora goats, as against 49d. with sheep.

In Australia the mohair industry has never been taken up seriously. Sheep, cattle, and horses have had nearly all the attention, and Australians are very conservative in stock matters. The first importation of Angoras was in 1833, by a Mr. A. Riley, who ran them at Raby, New South Wales; at Canterbury Park, near Sydney, there was a flock; Mr. J. Black, at Muswellbrook, had a flock of pure and cross breds, and Mr. Keys had a fine flock which ultimately went to Dubbo district. The export of mohair from New South Wales in 1899 was 200 lb. In the Singleton district the Messrs. Blaxland have bred up twenty pure stock Angoras, and seem inclined to persevere in the industry.

In Victoria, in 1856, the Zoological Society of Victoria secured seven pure Angoras from Asia Minor, and other small importations took place up to 1866, when 105 were received from Broussa, in Asia Minor. With the view of encouraging the mohair industry, the purebred stock were distributed through the country, but so far no export of mohair is noted.

As regards South Australia, the following from the *Adelaide Observer* of 1st June, 1898, will be of interest:—At Adelaide sheep market on Friday week Messrs. Elder, Smith, and Co. offered for sale, on account of the executors of the estate of the late Mr. Price Maurice, the famous Castambul flock of pure Angora goats. This flock was established in 1870, in which year Mr. Maurice instructed an expert living at Constantinople to procure him a number of the best Angora goats obtainable. The agent accordingly purchased the goats, and they were landed in South Australia, at the total cost of £21 5s. per head. The animals, which were obtained in Asia Minor, formed the nucleus of the well-known Castambul flock. There was also a subsequent importation, and in 1875 Mr. Maurice bought Mr. W. F. Haigh's entire Port Lincoln flock of 106 for £558 10s. These were sent out by Sir Titus Salt. Ever since its introduction Mr. Clement Sabine has had entire charge of the flock, and has taken great pains to keep it pure. It was, in fact, the only purebred flock of any size in the colony, and its dispersal is a matter for considerable regret, both on account of the picturesqueness of the animal and its usefulness and its suitability for our climate. In the north, Angoras have been crossed with the common goat, and in 1875 the crossbred hair realised 2s. 4½d. per lb. net, the pure mohair at that time fetching 2s. 11d. per lb.

Since then the price has receded considerably, until last year it was 1s. 2½d. per lb. The crossbreds mentioned above were running at Pekina, and were boiled down some years ago, their tallow realising £2 15s. a ton more than any other tallow from South Australia ever fetched in London. The weight of mohair grown varies considerably, according to the feed, but on bush country the does will yield from 4 to 6 lb., and the bucks from 6 to 8 lb. Besides this the skins are very valuable, and the meat is said to be excellent, and free from any strong taste.

In the United States the value of the industry has also been appreciated. The first importation of Angoras to that country was made in 1848, and up to 1880, when the Sultan's edict prevented the further exportation from Turkey, 400 had been received. In 1899, after nineteen years of breeding, there were (estimated) 247,775 pure Angoras in the United States.

In Cape Colony alone it is estimated that there are 4,000,000 Angoras, and the export of mohair last year (1900) was 9,000,000 lb., of the value of £450,000. In 1899 the export was 12,800,000 lb., of the value of £640,000; and in 1897 it was 12,100,000 lb., of the value of £676,644—the discrepancy between bulk and value in the two years last quoted being accountable through market fluctuations. Surely those figures will make people in this State think. Up to 1872 in Cape Colony the mohair industry was but a very small thing. In 1861 the export was 784 lb., of the value of £61; and in ten years the figures advanced to 867,861 lb., and £58,823. The next decade saw a jump to an export value of £253,128; and in 1892 the figures were 10,516,837 lb., and £373,810.

In Queensland, also, something has been done in this matter. Mr. Charles Clark brought over to Queensland from Tasmania a number of Angoras, but they did not do well at Talgai, when run in flocks on the grass, but on bushes they prospered. Mr. Willis, of Springsure, has had a flock for some years, and gets a good price for his mohair. At Moura, near Banana, there is also a small flock. In the Kilkivan district there is a grade flock numbering about 400, including kids, and the skins range in prices from 5s. to £1. The owner of the flock says: "We have as yet not sold any of the mohair. . . . They (the goats) are very easily kept, and very healthy. Whilst the cattle were dying with ticks and redwater, the goats were feeding all around them, and were not in the least affected, nor did we ever find a tick on them. The flesh of the Angora is superior to mutton, being firmer in the grain, and that of the kids is a great delicacy." He also says: "If there were a law for the protection of the Angora, I would get a purebred buck, and thus improve the fleece, making it of value for export, the lower grades not being of much value."

A Springsure gentleman wrote recently: "We have had Angora goats now for some years, and found they did well all through the droughts, when the sheep died off in thousands, and when—at that time the ewes were unable to rear a single lamb—our children often had two lambs being suckled on one goat. At the second cross they have very good fleeces—viz., when the common goat is crossed with the purebred buck."

It is estimated that a good Angora buck would cost £60, which would include insurance, freight, and attendance with feed on the voyage. This is the approximate cost, if imported from Port Elizabeth, South Africa. The best recognised breeder of Angora goats (of late years) in South Africa is Mr. Holmes, of Pearston, Cape Colony, who has written much to the Press on the subject, and is considered an expert in the matter.

In conclusion, we may state that Mr. P. R. Gordon, Chief Inspector of Stock in Queensland, is keenly interested in this matter, and has, at the request of Mr. Jenkinson, M.L.A., prepared a Bill to make the term "sheep" include goats in legislation, as is the case in South Africa.

DISHORNING CATTLE.

By C. B. LANE, New Jersey Exp. Station.

Dishorning has rapidly grown in favour during the past few years, and at the present time it is commonly practised in many sections. The prejudice and exaggerated ideas as to the severity of the practice are gradually giving way as instruments for doing the work improve, and farmers and dairymen become better acquainted with the operation.

In our own experience we have found it to be practical, rendering the animals, especially bulls, more quiet, and making them less capable of injuring each other or their attendants. During our first experience in dishorning, the horns were removed with a saw. While the operation was successful, and no serious results followed, it required considerable time, and was evidently quite painful to the animal.

Later, a pair of Keystone clippers were secured, and three cows and one bull were dishorned. It required but a second to remove a horn after the clippers were placed over it, and the whole time required for operating on a single animal did not exceed more than four or five minutes, except in the case of the bull, where greater precaution was taken to make the animal secure.

All the wounds bled at the time of the operation, but not to such an extent as to cause the animals to show signs of weakness. They did not appear to be in much pain except at the moment the clipper was in process of closing. When taken to the stalls after the operation, two of the cows ate as though nothing had happened, while the third refused a part of her food for a day, but her usual appetite soon returned. The operation had a marked effect on the three-year-old bull. Previous to dishorning he was inclined to be ugly, but after the removal of his horns he was comparatively quiet and docile.

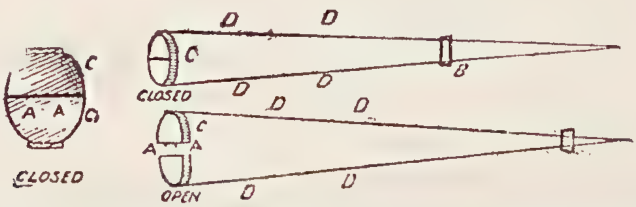
Complete records were kept of the yield of milk from the three dishorned cows for twenty days previous to the operation, also for twenty days following, and it is interesting to note that the decrease in the yield of milk from these cows was 3·3 per cent. greater than for three other cows not dishorned and giving practically the same yield at the time of the operation, showing that the milk flow was but slightly affected. This difference might have been due, in part, at least, to some other cause.

The simplest and most humane way of destroying the horns seems to be to prevent them from developing when the animals are young. This may be done by the use of caustic potash (in the form of sticks), which rapidly destroys the skin and other tissues when kept in contact with them. The method of applying the potash is very simple. The hair is clipped away from the young horn, so that the potash may come in immediate contact with the parts to be treated. The stick of potash is rolled up in a piece of paper, so as to leave one end exposed. The exposed end is moistened slightly and rubbed on the embryo horn for a few seconds, or until the skin begins to start, care being taken that the whole of the border is included in the treatment. A surface about three-fourths of an inch in diameter will cover the parts in calves a few days old. In our experiments, six calves have been treated; their ages ranged from three to eighteen days. Healing soon followed the operation, and smooth polls have resulted in every case. The best time to apply the potash is between the fifth and tenth days, although it has proved effectual even on the eighteenth day.

The Horse.

CASTRATING COLTS.

The doing away with the use of the searing iron when cutting colts has saved much unnecessary pain to the unfortunate animals. Not only is much pain saved, but a searing iron will not prevent loss of blood so readily as the instrument now used, which, with a quick wrench, tears the arteries of the string. It is the constitution of the walls of all arteries to curl up inwards when torn, and so form a plug which stops the flow of blood. Consequently, a clean-cut artery, especially if cut with a fine-edged knife, will bleed profusely. The searing iron is used to counteract the effect of this, but it is much more severe on the horse, and is not nearly so effectual in preventing the loss of much blood. An instrument for taking the stones out in the proper way can be easily made by any handy station man. It is useful to those who have only a few colts to cut now and again.



The string is first held by a cold searing iron or an instrument made on the same principle; then the string is gripped immediately below with the illustrated instrument. The teeth A fit into holes made for them in the other side, and the string should be placed between the two teeth. Then B, which is a buckle from a stirrup-leather with the tongue taken off, is pressed as far down the lever as it will go, so as to grip the string in a vice and diminish the pain. A couple of quick turns will then take off the stone. The lever D can be made from pieces of palings cut smooth, and C should be cut out of a good durable wood. The instruments should be well boiled both before and after use.—*Pastoralists' Review.*

ANOTHER ANTIDOTE FOR SNAKE-BITE.

The following is from a correspondent to the *Cologne Gazette*:—The writer is an old settler living some fifty years in San Martina du Gaziwari, Brazil, South America. He writes: As we have here a simple antidote against snake poison discovered, I think it my duty to humanity to make it known. One of the simplest and safest remedies against the deadly poison of snake-bite is: Petroleum to be applied to the wound at once, and to keep it saturated. He writes it is astonishing how this remedy helps. Six persons who have been bitten by snakes, of which one was a son-in-law, and the other a grandchild, have used this remedy, and all slept well the first night, and could follow their work the next day. My son-in-law was 200 metres distant from the house, and when he arrived his foot was swollen and wound was black and green. He used petroleum. After applying this, the pain left him totally; a day after he was perfectly well.

Since we know of this remedy we are not afraid of the snakes, and everybody that works far from home takes petroleum with them in case of snake-bites. If somebody is bitten on the finger or toes, it is the best to bathe the afflicted part in petroleum; if this can't be done, then saturate a piece of cloth in petroleum, place it on the wound, and keep it well saturated.

Poultry.

PRESERVATION OF EGGS.

More than twenty methods of preserving eggs fresh for lengthened periods have been promulgated from time to time, but it appears that only three or four of these methods can be absolutely relied on.

The *Revue Générale Agronomique* prints an article taken from the *Berliner Markthalen Zeitung* detailing the results of experiments made in Germany, having for their object the proof of the value of certain vaunted methods adopted for the preservation of eggs.

Fresh eggs were treated in June, and they were examined after eight months—the end of February. Amongst 100 preserved in the following manner, the number of bad eggs was found to be as below stated :—

100.	Bad.
Preserved in salt water	100
Wrapped in paper	80
Plunged into a solution of salicylic acid and glycerine	80
Rubbed with salt	70
Preserved in bran	70
Painted with a solution of salicylic acid and glycerine	70
Plunged into boiling water for from 12 to 15 seconds	50
Plunged into a solution of alum	50
Plunged into a solution of salicylic acid	50
Varnished with silicate of potash (water glass)	40
Varnished with collodion	40
Smeared with saindoux (hog's lard)	20
Preserved in wood ashes	20
Varnished with gum-lacker	20
Treated with a mixture of boracic acid and silicate of potash	20
Treated with permanganate of potash	20
Smeared with vaseline	0
Preserved in lime-water	0
Preserved in a solution of silicate of potash (water glass)	0

From the above, it would appear that only the three last methods of preservation are reliable. From our own experience during the past seven months, we are quite satisfied with the lime-water method.

In May last we commenced putting away eggs in a lime-water solution. We added salt, but this is quite unnecessary. Every month since we have tested the eggs, and found them as fresh as when they were placed in the tin.

Mr. D. Webster, the well-known Brisbane caterer, has a number of tanks each capable of holding 1,400 eggs, and he says that he keeps them fresh from July of one year to August of the next. All testimony is in favour of lime-water or water glass. Major Ackerley, of Riverview, preserves hundreds of dozens of eggs, some by smearing with butter, others by keeping them in lime-water, and he says that both plans are effective.

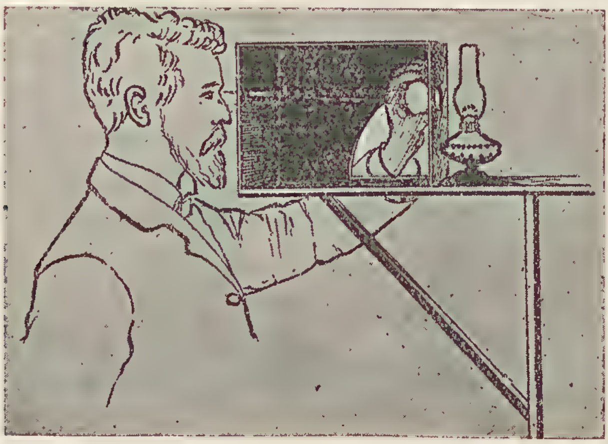
This being absolute fact, why do farmers sell their eggs at 4d. per dozen, when by waiting a few months they might get from 1s. 6d. to 2s. per dozen? We advise them to try one of the three last plans if they want their fowls pay from an egg-producing point of view.

PRESERVED EGGS.

A chemist in New Zealand has, it is said, discovered a new method by which eggs can be perfectly sterilised and kept absolutely fresh for a period of three years. The New Zealand Government appear to believe in the discovery, for Mr. Gow, the Commissioner of Trade, has gone to England with a box of these eggs, which will be tried, of course, when he arrives. If the process should prove effective, it will lead to a complete revolution in the egg trade, and Australian eggs will be sold as new-laid in the British markets. But there is no reason why our eggs should not be sent to England preserved in lime-water. We know that eggs so preserved will keep fresh for at least six months, possibly twice as long. The voyage to London from Australia only takes from seven to eight weeks, and tanks of fresh eggs might be landed every week. If the eggs were coated with vaseline, they could be still easier dealt with, as there would not be any weight of water to be carried. It is a most remarkable thing that whilst in other countries people are everywhere to be found who make such experiments for themselves at their own expense, in Australia nothing can be done without Government help. Everybody wants to be wet-nursed by the Government; and if Government money is not available, then an industry may languish and perish before anyone will do anything to try and carry it on on his own responsibility. Of course it is quite proper and necessary that the State should give all the assistance in its power to the various industries of the country, but there are some things not requiring capital as much as energy on the part of the individual, and this egg-shipping is one of those things. A shipment of 1,000 eggs when eggs are 4d. a dozen would be a trifling matter as far as money is concerned, but might be the forerunner of an immense export trade.

TO TEST EGGS.

Take a common candle-box or cigar-box, and take out one end of it. In one side make a hole of the size and shape of an egg, and on the opposite side, in line with this hole, cut a round hole about an inch in diameter as an eye-piece to look through. Light a lamp, and place it outside the box about 2 inches from the larger hole. Now take an egg, large end up, between your finger and



thumb and place it against the large hole, inside the box. Look through the small hole, and you will see the inside of the egg. If too much light comes in at the edges of the hole, glue a piece of cloth over it, and cut an oval in it a little smaller than the hole in the side of the box. If the eggs appear clear, they are fresh. This is a very simple way of testing eggs either for hatching or storing.

HIGH PRICES FOR POULTRY.

Talk about high prices for highbred stock. Mr. Joseph Partington was a poultry breeder of note in England, and a great prize-winner. He died a few months ago, and his stock of purebred fowls was sold. People from many parts of the world came to the sale. The top price was £150 for a Black Orpington cock, which price was paid by Mr. Wm. Cook, the introducer of the Orpington breeds. Three hens fetched £69, and cockerels hatched this year £17 each.

POULTRY-BREEDING IN VICTORIA.

The poultry-breeding industry in Victoria is gradually increasing and becoming more profitable, owing to the export trade of eggs and fowls having been opened up during the last few years. The Victorian export trade in poultry produce is of quite recent origin, and a few years ago Victoria supplied only the home demand, which, being inadequate to the supply, caused low and unremunerative prices of eggs and table birds. Since, however, a market has been found for the produce of Victorian poultry-yards in this and other countries, the outlook for the poultry industry has greatly improved, and poultry-keeping is now a profitable business.

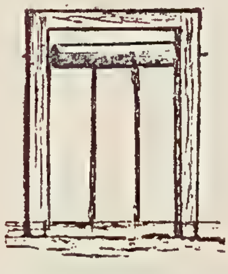
The poultry industry is chiefly in the hands of farmers, vinegrowers, and market gardeners, although there are a few poultry farmers who make the production of eggs and table birds their sole business. Poultry fancying, as distinct from utility poultry-breeding, is also in a flourishing condition, and many purebred birds of various breeds have been and are imported from this country and the United States.

The conditions are very favourable to poultry-keeping in Victoria, the climate being mild, and there being no cold winters. The poultry industry is greatly assisted by the Department of Agriculture, which organised the export trade, while it also undertakes the shipment of poultry produce through the Government Cool Storage Depôt, and assists the industry in other ways.—*Exchange.*

TRAP NESTS FOR LAYING HENS.

For the purpose of obtaining a selection of eggs from the best laying hens, Mr. W. B. Tegetmeier contributed the following remarks to the *Field* on trap nests for hens:—

There is a wide distinction between the poultry-breeders of America and those of our own country. In England we can get together exhibitions of many thousands of birds, not a single one of which has been selected for useful or profitable purposes, but as illustrations of the power of man in modifying the plumage and



form of domesticated animals. In the States, on the other hand, considerable attention is paid to the breeding of animals for useful purposes, and a selection is made of the best laying hens, the eggs of which are hatched so as to propagate the most prolific breeds. Where a considerable number of hens are kept, the difficulty arises in selecting the eggs laid by any particular hens, and consequently it is not known which are those of the best layers. But if trap nests, which retain the hen after she has laid, are employed, every egg can be identified, and we might have breeds of prolific birds instead of the scanty layers that are now too common in many varieties of fancy fowls. The Rhode Island report, which was quoted, did not give any particulars of the construction of the trap nests that were employed; but a modification of what is known to pigeon-fanciers as "bolting wires" would be perhaps one of the simplest adapted for the purpose. I, therefore, present to the poultry-fanciers who are not familiar with this contrivance the following diagram, illustrating the manner in which "bolting wires" can be applied to ordinary hens' nests.

A cylinder of wood, which turns freely on a pivot at each end, is placed across the upper part of the entrance to the nest; from it hang two wires sufficiently long to extend to the bottom of the entrance, where they are arrested by the framework, and cannot pass out beyond the perpendicular. These wires hang so loosely that a hen or pigeon can readily push them back and enter into the nest, or, in the case of a pigeon, into the loft. As soon as the bird has passed through, the wires fall and egress is arrested. The construction is so simple, as shown by the diagram, that no further description is necessary. It is obvious that a hen going into a nest furnished with one of these traps, in order to deposit her egg, is confined there until she is released. The use of traps of this kind, in order to obtain the particular egg laid by any hen, necessarily involves a certain amount of trouble in liberating the hens after laying, but this is amply repaid in many cases where the eggs are required for setting, by their identification as having been laid by the best hens and the most prolific layers. When not required for use, these bolting wires can be raised up and secured by a small wire hook placed for that purpose in the nest.

WORKING AN INCUBATOR.

A SUITABLE ROOM MUST BE CHOSEN.

When an incubator fails to hatch satisfactorily it by no means follows that the blame lies with the machine. The makers call them automatic, but they are so only to a limited degree, and, though there is nothing intricate in the working, yet certain rules have to be followed, and certain conditions maintained; otherwise, the best of incubators will fail to hatch a chicken. Some makers forward with each machine they sell full and detailed accounts of how to work them; others, again, cut the printed instructions far too short, and leave too much to the imagination. There are certain simple rules common to all incubators, and these I will refer to; but in all cases I would advise workers to stick as closely as may be to the makers' instructions, and never to buy a second-hand machine without them. Indeed, second-hand machines should be looked on with suspicion, and bought on a month's approval, if possible. On the other hand, an incubator that hatches satisfactorily should not be lightly discarded; it often happens, when two are run of the same pattern and under precisely the same conditions, that one hatches better than another—that in fact they vary in results from causes which are not always clear to the worker.

Having got the incubator, the first desideratum is a suitable room to stand it in; that is to say, a room with an equable temperature, and not subjected to any vibrations or noises, as these are liable to affect the egg germs. It really seems, though there is no scientific reason for it, that fertile eggs in an incubator are more sensitive and liable to be affected by their surroundings than under a hen. Not all of us realise how sensitive the germ is in the early stages of its development, and how slight a cause will prejudicially affect a successful hatch. A room subject to violent fluctuations of temperature is not suitable, and for this reason rooms with glass roofs or corrugated iron are not good, for we want as little strain thrown on the regulator—that is, the thermostat—as possible. Therefore, an ideal incubator-room will have a temperature of about 60 degrees, and the less it varies through the twenty-four hours the better. If a spare room in the house can be devoted entirely to the incubator, or incubators, so much the better. A cellar is often suitable if not damp, and there is good ventilation. Brick floors are not good—wood or stone is better—and the incubator should stand perfectly level.

The Temperature.

As previously stated, the best hatching temperature is about 103½ degrees, but this is assuming the room temperature is at about 60 degrees. If the room temperature falls, the eggs do better at a higher temperature; if it rises, at a lower. Hence, in a hot summer's day, if the temperature rises to 80 degrees, the eggs should be subjected to a temperature of 102 degrees, or even less; while in a cold winter's day, with a room temperature of 40 degrees, they can safely stand 106 degrees, a temperature which would be fatal in hot summer. It can be safely laid down as a general rule that the lamp should be turned up a little at night to compensate for the lowering of temperature which will inevitably follow next winter.

Testing the Incubator.

But first, having set the regulator at the right temperature, taking into consideration that of the incubator-room, and so treating the ventilating apparatus that there is a little surplus heat—in other words, so that the damper lies from ⅛-inch to ¼-inch over the lamp chimney—work the incubator for two or three days to see how far it can be relied on to maintain an even temperature. With a bad or uncertain thermostat, it needs looking after every two or three hours—a tax on one's time and patience that grows very wearisome; but with a reliable regulator, when it is once in working order, morning and evening attendance, and a glance at the thermometer during the day, just to see that all is well, alone is required. A variation of more than 3 degrees is generally fatal to the egg germs; but no positive statement can be made on this point, as so much depends on the strength of the germ, and the period it is subjected to too much or too little heat.

Only fresh eggs should be used for hatching in an incubator. I believe a firm claim that their machine hatches stale eggs as well as fresh, but I remain sceptical. Stale eggs, and this is a rule without exception, hatch better under hens than in an incubator. By fresh I mean laid within the week, and it is risky to put eggs more than eight days old in an incubator. Eggs destined for incubation should be stored in bran, or in an egg rack, at a temperature of about 45 degrees, and turned daily. Eggs in any degree abnormal in appearance, with wrinkled shell or very large or very small, should not be used for hatching, and it is perhaps hardly necessary to add that they should be perfectly clean. They should be turned twice a day to prevent the egg germ, which floats on the top of the yolk, from sticking to the shell. A sitting hen always turns her eggs, Nature teaching her to do so, and any neglect on the part of the owner to do this will result in a bad hatch.

Moisture and Ventilation.

Besides a regular temperature and turning of the eggs there are two other points necessary to keep in mind—the eggs in an incubator require moisture and ventilation, and the second is more easily supplied than the first. Eggs, indeed, need little ventilation, for, as readers know, the eggs under sitting hens, boxed up in a very confined space in spring, get but little of it. The incubator makers usually see that the ventilation supplied is adequate. Draughts, of course, are very bad, but in all properly constructed incubators draughts playing on the eggs are an impossibility. As to moisture, it must be acknowledged we have still much to learn, and probably the many failures that take place, the fertile eggs that fail to hatch, are largely due to too much or too little moisture. At one period it was thought almost impossible to give the eggs too much moisture, but it is now recognised that too much is as bad as too little. Every make of incubator has its own method of providing moisture. In the hot water or tank machines a tray is provided, standing under the egg drawer, and this must always have boiling water in it. Beginners will be surprised to notice how quickly it evaporates. In hot-air patterns moisture is also present, though not usually in the form of a water tray.

A fault frequently committed by beginners is opening and shutting the incubator drawer too often. It is very easy to jar the eggs on such an occasion; indeed, those patterns that dispense with a drawer entirely are superior to those that have them. Especially at hatching-time should the eggs be meddled with as little as possible.

The heat is nearly always supplied by means of a lamp, but gas, if it can be had, is less trouble and far better, but few of us have the opportunity of choice. The lamp should be carefully tended and cleaned daily, and the lamp chimney kept clean and free from soot. If these simple rules are followed and the incubator works satisfactorily, we can count on producing chickens at any time of the year, the successful hatches being at least as good as if reliable sitting hens were employed.—*Farmer and Stockbreeder.*

FOWL MANURE.

There are not many people who keep fowls who recognise the great value of the cleanings of poultry-houses, and yet the manure is far richer than that of any other farm animal, as will be seen from the following analyses which we take from a southern exchange:—

SELECTED CONSTITUENTS CONTAINED IN ONE TON OF ANIMAL MANURE AND ONE TON OF FARMYARD MANURE IN A FRESH CONDITION.

	Nitrogen as Ammonia. lb.	Potash. lb.	Lime. lb.	Phosphoric Acid. lb.
Fowl manure ...	43	19	58	39
Sheep	20	14	33	13
Horse	17	13	10	9
Cow...	9	8	10	3
Farmyard manure ...	10	13	39	6

It is not many months since a farmer sold to another twenty-five sacks of fowl manure at 1s. per sack, imagining that he had made a good bargain. Air-dried hen manure is worth from £1 14s. to £2 2s. per ton of 2,000 lb. Every fowl will produce, on an average, 6d. worth of high-class manure, so that the owner of 100 fowls can save as much as would buy half-a-ton of superphosphate. In Vol. VIII. of this *Journal* we explained how to utilise this manure. The plan is to spread a layer of dry soil, black or swamp soil for preference, on the ground or barn floor, cover this with the fowl manure, and beat the whole to a fine powder with the back of a spade, then add hardwood ashes. Some add gypsum, but this is better left out. Mix the lot together in the proportion of 3 bushels of soil, 2 bushels fowl manure, and 1 bushel of ashes. When required for use, moisten the heap a little time before planting with water. Cover it up with bags and let it lie. The best way to apply it to the soil is to put about 2 lb. of the mixture in a hole, watering it well. Then mix it well with loose soil, spread it, and cover with 3 or 4 inches of soil, in which sow your seeds. In the evening water with a solution of the manure, 1 lb. to 4 gallons of water.

The Orchard.

FROST-RESISTING MANGOES.

In the annual report of the officiating Chief Commissioner of Settlements and Agriculture for the Central Provinces of India is the report of the management of the District Gardens, amongst others that of the Pachmarhi Gardens. These gardens appear to be situated on a plateau subject to frost, as Mr. J. Safdor Ali, the officer in charge, says in his report—

"The yield of mangoes was very poor; the trees do not seem to flourish much; they were planted about fifteen or twenty years ago, but they are stunted and are not larger than trees of five years' standing in the plains. Many of them have been killed by frost, and there is danger of frost every year. I have imported a few choice varieties of mango grafts from Lucknow, but with quite a different object. If they were planted out, they would not grow more satisfactorily than those already referred to. I have noticed that the Pachmarhi forest abounds in mango-trees, and they all seem to thrive well; frost does not seem to affect them in the least. I intend getting the wild mango seedlings as stocks, and will graft the imported mangoes on them; the trees produced will be much hardier and the results more satisfactory."

In many parts of Southern Queensland and on the slopes of the Main Range, except in sheltered localities, the mango will not thrive, owing to the annual recurrence of frosts. It would be well if a similar experiment to the one recorded above were made in the interests of our own fruitgrowers.

MANURE FOR PASSION VINES.

It has been shown by Mr. F. B. Guthrie that each passion vine in fruit removes from the soil $6\frac{1}{2}$ oz. nitrogen, $1\frac{1}{2}$ oz. phosphoric acid, and $2\frac{3}{4}$ oz. potash annually, so that an acre planted with 300 passion vines, 12 feet by 12 feet apart, would remove 117 lb. nitrogen, 28 lb. phosphoric acid, 52 lb. potash. Mr. A. Despeissis, writing on the subject of "Woodiness in Passion Fruit," in the *Journal of Agriculture* of Western Australia, says:—

Knowing that sulphate of ammonia of commerce contains about 20 per cent. of nitrogen, superphosphate about 14 per cent. phosphoric acid, and sulphate of potash of commerce 50 per cent. of potash, we arrive at the following mixture, in order to restore to the land all the elements of plant food extracted by passion vines, and by a crop of passion fruit, viz.:—

Sulphate of ammonia	600 lb.
Superphosphate of lime	200 „
Sulphate of potash	100 „

Such a mixture, applied at the rate of 3 lb. per vine, would cost 4d. per vine or a little over. It should be applied a year or so after the vines are planted.

Besides a liberal application of chemical fertilisers, it has been suggested that, considering that the woody disease is propagated by means of diseased seeds, and, moreover, that in all attacked vineyards there are some vines which always look healthy and appear to be proof against the blight, cuttings be taken from such vines and planted with a view to obtaining passion vines endowed with the immunity of the parent.

FRUIT-TREE PLANTING IN GERMANY.

At the Geissingen School of Instruction in Viticulture, Fruit Culture, and Horticulture, experiments have been conducted since as far back as 1892, having for object the loosening of deep, clayey, and rocky subsoils below the depth at which fruit trees are usually planted. It was then shown that by means of explosive charges very good results might be obtained in this manner in the way of loosening the subsoil.

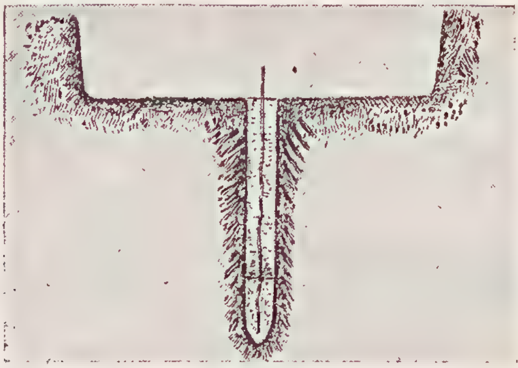


FIG. 1.

In view of those results, in November last year, the subsoil of some holes destined for fruit trees was loosened by the aid of powder. The method consists in boring a hole about 80 centimetres (32 inches) deep in the middle of the fruit-tree hole by means of a paling iron (Pfahleisen) to form a receptacle for the powder. From $\frac{3}{4}$ lb. to 1 lb. of blasting powder was used. In order to direct the action of the powder-gas to the sides of the hole, the charge must be tamped on top as firmly as possible with dry earth. Fig. 1 shows such a hole with the charge ready for ignition. Simple as the work seems, it requires great care, and should be conducted by an expert. Fig. 2 shows the boring tool and wooden mallet.

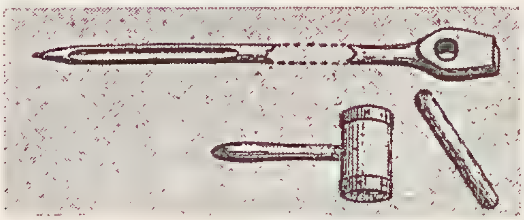


FIG. 2.

That this method of subsoil loosening effects its object was shown by exposing one-half of a tree hole as low down as the bottom of the borehole, when it was seen that the soil showed great far-extending cracks. When it is further considered that the winter rains and frosts easily penetrate these cracks, the great advantage of the work is seen to be eminently satisfactory.

CELERY FOR RHEUMATISM.

The primary cause of rheumatism is acidity of the blood, and exposure to wet and cold intensifies the trouble. The remedy is a very pleasant and simple one. Eat as much celery as possible, raw or boiled. It produces an alkaline condition of the blood, and so minimises the rheumatism. Celery is also an excellent nerve tonic. It is, therefore, an excellent vegetable to use in hot weather, and prevents the nervous prostration consequent upon hot, muggy weather.

Plate VI.

COULURE.

Non-setting of Grapes. (Natural Size.)

Viticulture.

COULURE; OR NON-SETTING OF GRAPES.

BY E. H. RAINFORD, Instructor in Viticulture.

A certain amount of loss will be experienced by Queensland vignerons this season from *coulure* or non-setting of some varieties of grapes, which are more subject to this defect than others, and a few lines on this subject will not be out of season.

Coulure appears under two different forms—one, the failure of the flower to set the fruit in all or part of the cluster; another, in which the fruit sets and increases in size, shortly to fall off the bunch in greater or less quantities as the attack may be severe or mild. The causes of this serious defect are two—constitutional and accidental.

Constitutional *coulure* is attributable either to defective sexual organs of the flower, by which fecundation is impeded, or to degeneration of the plant. In this latter phase the flower clusters form and blossom in the ordinary manner, with the sexual organs apparently perfectly normal and healthy; but, instead of the fruit setting in the ordinary manner, the cluster dries up to the very point of attachment to the cane, subsequently falling off, leaving no trace of its existence; sometimes one or two berries are fecundated, which attain a large size. The varieties most subject to this form of *coulure* are the Clairettes and Terrets, the former erroneously called in this State Verdeilho. The cause of this class of *coulure* is, apparently, cultivating the vine in badly-drained land, as it is on this class of soil the defect more frequently appears. That it is constitutional and not accidental *coulure* is proved by the fact that if cuttings of these degenerated vines are planted elsewhere they are found to possess subsequently the same defect as the parent vines. The only cure for both forms of constitutional *coulure* is to graft the affected vines with other varieties.

Accidental *coulure* is caused by—1. Adverse meteorological conditions at flowering time. 2. Too great a vigour of vegetation. 3. Fungus attacks of the flower and immature berries.

1. This class of accidental *coulure* may be caused by a continuation of rain, brusque changes of temperature, or prevalence of a hot wind during the blossoming period. The non-setting is observable on the more exposed side of the bunch, and on those bunches more exposed than others. The organism of the flower or its sexual organs are so extremely delicate that the above-mentioned causes are often sufficient to interfere with fecundation or to blight the immature berry. The disease does not attack all varieties alike, some resisting atmospheric changes more than others. At Gatton College this season, the Alicante and B. Prince grapes were practically annihilated, while other varieties in close proximity were spared. Accidental *coulure* when due to adverse meteorological conditions, has generally the appearance of a perfect cluster of minute berries, with few or many large berries intermixed according as the attack has been severe or not. The small berries, after a time, disappear, some few remaining aborted and not larger than shot. (See Plate I.)

There is practically nothing to be done for this class of *coulure* beyond avoiding excessive topping, which causes over-exposure of the flower clusters.

2. The non-setting due to too great a vigour of vegetation may be caused by the vines being planted in too rich a soil, whereby very vigorous growth of wood is induced, or by an unusual amount of rain during the spring and early summer months. The effect of excessive vegetation is to draw away from the clusters the sap required for their nourishment; if this drain can be checked in time, the *coulure* will also be checked. Pinching, which will stop

the growth of the young shoots, is indicated here, and it is frequently followed by beneficial results; but it must be done before the flowers have opened or at latest contemporaneously with their opening. If this precaution is neglected for a few days, the damage will be done, and the flowers have been blighted. All the shoots, except those required for special purposes, should be pinched back, leaving behind only adult or nearly adult leaves; the lower laterals, which will be forced out, being subsequently stopped at the first leaf. A good remedy for *coulure* on rich soils is to allow a more liberal winter pruning, giving one or two fruit-rods to each vine; this will check the vigorous growth of a few individual shoots, and with an increase of crop there will be a decrease of excessive vegetation—a double gain to the vigneron. Vines planted in sandy and in stiff, badly-drained soils are equally affected by *coulure* if there is an unusual amount of spring moisture. This is due to poverty of sap caused by too much moisture in the soil, which, united to considerable atmospheric humidity preventing rapid evaporation from the leaves, causes a weak elaboration of organic matter; the evil is intensified if there is persistent cloudy weather before and during the flowering.

In the case of poor, sandy soils, application of fertilisers is the best remedy; and in the other case, drainage where it is possible. Pinching will do some good if done at the right time.

3. COULURE caused by fungus attacks of the flower and immature berry is known by parts of the cluster being amputated, as it were, by the corrosion of the stalk by anthracnose, the part beyond the point attacked turning brown and drying up; in severe cases the whole cluster is lost. In the case of oidium, the flower is attacked and the complete stalk left more or less bare of berries; but it is easily combated by timely application of finely-powdered sulphur, and, as this is an inexpensive procedure, it should always be done at flowering time in those vineyards where oidium makes its presence known in the spring. The treatment of anthracnose is more difficult, and considerable loss is caused every year in Queensland by the attacks of this fungus pest in the spring. Application of winter dressings to the stocks and frequent powderings of the spring growth with a mixture of lime and sulphur, gradually increasing the proportion of lime if it continues to spread, are the only remedies. Examples of *coulure* through anthracnose are given in Plate II.

These are the principal causes of *coulure* and the methods of dealing with it. There remains, however, for the individual vigneron to find out by his own observation to which of the causes *coulure* of his grapes is due, should it be of frequent occurrence, and to act accordingly. In the case of *coulure* due to abnormal climatic conditions, as was the case this season, nothing can be done but to take it as philosophically as possible.

COMBATING PHYLLOXERA.

Mr. E. H. Rainford, commenting on an article by M. Bellott de Minierès on the French method of combating phylloxera, as affecting Australian vines, writes as follows to the Under Secretary for Agriculture:—

SIR,—The note of alarm sounded by M. Bellott de Minierès and echoed by the British Consul at Bordeaux, as to the ill effects upon Australian wines if the French method of combating the phylloxera by grafting upon American resistant stocks is adopted by them, is in my opinion without foundation, and should not be taken seriously by Australian vignerons.

M. Bellott de Minierès, in his communication to the consul, contends—

1. That the system of grafting vinifera on American resistant stocks gives no immunity from phylloxera, because by a francisation of the stock its resistance becomes weakened, so that, after eight years, it becomes obligatory to treat the vines with bisulphide of carbon to keep them alive.

Plate VII.

COULURE.

Non-setting of Grapes. (Natural Size.)

2. That the American stock influences adversely the quality of the French grape by deteriorating it, and therefore deteriorating the quality of the wine made from it. That by the increased production the quality is lowered, and consequently the wine's value is lowered.

3. That by the use of bisulphide of carbon from the first the vines are maintained in their pristine vigour and qualities, and that the soil is benefited by its use.

4. That the use of copper solutions for combating fungus diseases is ineffective, and deteriorates the quality of the wine made from the grapes so treated.

5. That, by the use of ammoniurettes of copper, for the preparation of which M. Bellott de Minierès has invented an apparatus, those diseases may be effectively treated without detriment to the quality of the wine.

I will comment upon each point separately—

1. Experience has proved that when vinifera varieties have been grafted on American stocks of sufficient resistant powers adapted to the physical conditions of the soil they have been planted in, and having a reasonable affinity to the scion, there has been no deterioration of phylloxera-resistant power. There are at the present day in France numerous Rupestris and Riparia vines grafted with French vines twenty-five years ago, that are as healthy and flourishing as when first planted. Many mistakes were made formerly in selecting stocks of insufficient resistant powers, such as the Taylor, Vialla, Solonis, Othello, Jacquez, &c.; likewise in planting the higher resistant stocks in soils totally unfitted to their nature, with consequent weakening of the systems and liability to succumb to disease attacks. With the experience acquired by these failures, we now know which are the true resistant stocks to choose for planting in a given soil and which vinifera shows most affinity for individual varieties, so that failures in the future as regards the healthiness of the grafted stocks should be rare.

2. About a year ago the cry was raised in France (possibly by M. Bellott de Minierès) that the system adopted by French vignerons of grafting resistant stocks to combat the phylloxera disease was causing a deterioration of the wine, that vineyards which formerly produced wines of the first growth had fallen to second and third rate places. The *Figaro*, a leading French journal, sent a representative to Bordeaux to make inquiries on the subject, and a series of articles from the pen of this reporter was published in the *Figaro*, proving that the fears entertained were unfounded, and that Bordeaux merchants were generally agreed that, beyond what resulted from adverse seasons, no marked deterioration of the quality of the best growths was to be observed. Deterioration of quality consequent upon increase of quantity has taken place where, in the reconstruction of the dead vineyards, vignerons, in their greed for quantity, had sacrificed quality by grafting the resistant stocks with enormous croppers, and these are now paying for their want of foresight in unsaleable stocks and low prices. Moreover, M. Bellott de Minierès is inconsistent on this point; for, if grafting French vines on American stocks so weakens the vine's resistant powers to phylloxera attacks that it has to be kept alive with bisulphide applications, how could its production increase to the alarming extent he bewails? Granting, however, that the use of resistant stocks *has* had the effect of depreciating the quality of the wine, how is that to be avoided?

3. By use of bisulphide of carbon, says M. Bellott de Minierès, instead of resistant stocks. I may say at once that the system is utterly inapplicable for Australia. To keep a vineyard free from phylloxera by the use of bisulphide would cost £8 per acre per annum; there is no vineyard of wine grapes in Australia that would bear such an expense as that. With the best wine that Australia can produce, selling at from 20s. to 24s. a dozen, such a yearly charge could not be met. In France, where the *grands crus* fetch very high prices and are very eagerly competed for, such an expense could be borne if the

welfare of the wine required it, but at present there is no such quality of wine produced in any State of the Commonwealth that would authorise such a ruinous expenditure on the part of the producer. Since the use of bisulphide is, on pecuniary grounds, out of the question, the only alternative to giving up viticulture in phylloxera-affected areas is the use of resistant stocks.

4. If the use of copper solution for combating fungus disease could be discarded in favour of some other equally effective and cheaper system, vignerons in France would undoubtedly hasten to adopt it. At present apparently they have no alternative to using copper solutions or allowing the grapes to rot. It is very doubtful, however, whether the infinitesimal amount of copper introduced into the wine affects its quality. Be that as it may, Australian vignerons need not trouble themselves on this score, as, up to the present, we are free from the fungus diseases for which these copper solutions are used in France.

5. If the ammoniurettes of copper are so successful in destroying fungus germs on vines without affecting the quality of the wine, M. Bellott de Minierès should do his utmost to introduce his system into France, where it is apparently unknown, as no mention is made of it in all the literary productions dealing with viticulture and winemaking I have been reading for the last twenty years.

I have, &c.,

E. H. RAINFORD, Viticulturist.

FRENCH HONOURS TO ENGLISH VIGNERONS.

France has always been celebrated for its vineyards and its excellent wines, and it will come as a surprise to many to learn that a firm of Englishmen, Sir Walter Gilbey and Co., have been awarded the gold medal and the diploma of the Agricultural Society of the Médoc for the best-cultivated vineyards, the competition for which honours extended over an area of 300 square miles. It was in 1875 that the Messrs. Gilbey became possessed of the vineyards of Château Loudenne, which at the time were in a very poor condition. In 1876 began the terrible visitation of the *Phylloxera vastatrix*, which brought destruction and distress to French vignerons, and caused a loss to France of £400,000,000 between that year and 1890. The French Government exerted itself nobly to devise some means of combating the pest, and offered immense rewards for that purpose. Numerous suggestions were brought forward, but of all of them only two commended themselves to the Messrs. Gilbey. One was the application of sulpho-carbonate of potassium to the roots; the other, the grafting of French vines on to American stocks. These remedies proved so successful that other proprietors followed suit, with the result that the blighted industry was once more restored to its former flourishing condition.

This state of affairs in France has justly been ascribed by the generous French people to the efforts and sacrifices of the English firm. The mayor of the Department of Médoc went in person to Château Loudenne to present Sir Walter Gilbey with the medal and diploma; the estate manager, Mr. Samuel Hucks, with a silver medal and diploma; and the firm's bailiff, Mr. Bayle, with a silver medal.

These are not the only honours Sir Walter's firm has received at the hands of the French people. In 1887 they received the gold medal given by the Minister for Agriculture for the best cultivated vineyard in France, and also the society's diploma for the improved cultivation of the vineyards of Château Loudenne at that time. In 1900 the English firm was awarded the gold medal at the Paris Exhibition. Such peaceful honours showered upon our countrymen by the French serve to demonstrate that science in agriculture in any form is recognised and honoured independent of nationality.

What Englishmen have done in France, Englishmen can do in Australia. We have in this Commonwealth lands unsurpassed for the growth of the vine and the production of perfect wine. We have in many districts all that is required in the matter of climate and rainfall. If for many years our Queensland vignerons did not succeed in producing so perfect a wine as their brethren in South Australia and Victoria, it was solely due to want of sufficient knowledge of the soil and climate, added to the fact that few had any scientific knowledge of winemaking.

These disabilities have, however, passed away. The Department of Agriculture has spared no pains—by the introduction of new varieties of the best kinds of wine grapes, by the appointment of a scientist in grape culture and wine manufacture, and by the establishment of vineyards at the State Farms—to instruct the vignerons in the best and latest methods of cultivating their vines and of manufacturing wines which, given age, will hold their own with those of their southern rivals.

It need scarcely be said that the Queensland winemakers are alive to the fact that the door has been opened for the introduction of southern wines into this State; and this will prove an additional incentive to them to put forth all their energies, and to avail themselves of all the resources science places at their disposal to produce wines which will rival those of the south.

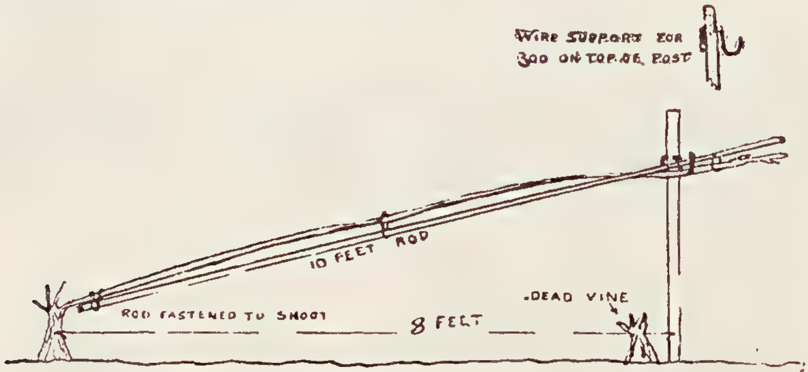
FILLING UP VACANCIES IN VINEYARDS.

At the Thirteenth Annual Congress of the Agricultural Bureau of South Australia, held in Adelaide on September 10th to 13th, Mr. Thomas Hardy, member of Central Bureau, read the following paper:—

This is a subject which may appear of small importance to many persons, vinegrowers included, but I shall be able to show that it is bad management to allow blank spaces in a vineyard.

In the first place, the land has to be all cultivated, whether it is filled or not. The second is the untidy and incomplete appearance of a vineyard with many blanks in it. Many persons think that more grapes are got from the vines adjoining the blank spaces, but a close observation will show that very little more crop is got from them, so that we may safely say that the productiveness of three-fourths of the vacant ground is lost.

Now, having shown that blank spaces in a vineyard are an eyesore and a loss to the owner, I will proceed to show how they may be prevented, and, when they do occur, the best means of filling them. It is well known to all who have raised vineyards that it is of no use to try and fill up the vacant spaces with cuttings or rooted plants after the third or fourth year from planting; even if such plants keep alive (which they seldom do), they never make any growth to speak of, and it is money and time thrown away to attempt to do it. Therefore it is most necessary to see that the vineyard is kept well filled up during the first and second years after planting. Where vacancies do occur from want of this being done, or from other causes, such as the dying out of older vines, the only way to succeed in filling up is by layers from the nearest vines. This was an easy way when vines were planted from 4 feet to 5 feet apart, because rods could often be found long enough to lay down, or the vines sometimes were wholly buried, and shoots brought up where the vine stood, and also in the place where a new plant was required. To such an extent was this done by the Swiss vinegrowers in the Geelong district, that I have known of as many as twenty-five vines that were found all joined together underground when the vines were uprooted in one of the vineyards there some years ago. The difficulty is to get the rod long enough to reach over the wide spaces in our new methods of planting, and after much thought and experimenting I have come to the conclusion that the only reliable way is to prune one of the arms or branches of the vine you intend to get the shoot from to that one only, so as to take all the strength from that part of the vine, then have a stake from 3 feet to 4 feet out of the ground, either of mallee or some wood that will last for three years, and drive it in where you want the new vine to be; then have a light wattle rod about 10 feet long, fasten the large end to the base of the cane you have left, and tie it to the rod at intervals, and cut out all the buds but the two end ones, or rub them off after they have shot out. In the stake near the top bore a small hole, and put a piece of No. 14 wire about a foot long through the stake, bend down one end to keep it from slipping back, and form a hook with the other end to receive the wattle rod.



In most cases it will be found that the rod will have an inclination upward from the vine to the stake, and so much the better if it has, as the new shoots will grow much stronger than if laid on the ground, and be less liable to be injured by the wind. As soon as the new shoots have grown, say, a foot, they should be tied, and where two have grown, one of them, the best of course, only should be left, and no fruit should be allowed to grow either on the new shoots or on any part of that arm of the vine, the object being to get as much growth as possible in one year. The vineyard should be gone over at least once a fortnight while the vines are growing to tie the young shoots to the rod. If these things are properly attended to, it will in many cases be possible to get a rod long enough to lay down in one year, and the rods will not be in the way in cross cultivation of the land, as they can be lifted out of the way for that purpose, and put back again afterwards.

In layering the rods, when long enough they should be bent down at a sharp angle from the vine to a depth of 8 inches or 9 inches below the surface, and brought straight up at the stake, so that the plough or scarifier will not run foul of them in working the vineyard.

If the shoot cannot be got long enough in one year, it should be pruned to the full length and tied securely to the wattle rod, and all buds suppressed, except the two at the extreme end. It is always best to leave two, in case of one being blown or knocked out, and allowed to grow another year, when in almost every case it should be long enough. It is best not to sever the layers from the parent vine for some years, until one is quite sure that it derives its strength from its own roots, and not from the parent vine. Of course, in trellised vines no stakes or rods are required, as shoots are carried along the wire, and they should be carefully tied and not allowed to bear any fruit, as that will greatly prevent the growth of the shoot, and the object should be to get the layer put down as soon as possible, when it will in two years become a bearing vine.

Plate VIII

FLINDERSIA PUBESCENS, Bail.

Botany.

A GOOD SHADE TREE.

Flindersia, so-named by Dr. Robert Brown after the famous Captain N. Flinders, belongs to the natural order Meliaceæ, and is a near ally of the genus which includes our Red Cedar (*Cedrela Toona*).

There are fifteen species of the genus indigenous in this State, where most of them are known as possessing timbers of excellent quality and greatly sought after by the house, boat, and coach builder, cabinet-maker, &c.

A distinguishing mark of the genus is the fruit, which is oblong, hard, and generally covered with tubercles, and opens in five boat-shaped valves. In most of the species these separate when ripe, but in one species, the Crow's ash, they remain adherent at the base, and are often used in the making of fancy pincushions, and for ornaments, &c.

Two of the best-known species are Crow's ash (*F. australis*) or *Flindosie*, as one often hears the timber-getter calling it, and *F. Oxleyana*, the common yellowwood. The timber of the firstnamed is very strong and durable, and is a favourite for veranda floors, while the latter is strong, is used for cabinet work and buggy shafts, and is adapted for handscrews. Another species, *F. Chatawaina*, named after our late esteemed Minister, is considered one of the very best timbers of the North, where it is known under the names of Cardwell Maple, Silkwood (Cairns), and Red Beech (Atherton), and used for a great variety of purposes.

The plate here given represents *F. pubescens*, one of the handsomest species of the genus, and is from a photograph, taken by Mr. Mobsby, of a tree growing in the Wickham-terrace reserve. Mr. R. McDowell, the superintendent of the reserve, thinks a great deal of it as a shade tree, and with good reason, for it is one that will be hard to surpass for the purpose. He has planted a number in the reserve and other places under his charge, and all are doing remarkably well. One would hardly credit this tree, which belongs to the tropical parts of the State, thriving in the situation where this photo. was taken, as it is very exposed to westerly winds, and the soil is exceedingly poor. But the trees could hardly look better even in their native habitat, and makes one wonder why more of the many handsome trees of our tropical parts are not u ised in our reserves and gardens. The seed from which these trees were raised was obtained from tropical Queensland by Mr. Walter Hill, late director of the Brisbane Botanic Gardens, who was a great enthusiast in the cultivation of our native plants.

Nothing so far is recorded of the timber of this tree, but no doubt it will be found to be good, like others of the genus.

Two species of our inland plains—viz., *F. Strzeleckiana* and *F. maculosa*—would prove pleasant additions to our cultivated ornamental trees. They are both small trees, and go by the names of spotted-tree and leopard-tree on account of the bark falling off in scale-like pieces and leaving light-coloured indented patches upon the stem.

Horticulture

COTTAGE GARDENING—(CONTINUED).

BY W. SOUTTER.

Continuing from page 484 of the *Journal*, I promised to say a word about horticulture in the West and North. As before stated, plants that flourish on the coast are not a success in the wild West. There are, however, away in the back blocks, hearts that desire the influence of flowers and the presence of green verdure; and although the successful growth of many of our gorgeous flowers of the Pacific slope cannot be expected, still there are quite a number of the more humble sorts that are quite companionable, and lend a charm to the squatter's home.

How few of our inland towns can boast of a garden, even of the smallest dimensions. The only attempt at gardening is made by the Mongolian, who, as all are aware, is not given to the artistic phase of the question I have never yet seen John guilty of planting an ornamental tree or an ornamental flower—he is painfully practical, and aims for an article he can turn into cash. No one can blame poor old John for this. But round the home of the hardy pioneer of the West many of the favourites of the flower garden can be and should be grown. Many of the failures in the past to form gardens out West has arisen from the following cause: Mrs. Brown comes to town from the station out West to pay a round of visits to her friends. She notices in their gardens such plants as the Bougainvillea, Allamanda, Acalypha, and other handsome flowering and foliage plants. She straight off makes up her mind that she must plant the same in her garden away out on the Warrego, Thompson, or Diamantina. Needless to say, the plants die, and so does her desire for future efforts in the same direction. The same result follows her tree-planting, and Mrs. B. comes to the conclusion that gardening, as far as she is concerned, is a dead failure; and the garden plot is once more relegated to the goat and such weeds as locally flourish. This state of matters I can verify, as they have come under my own observation several times.

There can be no hard-and-fast lines laid down as regards the kind of trees which may suit every corner of the inland area of this State, as elevation, depression, geological formation, and temperature conditions differ in every few miles of country; but there is always some botanical feature which may act as a finger-post to guide the would-be planter even in the far West—in brigalow and myall country. Such trees as the acacia, bottle-tree, cypress, pepper-tree, plane, oak, poplar, and conifer will succeed; and many of our native trees might be planted, as Moreton Bay ash, bloodwood, ironbark, grey gum, casuarina, &c.; and here just let me digress for a moment to say that, instead of looking around for trees of other countries and climates, if we only systematically took in hand the intelligent planting and pruning of our native Australian trees, the results would not only be satisfactory from a growth standpoint, but the effect from a scenic point of view would be equally pleasant; but the first thing a man does when he buys a piece of land is to kill every tree within the confines of his boundary, and then has to exercise all his energy to get trees to grow again, and before he can rear a tree big enough to afford him shade while he eats his lunch he is across the Styx. Wherever the foregoing trees will flourish, the following shrubs and flowers should grow:—*Ligustrum*, *Keeria japonica*, *Spiræa*, *Arbutus canariensis and A. Unedo*, *Buddlea paniculata*, *Deutzia crenata*, *D. scabra*, *Dombeya floribunda*, *Escalonia monteridensis*, *Gardenea globosa*, *Hibiscus syriacus*, *Jasminum fruticans*, *Laurus nobilis*, *Nandina domestica*, *Nerium album*, *Phormium tenax*, *Photinia serrutata*.

Plumbago capensis, *Prunus sinensis*, *Punica granatum*, *Sambucus*, *Tamarix gallica*, *Vitex trifoliata*, *Yucca* of various kinds, &c. Bulbs of nearly every sort can be grown at the proper season; and annuals of many sorts can be depended upon to give a fair show of flowers during the year.

It must not be forgotten that to successfully grow the plants I have mentioned the watering-can or the pipe-hose has to be used as occasion requires, for without moisture plant-growing is out of the question. Where water is plentiful there also will be flowers.

THE ROYAL BOTANIC GARDENS OF EDINBURGH.

These extensive and beautiful grounds cover an area of 57·648 acres, and are replete with valuable plants such as tropical palms, ferns, orchids, pitcher-plants, economic plants, plants of dry regions, &c. There are hot-houses, lecture-rooms, laboratories, herbarium, arboretum; in fact, everything to make the gardens attractive and of educational value. In this latter respect the Edinburgh Gardens admirably fulfil their functions. Special instruction in the sciences underlying the practice of horticulture and forestry is provided for the staff of the garden. The course of instruction is spread over three years, and consists of lectures upon and practical instruction in the sciences taught. A reading-room and library are also provided for members of the staff going through the course. The Regius keeper from time to time gives lectures which are open to the public, and the laboratories are open to anyone desirous of undertaking botanical research.

In recent years a school of rural economy has been established in Edinburgh, and a considerable part of the botanical teaching in connection with it is carried on in the gardens. Students of the university also go to the garden for instruction in botany. It seems a pity that our beautiful Brisbane Botanic Gardens cannot be utilised in a similar manner. One might travel a long way in European countries before finding such a magnificent collection of representatives of the vegetable world as is here to be seen, and there are not wanting earnest students of botany who would gladly avail themselves of any such opportunities as are offered by the Scotch gardens, if the able and scientific director could see his way to spare the time necessary for the purpose.

LIQUID MANURE FOR POT PLANTS.

Few people are aware of the great value of fertilisers applied in liquid form. Nearly every plant is benefited by its use at some period or other, and if applied prudently when the plants are most in need of some kind of stimulant the effect will be most observable, more especially in the case of plants in pots, where the space they occupy is circumscribed, and the properties of the soil soon become exhausted. How often we hear exclamations of surprise at the beautiful and healthy plants some growers produce, and the extremely small pots they are in. The secret is the careful and regular application of liquid food when the plants are growing and their pots are full of roots.

Many of the ills which plants are heir to are believed by those who are ill-informed to be the result directly or indirectly of the use of manures, when the real cause generally is the poverty of the soils in which they are expected to thrive.

It will be apparent to every amateur that weak and unhealthy plants are more subject to insect pests than are the healthy and vigorous. All plants do not require manure at the same period, so the amateur must use a certain amount of discretion. As the hot weather advances liquid food will be required. Notice the appearance of the various plants, and apply it accordingly.

All liquid manure must be given in a weak state. The gardener must consider for what purpose he is using it, whether for foliage or flowers. If used to excess, the former will be at the expense of the latter. Plants like pelargoniums, zonales, cinerarias, petunias, calceolarias, and some other soft-wooded plants, for these once a week will be ample, until such time as they show their bloom buds, when twice a week, easing off as the flowers expand, and ceasing altogether when the plants are going to rest. Never apply to newly-potted or dormant plants, especially in winter time. Many greenhouse plants, palms, aspidistras, &c., that have become potbound, will be greatly aided by a judicious application of manure in a liquid form when they are starting to grow.

Perhaps the most simple, best, and most easily procured form is made by taking one kerosene tin full of fresh cow or horse manure (cow preferred); put in a branbag and suspend in a barrel containing thirty gallons of water. Keep this stirred frequently for a week, and let it settle. When clear, one quart of liquid to two gallons of water will be sufficient to use.

Soot makes an excellent fertiliser. This may be prepared by putting a couple of gallons of soot (in a bag) to the same quantity of water as above, using a quart of the liquid to three gallons of water. This manure produces fine, dark foliage, and may be given to almost any plant requiring a stimulant without fear of injury. Ammonia, guano, superphosphates (besides fowl and pigeon manure), in fact, nearly all artificial manures, when the quantities and strength are known, may be dissolved in water, thereby bringing their fertilising properties into direct contact with the roots in the best possible manner.

Besides the above directions, some judgment is needed. Amateurs should use their intelligence, and they will soon learn how to vary treatment when it becomes necessary to do so.—*Garden and Field.*

DO PLANTS WEAR OUT?

BY JAMES PINK.

Beyond doubt, after plants have been brought under cultivation for a number of years they degenerate. When we look upon the great world of plants, the mountain, the hillside, the valley have each a vegetation adapted to the several situations. Here the species appear to have grown during the present dispensation, each producing its kind true from seed, generation after generation without showing any debility. Some appointed law seems to have rendered the several specific peculiarities eternal, each species reproducing its kind by Nature's law of propagation by seed. Man, to supply his wants, brings certain species of plants under cultivation, and by cross-breeding and cultivation so changes their character that the species often almost loses its individuality, so that it can no longer be raised true from seed, and is propagated by other methods. Being artificial productions, they become subject to the natural law of deterioration, gradually lose their vitality, and in time suffer from all the ills incidental to old age often hastened by bad cultivation and general neglect—

> Thus by destiny all things decay,
> And retrograde by motion unperceived.

The Marguerite strawberry appears to have reached this period, and by degeneration to have become so subject to leaf disease that Bordeaux mixture ceases to be a remedy for the blight. These plants are suffering from debility incidental to old age. Some growers are obtaining plants from the other States for planting during the coming season, but this will not be found to be a remedy for the disease, because the plants so obtained will not be new, but only a part of the same old stock grown elsewhere. New plants and varieties can only be obtained by seed. This is the only natural system; all other methods of propagation are artificial, no matter whether it be by runners, layers, cuttings, grafting, or by buds. The scions or runners are always a part of the plant from which they were taken, and retain all its weaknesses and other characteristics. When any variety has reached this stage, the only means of restoring it to health, vigour, and productiveness is by seed. Every seedling raised is a new individual, possessing all the strength and vigour of youth, and will retain that vigour for many years if properly cultivated, and not allowed to kill itself by over-cropping, or to be choked by weeds. To obtain seed, a few healthy plants should be planted in a good situation and well cared for, and be allowed to bear only as many berries as are required for the seed. To obtain the best results from seed the best plan would be to cross the Marguerite with some other good strong variety, such as Trollope's Victoria or Federator; the Marguerite being the mother or seed-bearing parent, the seedlings always retain the general characteristics of the mother parent. How to raise strawberries from seed was fully explained in last month's *Journal.*

THE LEAVES OF ROOT CROPS.

It is not uncommon for farmers who have grown a heavy crop of mangolds to regret that they have not sufficient stock, more particularly pigs, to consume the tops. It cannot but be known to the intelligent farmer that the leaves of mangolds, beets, turnips, &c., have a considerable fertilising value when ploughed under. Many instances are recorded in which on light land a grain crop has failed after mangolds, owing to the tops having been removed, but when they were ploughed in good grain crops have been obtained on the same land. The leaves doubtless contain nitrates and other saline matter. It is, however, singular to note that when beet leaves are ploughed in and a crop of barley is sown, the weight of straw is increased, but the grain is lighter than if other fertilisers were employed.

KILN DUST AS A POTATO MANURE.

Some experiments on the manuring of potatoes have been carried out during the past two years at Blidworth, under the direction of the staff of the Midland Agricultural and Dairy Institute, England. These experiments were carried out on a farm and on a piece of allotment ground where potatoes are grown very frequently year after year.

An interesting feature of these trials has been the results obtained by the application of dressings of kiln dust as compared with those from dressings of farmyard manure and from ordinary mineral artificial manures. On the farm, the average results of the two years' experiments furnished the following net profits per acre (debiting the whole cost of the manure to the potato crop) from the three most profitable dressings:—

	£	s.	d.
From 1 ton of kiln dust	2	15	8
From ½ ton of kiln dust	3	15	4
From complete dressing of 3⅓ cwt. kainit, 1⅔ cwt. nitrate of soda, and 2½ cwt. superphosphate	2	17	6

On the allotments, kiln dust also yielded the greatest profit, and the complete dressing of artificials ranked next, as was the case on the farm plots.

Tropical Industries.

COTTON NOTES.

More cotton is grown, and more is locally worked up into cotton goods in the United States than in any other country in the world. During 1900 that country consumed over half-a-million more bales than Great Britain owing to the great demand for American cotton goods, although the spinning capacity of Great Britain exceeds by far that of the United States.

From the beginning to the close of the last cotton season, a most extraordinary range of prices was noted, as the following figures will show :—

Spot cotton opened in New Orleans on 1st September, 1899, at $5\frac{15}{16}$ cents (nearly 3d.), and in New York at $6\frac{1}{4}$ cents (over 3d.), for Middling Upland ; and on the last day of the season, 31st August, 1900, the same class of cotton sold at New Orleans at $9\frac{1}{2}$ cents ($4\frac{3}{4}$d.), and in New York at $9\frac{5}{8}$ cents per lb., a difference of $3\frac{9}{16}$ cents and $3\frac{3}{8}$ cents (about $1\frac{3}{4}$d.) The total crop reached 9,142,838 bales.

At the same time a similar rise took place in Egyptian cotton, and Sea Island cotton, which is grown in Florida, Georgia, and South Carolina, sold locally at 2s. 1d. per lb.

COST OF PICKING AMERICAN COTTON.

As in Queensland, when cotton was universally grown on the coast lands, the picking of cotton is the largest item in the cost of production in all cotton-growing countries. That cost may be set down at about 20 per cent. of the entire cost and to 16 per cent. of the entire value of the crop. In Egypt the cost of picking only reaches 6 per cent.

In Queensland, with clean cotton at 5d. per lb., the cost of picking would be about equal to that of the United States.

It is a singular thing that, with all their vast production, the United States import thousands of bales of cotton, mainly from Egypt and Peru. In 1900, 135,000 bales were thus imported.

There is unquestionably a good opening in this State for small farmers to grow cotton profitably. There is no need to doubt whether cotton will thrive in Queensland; that question has been answered years ago by the record of thousands of bales exported from Southern Queensland. The West Moreton lands on which cotton was produced have been mostly devoted to pasture ever since the decline of the industry, and if broken up and planted would be found to be sufficiently fertile to produce good cotton crops.

BRAZILIAN COFFEE IN HAWAII.

Following Porto Rico's example, Hawaii is now petitioning Congress for a protectionist duty on coffee to shut out the cheaper Brazilian article from the islands. Little by little Brazilian coffees are monopolising the markets even in coffee-producing countries, and making competition impossible. As it becomes unprofitable, coffee-planting will be given up and the circle gradually narrowed until with an immense consumption and practical monopoly of production we shall have it all to ourselves and dictate prices to the world. It is this that Brazil should aim at to eliminate competition ; and that can be done only by selling at prices at which competition is impossible. The process may be painful to ourselves, but it is certain, and in the long run will amply reward the sacrifice. Instead of limiting the output, what is wanted is to produce more and cheaper, and flood the world with our coffee.

The following is a resolution passed by the Hawaiian Legislature about to be presented to Congress :—

"Before Hawaii was annexed to the United States" said Mr. Kalanokahlani, "the coffee industry was fairly prosperous and the growers were making money, but since the admission of coffee free of duty the business of the Hawaiian coffee-growers has steadily declined until now the industry languishes.

"There are very rich coffee lands in Hawaii that, if worked, are capable of producing large crops of the most delicious coffee in the world, but under existing conditions our planters cannot compete with the cheap labour employed on the coffee plantations of Brazil, Mexico, and other South American countries, and hence it is that they will ask Congress for protection.

"It seems to me that since the Supreme Court's decision in the Porto Rican case Congress would have power to levy a tax on all coffee imported from foreign countries into Hawaii, while admitting free of duty all Hawaii's coffee into the United States and Territories. The duty on foreign coffee would give us protection and enable our coffee-growers to build up a home market in the Territory. The farmers of the United States are protected by a tariff, and why not extend like protection to the owners of coffee plantations in Hawaii?"—*Planting Opinion.*

BRAZILIAN COFFEE NOT WANTED.

The merchants of San Juan (Porto Rico) are alarmed concerning the importation of Brazilian coffee, which has been made possible by the removal of the tariff. Lately the steamer "Ponce" brought two consignments of coffee, one of 120 bags and the other of 113 bags. This coffee can be sold here at about one-half the price of the Porto Rican product, thus destroying the market for the latter. The merchants of Manita met and resolved not to trade with the importers of coffee from Brazil, and meetings were held in other towns. Governor Hunt has consented to ask Washington for relief by the enactment of a measure declaring that the proclamation does not refer to the special duty of 5 cents on coffee, as per section 1, but only to section 3.

The importers of the coffee to arrive fearing public feeling, announced that the coffee received would be shipped back again by the next vessel, the newspapers having demanded that a boycott be instituted against the dealers on patriotic grounds until Congress can act, considering a favourable construction of the law to be impossible.—New York *Journal of Commerce.*

BANANA AS DIET IN TYPHOID CASES.

An American doctor (Dr. Usery, of St. Louis), says the *Liverpool Journal of Commerce*, has lately confirmed the previously stated belief accepted in some medical quarters, in the value of the banana as a food for typhoid patients. During the progress of this malady, the use of solid food owing to the thinness of parts of the intestinal walls, is attended with danger; but it is asserted that the banana is both safe and beneficial, the stomach practically absorbing the fruit owing to its nature. It contains only about 5 per cent. waste matter, 95 per cent. possessing nutritive properties.

Forestry.

EFFECT OF FORESTS AND SNOW ON WATER SUPPLY.

The effect of forests on snow and the combined effect of the two on the available water supply of a country are the subject of Bulletin No. 55 of the Agricultural Experiment Station of Fort Collins, Colo. The bulletin was written by Professor L. G. Carpenter, Director and Irrigation Engineer of the station. The conclusions of the author are as follows:—

(1.) The mountain streams in the early irrigation season are largely supplied by melting snow.

(2.) There is a marked diurnal fluctuation, greater with high water than with low, due to the daily variation in the rate of melting.

(3.) The stream at high water may be one-half greater than at low water on the same day.

(4.) Cloudy weather in the mountains, protecting the snow from the radiation of the sun, causes the fluctuation to disappear and the flow to decrease.

(5.) This decrease is so great that the cloudiness associated with continued rain usually more than counterbalances the gain from the rain.

(6.) The loss of snow by evaporation is considerable, especially when exposed to winds.

(7.) Snow remains in the timber and in protected spots much longer than where exposed.

(8.) This is due not so much to drifting as to shelter from the radiation afforded by the forest cover.

(9.) Hence the greater amount of forest cover the less violent the daily fluctuation, the more uniform the flow throughout the day and throughout the season, and the later the stream maintains its flow.

(10.) The loss of the forest cover means more violent fluctuation during the day, greater difficulty in regulating the head-gates and keeping a uniform flow in ditches, and hence an additional difficulty in the economic distribution of water. Also, the water runs off sooner; hence the streams drop earlier in the summer, and on account of the lessening of the springs the smaller is the winter flow.

(11.) The preservation of the forest is an absolute necessity for the interest of irrigated agriculture.—*Engineering News.*

VENEERS.

Here is a piece of news which may induce owners of standing scrub to pause before destroying timbers which would be greatly prized in the home markets.

We have, over and over again, pointed out the suitability of many of our scrub woods for veneering purposes, but all we have said has apparently been spoken to the winds. The prices of fine woods have recently advanced from 15 to 35 per cent. in the European markets. This has been brought about by the increased demand for veneers for making furniture, piano cases, musical instruments, &c. The new method of decorating walls with veneers instead of tapestry, wallpaper, or leather has resulted in a great increase in the demand for woods suitable for the purpose. In the museum of the Department of Agriculture may be seen a very fine collection of forest and scrub timbers, polished, planed, and in the rough. These are all named, both the scientific and the common Australian name being appended to each specimen. The localities, whence they came are also indicated, whilst a little book by Mr. F. M. Bailey, Government Botanist, is available, which gives all information about these timbers. If scrub selectors would avail themselves of these means of finding out the value of their trees, they might discover that it would pay them to refrain from burning them. Here is an instance of the value of rosewood. Some years ago, when the settlers in the Rosewood Scrub were felling and burning every stitch on their selection, we obtained a log of rosewood about 8 feet in length and 15 inches in diameter. The log was sent to Oxley, where it was cut into ¾-inch planks at the sawmill of the late Mr. Berry. The planks were kept for over a year, and then were sent to Mr. Carey, cabinet-maker, to be converted into a chest of drawers. Mr. Carey turned out a most beautiful piece of furniture, highly polished, and which was redolent of violet scent. The drawer-knobs were made of another beautifully marked scrub timber—tulip-wood (*Harpullia pendula*). Such an article of furniture, which only cost £5 to make in Queensland, was valued by an English expert at £15.

Appended we give a short list of a few of the Queensland woods, which are beautifully marked, and which are susceptible of high polish:—

Black Ebony (*Maba reticulata* and *M. geminata*). Black in the centre, close in grain, hard and tough, the black a good substitute for ebony. Scrubs of Northern Queensland.

White Myrtle (*Rhodamnia Argentea*). Wood dark-brown, close-grained, hard, tough, and durable. Southern Queensland scrubs.

A Brown Silky Oak (*Musgravea Leptostachya*). Wood of a light-brown colour, nicely marked, light, and firm. Does not shrink much or warp in drying. Tropical Queensland scrubs.

Gutta Percha Tree (*Excœcaria parvifolia*). Wood near the outside yellow, the heart dark and very beautifully marked, close-grained, and easily worked. Tropical Queensland.

Thready-barked Oak (*Casuarina inophloia*). Wood very beautiful, of a reddish colour, but with numerous dark marks, grain close. Both sides of the coast range in Queensland.

Forest Oak (*Casuarina torulosa*). Wood of a reddish colour, very nicely marked, close in grain, and hard. Common on ranges in Queensland.

Acacia (*Acacia fasciculifera*). Wood of a red colour, very hard, and close in grain. Central Queensland.

Leguminous Ironbark (*Erythrophlœum Laboucherii*). Wood red, hardest in Australia—close-grained. North Queensland.

Acacia (Gidgee) (*Acacia homalophylla*). Wood dark, close-grained, heavy, and prettily marked. Western inland Queensland.

Wormia alata. Wood of a dark colour, shows a pretty red "clash," somewhat resembles English oak. Close in grain, easy to work. Coast swamps of Queensland.

Geijera Muelleri. Wood with a beautiful dark-clouded heart wood; the rest of a light colour; all hard and close-grained. From Brisbane northward.

Alexandrian Laurel or Domba-tree (*Calophyllum inophyllum*). Wood of a reddish colour and pretty, wavy figure, strong, and durable. Tropical Queensland.

Cotton-tree (*Hibiscus tiliaceous*). Wood close-grained; colour, invisible green; beautifully marked, easy to work, takes a good polish; resembles Pollard Oak.

Johnstone River Red Beech (*Tarrietia trifoliolata*). Wood of a reddish colour, close-grained, and firm. Takes a fine polish. Cairns and Johnstone River, North Queensland.

Cairns Satin-wood (*Dysoxylon Pettigrewianum*). Wood hard, outer wood yellowish, close-grained, and firm. North Queensland scrubs.

Sour Plum (*Owenia acidula*). Wood reddish, close-grained, hard, but very easy to work. Interior of Queensland.

Barklya syringifolia. Wood blackish-grey, close in grain, and very tough. Scrubs of Southern and Central Queensland.

Ringy Rosewood (*Acacia glaucescens*). Wood—sap-wood of a light yellow colour; all the rest dark, resembling English walnut and rosewood, with transverse, wavy lines giving to a turned stick a ringed appearance; a very valuable wood for veneers; more or less fragrant. Northern and Southern Queensland.

Black Wattle (*Acacia Cunninghamii*). Wood of a dark colour, close-grained, hard, heavy, and prettily marked. Widespread in Queensland.

Dead Finish (*Albizzia basaltica*). Wood towards the bark, bright yellow; heart wood, dark red; close-grained, hard, and very beautiful. Inland Queensland.

Mr. F. M. Bailey, Government Botanist, considers all these, as well as many other scrub and forest woods, very valuable for veneers and cabinet-making.

SOIL ANALYSES.

Many farmers hold erroneous ideas as to the value of soil analyses. We hear farmers speaking as though they only required to have the soil analysed to know what manures to apply to certain crops to obtain the best returns. This, however, is far from being so. In the first case, as every farmer knows, it would be nearly impossible to obtain a sample that would fairly represent even a 10-acre field. Besides this, an analysis will only show what the soil contains; it will not tell the farmer whether the plant food is in such a condition that the plants can make use of it, neither will it tell him what treatment the soil requires to make that plant food available. So many other things have to be taken into consideration, such as the physical condition of the soil and subsoil, its ability to retain moisture or perhaps the reverse, that (except to the scientist) a soil analysis is just as likely as not to prove misleading in dealing with the manures such a soil requires. The only guide to the farmer is experience. Find out what others have done under similar conditions, and prove by experiment whether the treatment beneficial in their case is equally so in yours.—*S.A. Journal of Agriculture.*

Science.

ARTIFICIAL COLD.

We have received from Mr. G. Monks, One-mile, Gympie, a very instructive and interesting paper read by Mr. John Falconer, C.E., at an agricultural conference held in Bundaberg in June, 1893. The subject is "Artificial Cold," and, as we are now approaching the hottest summer months, perhaps some of our readers might like to make a trial of the process as detailed by Mr. Falconer.

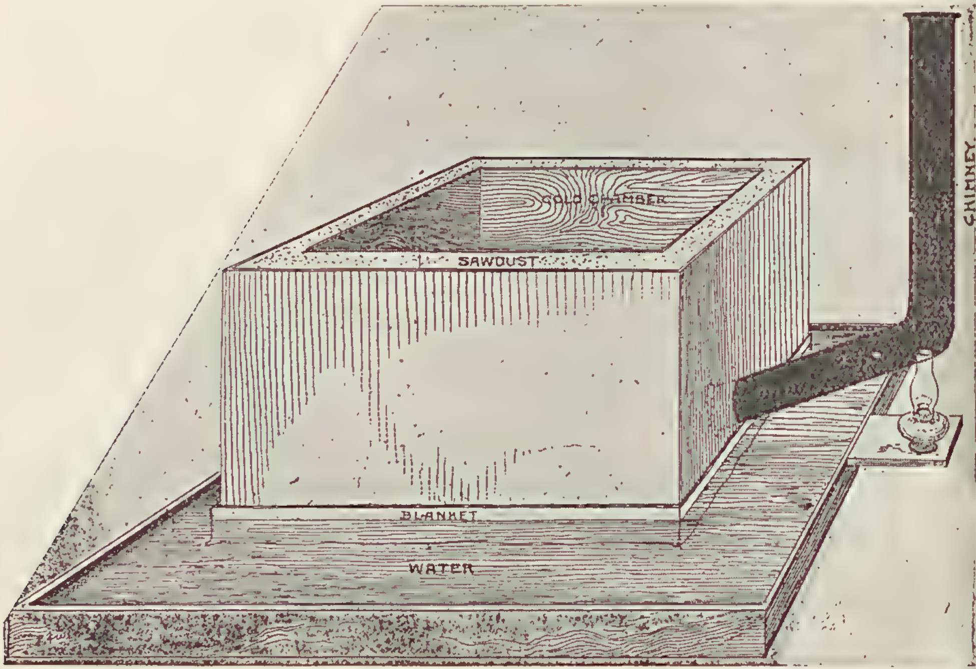
The general idea is thus stated:—When by any process, a change is produced in the form of matter, it undergoes certain developments; thus, when gas under pressure becomes liquified, it gives off a great amount of heat, and when it again is allowed to expand it takes up heat from its nearest surroundings. That is the principle in all plans or systems whereby artificial cold is produced. If, when air is compressed in a cylinder, it is surrounded by water, the temperature of the cylinder will be reduced; but when the air is released again, if it be conducted through a pipe surrounded by water, the latter will be frozen, as the air in expansion takes up as much heat as it had before it was cooled after being reduced, and it takes up heat from whatever it comes in contact with. Mr. Falconer exhibited a cylinder into which gas had been pumped with great force, until there was a pressure inside it of nearly 300 lb. per square inch. Now, if a small pipe were attached to this cylinder, and the pipe were conducted through a bucket of water, the expanding liquid gas would recover from the water all the heat it had before it was condensed and liquified in the cylinder, and the expanding of the gas would cause the absorption of the heat surrounding the pipe and reduce the temperature of the water until it became frozen.

A model of a safe was then shown. Of this safe the author said—

"Twenty years ago I designed and had constructed for a friend near Brisbane a dairy on the principle here shown, and on the hottest day in summer you could always be sure that the dairy was a cool place; it was constructed on the side of a hill, and is in use to the present day (1893). The model was thus described:—A box having the appearance of an ordinary safe. It is double, and between the inner and the outer boards there is a packing of sawdust, which is a non-conductor of heat. It is airtight, except at the bottom. It stands in an open trough in which there is water, and around the bottom there is a casing of four plies of blanketing. At the side there is an air chimney, and under the elbow of the pipe is an ordinary kerosene lamp, the chimney of which enters the funnel through a small tube. The combustion of the air in the lamp creates an expansion of the air in the funnel; if the lamp is turned up high, a roaring is heard in the funnel, caused by the rush of expanding air through it, for the heated air passing up the funnel causes a partial vacuum in the box, expanding the air in it, and causing a draught. The outer air having no inlet, except through the wet blanket, becomes rarified in its passage through the chamber, and the desired effect—*i.e.*, cold storage—is produced, for the expanding air must get heat, and it gets it from whatever it comes in contact with; in other words, the heat is drawn from whatever is in the chamber to supply the requirement of a natural law. If a larger lamp is used, the expansion becomes greater, and whatever is in the chamber will be frozen.

The dairy constructed by Mr. Falconer was built on this principle, with a brick chimney. Butter was kept in it for months in sound condition, and the interior was so cold that no one would care to remain in it for half-an-hour.

We have, unfortunately, not got the model of Mr. Falconer's safe, but Mr. Monks has suggested the accompanying construction.



TO FIND THE CONTENT OF A STACK.

Consider an oblong stack 40 feet long, 12 feet wide, 8 feet high as far as the eaves, and 6 feet from the eaves to the crown. Take the lower portion first. Multiply the length, breadth, and height together (the height to be measured from the ground to half-way between the eaves and the crown. Thus, $40 \times 12 \times 8 + \frac{1}{2}$ of 6) that is $40 \times 12 \times 11 = 5{,}280$ cubic feet $= 195\frac{5}{9}$ cubic yards. Any oblong stack can be calculated roughly in this way. Suppose, however, the stack to be built so as to bulge at the eaves. In this case the body of the stack must must be calculated separately. Instead of 12 feet, it is, say, 14 feet wide at the eaves, so the *average* breadth will be 13 feet, and the height to the eaves 9 feet, while the end of the crown from the eaves is 8 feet.

Now, $40 \times 13 \times 9 = 4{,}680$ cubic feet in the body of the stack, and the content of the roof will be $40 \times 14 \times 4 = 2{,}240$ cubic feet. Add these two quantities together; we have, $4{,}680 + 2{,}240 = 6{,}920 = 256\frac{1}{3}$ cubic yards. The surest way of getting at the weight is to weigh 1 cubic yard.

In old haystacks, 8 cubic yards will weigh 1 ton. For new hay well settled, about 10 yards will represent 1 ton.

Of wheat, 1 bushel of grain may be reckoned to the solid yard.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1900.		1901.										
	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
North.													
Bowen	0·05	2·30	17·25	6·23	8·26	4·75	0·94	0·19	0·10	6·36	0·18	0·93	0·92
Cairns	1·61	4·19	11·53	22·09	14·93	8·87	13·18	0·57	0·89	2·53	1·82	2·34	5·23
Geraldton	2·39	18·68	23·32	32·93	37·64	26·10	26·72	1·21	2·58	11·77	3·37	3·85	6·45
Herberton	3·11	4·01	8·25	4·16	10·95	2·87	3·80	0·18	0·64	2·53	1·04	4·92	1·13
Hughenden	0·10	0·61	1·62	1·41	2·82	1·74	3·48	0·03	Nil.	0·33	Nil.	0·31	0·29
Kamerunga	1·28	2·38	15·91	22·36	13·09	9·57	13·18	2·09	2·60	1·94	1·72	1·19	5·74
Longreach	0·19	0·11	0·41	0·22	3·09	2·56	5·95	0·09	Nil.	0·37	0·58	Nil.	Nil.
Lucinda	0·88	2·48	31·80	24·76	15·78	9·16	8·63	2·89	2·17	5·89	0·30	2·59	...
Mackay	0·12	7·00	24·85	8·99	10·13	6·80	1·32	0·25	1·07	5·14	2·29	1·35	1·85
Rockhampton	1·15	0·68	0·49	8·26	5·53	2·84	0·79	0·24	2·29	3·04	1·78	0·51	0·41
Townsville	0·05	0·76	14·91	12·94	4·95	3·13	0·74	0·32	0·19	1·87	0·14	0·90	0·16
South.													
Barcaldine	0·30	1·20	0·15	1·17	3·70	1·90	2·21	0·82	0·63	0·25	0·51	0·54	0·55
Beenleigh	2·80	1·49	5·99	4·30	11·44	4·17	4·55	4·15	1·34	4·49	0·70	3·35	1·35
Biggenden	1·65	0·06	1·11	2·55	6·19	6·35	1·47	1·56	0·74	2·81	2·11	1·35	0·47
Blackall	0·29	0·17	0·29	0·90	2·28	3·96	3·80	0·90	0·55	0·44	0·88	0·60	0·97
Brisbane	2·48	0·55	3·43	2·96	11·70	3·10	2·29	3·29	1·31	3·71	1·30	3·25	1·41
Bundaberg	1·06	1·28	2·34	2·61	3·17	10·27	1·14	0·74	2·01	5·59	1·80	2·18	1·28
Caboolture	0·86	2·11	1·11	5·51	11·53	4·64	3·34	2·27	3·70	3·18	1·55	5·01	3·17
Charleville	0·19	1·13	0·19	0·22	1·10	2·61	3·28	0·93	1·27	0·92	0·32	0·04	0·65
Dalby	1·77	3·37	2·89	0·44	4·77	3·12	1·12	3·59	2·83	1·66	1·11	4·09	0·15
Emerald	0·31	1·08	3·65	4·43	3·25	0·88	1·31	0·63	0·90	1·74	1·11	Nil.	0·09
Esk	1·35	1·80	3·99	3·15	8·36	4·11	1·78	2·45	3·01	3·03	1·72	4·87	1·08
Gatton College ...	4·12	0·47	6·27	1·54	6·73	3·86	1·55	2·93	1·53	3·23	1·06	3·02	0·86
Gayndah	1·84	0·08	1·22	2·10	4·22	3·97	0·97	2·32	2·29	Nil.	1·91	2·39	0·04
Gindie	0·49	1·32	1·57	1·62	2·07	0·44	1·21	0·84	1·34	1·77	1·81	0·53	0·02
Goondiwindi	0·90	0·94	0·59	0·25	3·53	1·82	1·90	1·73	2·30	1·55	0·67	2·83	0·21
Gympie	0·84	0·47	2·57	3·10	18·56	3·89	3·38	2·82	3·40	3·39	1·34	...	1·34
Ipswich	3·93	0·47	2·09	2·88	7·01	3·38	1·43	3·16	0·97	2·47	3·54	3·98	1·17
Laidley	4·55	0·63	4·01	1·58	6·94	3·81	1·47	2·54	2·00	5·32	1·22	3·37	1·10
Maryborough	0·68	1·18	5·03	5·51	11·76	5·58	4·09	2·22	3·07	5·02	1·05	1·54	1·84
Nambour	1·91	2·19	4·25	9·13	18·01	3·33	7·25	3·33	6·80	4·42	0·98	3·89	2·85
Nerang	3·02	2·92	4·26	4·22	14·91	5·12	5·42	5·34	0·79	5·41	0·88	4·57	2·70
Roma	2·20	3·28	1·13	0·11	1·77	1·11	1·11	2·66	2·26	0·98	0·43	0·71	0·54
Stanthorpe	2·17	2·16	1·94	0·80	3·95	2·13	0·77	2·74	1·52	4·22	1·42	2·93	2·22
Taroom	0·45	0·29	1·40	0·10	3·15	1·88	1·70	2·19	2·74	2·34	2·11	0·92	0·42
Tambo	1·87	1·52	0·52	0·51	1·66	2·75	2·85	1·47	0·73	0·74	1·47	0·51	Nil.
Tewantin	0·74	0·95	7·04	14·18	20·33	11·70	12·20	5·45	8·34	4·61	2·71	3·26	1·66
Texas	2·67	3·33	1·29	1·35	4·58	1·46	1·10	1·87	1·00	3·06	1·47	1·47	0·26
Toowoomba	2·42	2·40	3·60	1·76	6·84	6·59	1·04	3·57	2·22	5·57	1·85	4·45	1·10
Warwick	2·01	2·50	2·90	0·26	5·56	2·91	0·82	3·47	1·57	5·74	2·05	3·12	1·19
Westbrook	4·59	1·35	1·88	0·73	4·37	3·38	0·74	3·48	1·64	6·50	1·75	2·27	0·59

CLEMENT L. WRAGGE,
Government Meteorologist.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER (duty free).—Market for colonial, dull. Australian, 106s. to 110s.; Danish, 118s. to 120s.; Canadian, 110s. to 112s.

CHEESE (duty free).—American, 46s. to 47s.; Canadian, 46s. to 47s.; New Zealand, 46s. to 48s.; Australian, 46s. to 48s. per cwt.

SUGAR (duties, raw, 2s. to 3s. 10d.; refined, 4s. 2d. and ¼ per cent.).—Refined, £16 to £17 per ton; German beet, 88 per cent., 7s. 1½d. per cwt.

SYRUPS (duty, 2s. per cwt. and ¼ per cent.).—Finest, 14s. to 17s. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—7s. 6d. to 8s. 8d. per cwt.

RICE (duty free).—Rangoon, £10 to £15; Japan, £13 to £18; Java, £20 to £25; Patna, £18 to £21 per ton; Queensland (Pimpama Island), valued at £18 10s. in the London market.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, small to good middling, 44s. to 100s.; good to finest, 102s. to 125s.; peaberry, 41s. to 102s.; Santos, 31s. to 44s.; Mocha, 75s. to 100s.; Jamaica, finest, 100s. to 120s. per cwt.

ARROWROOT.—St. Vincent, 1½d. to 4½d.; Natal, 5d. to 8d.; Bermuda, 1s. 5d. to 1s. 8d. per lb.

WHEAT.—Australian, white, 30s.; New Zealand, white, 29s. 9d.; Duluth, red, 30s. 6d.; Manitoba, red, 30s. 6d. per 480 lb.

FLOUR.—Australian, £6 18s. per ton, equal to £5 6s. 6d. net return.

MALTING BARLEY.—English, 25s. to 26s.

OATS.—New Zealand, 24s. to 26s. 6d. per 384 lb.; Canadian, 16s. to 28s. per 320 lb.

SPLIT PEAS.—47s. to 55s. per 504 lb.

GINGER (duty free).—Calicut, good medium, 70s. to 72s. 6d.; medium, cut rough, 39s.; small, cut rough, 30s. to 34s.; Japan, rough, 42s. to 42s. 6d.; Jamaica, good bright, 58s. to 66s.; middling to fair, 42s. to 52s. per cwt.

PEPPER.—Capsicums, 15s. to 80s.; chillies, 35s. to 50s. per cwt.

TOBACCO.—American: Thomas H. Edwards and Co., Liverpool, report the following prices:—

STRIPS.	1901.	LEAF.	1901.
WESTERN—		WESTERN—	
Fillers	4½ @ —	Common export	— @ —
Rather short	5¼ ,, 6	African export	— @ 5 @ 6½
Very middling to middling	6¼ ,, 7	Short trade	3½ @ 4
Good to fine	7¼ ,, 8½	Medium to good trade ...	4½ ,, 6
BURLEY	6 @ 8 @ 11	BURLEY	7 @ 7½ @ 8
VIRGINIA DARK—		VIRGINIA DARK—	
Fillers	4¾ @ —	Common export	— @ —
Rather short	5 ,, 6	Short trade	— ,, —
Very middling to middling	6½ ,, 7½	Medium trade	4 ,, 5
Good to fine	8 @ 9 @ —	Good to fine trade	5½ ,, 6
VIRGININA AFD CAROLINA BRIGHT—		VIRGINIA AND CAROLINA BRIGHT—	
Semi-dark	— @ 6½	Common or semi-bright ...	— @ 6
Semi-bright	7 @ 7½ @ —	Medium or mixed	6½ @ 8½ @ —
Medium or mixed	8¼ @ 9½	Good to fine	10 @ 11 @ 15
Good to fine	10 @ 11½ @ 13		

WINE.—Prices remain as quoted last month.

GREEN FRUIT.—Lemons, finest selected, 30s. to 40s. per case of 420; oranges, 13s. to 18s. per 420; bananas, 8s. to 12s. per bunch.

COTTON.—Clean upland, 5½d. per lb.

COTTON SEED.—£7 per ton.

COTTON-SEED OIL CAKE (decorticated).—£4 12s. 6d. to £4 15s. per ton.

COTTON-SEED OIL.—Crude, £21 10s. per ton.

LINSEED.—56s. per 416 lb.

LINSEED OIL.—£31 15s. to £52 per ton.

LINSEED OIL CAKE.—£7 17s. 6d. to £8 2s. 6d. per ton.

MANILA HEMP.—£25 to £30 per ton.

NEW ZEALAND HEMP.—£33 10s. per ton.

WOOL.—At the last London sales prices remained firm.

FROZEN MEAT.—The following are the latest quotations for the various descriptions of frozen meat mentioned (last week's prices being also given for comparison) :—

New Zealand Mutton.

(Crossbred Wethers and Merino Ewes.)

	Dec. 7.	Dec. 14.
Canterbury	$3\frac{1}{2}$d.	$3\frac{3}{4}$d.
Dunedin and Southland	$3\frac{1}{8}$d.	3d.
North Island	$2\frac{7}{8}$d.	$2\frac{13}{16}$d.

Australian Mutton.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$2\frac{1}{2}$d.	$2\frac{1}{2}$d.
Light (under 50 lb.)	$2\frac{1}{2}$d.	$2\frac{5}{8}$d.

River Plate Mutton.

(Crossbred and Merino Wethers.)

Heavy	$2\frac{3}{4}$d.	$2\frac{11}{16}$d.
Light	$2\frac{3}{4}$d.	$2\frac{11}{16}$d.

New Zealand Lambs.

Prime Canterbury (32 lb. to 42 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Fair average	$4\frac{1}{4}$d.	$4\frac{3}{8}$d.

Australian Lambs.

Prime (32 lb. to 40 lb.)	$4\frac{3}{8}$d.	$4\frac{3}{8}$d.
Fair average	$3\frac{3}{4}$d.	4d.

New Zealand Frozen Beef.

(Fair Average Quality.)

Ox, fores (100 lb. to 200 lb.) ...	$2\frac{5}{8}$d.	$2\frac{11}{16}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.

Australian Frozen Beef.

(Fair Average Quality.)

Ox, fores (100 lb. to 200 lb.) ...	$2\frac{1}{8}$d.	$2\frac{1}{8}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$2\frac{7}{8}$d.	$2\frac{7}{8}$d.

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations for New Zealand and Australian lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 12s. to 13s.; Danish, 11s. to 13s. 6d. per 120.

BACON.—Irish, 61s. to 64s.; American, 50s. to 52s.; Canadian, 55s. to 60s. per cwt.

HAMS.—Irish, 94s. to 100s.; American, 52s. to 55s. per cwt.

HIDES.—In fair demand at last quotations.

TALLOW.—Beef, fine, £32 5s.; medium, £29 10s.; mutton, fine, £32 5s.; medium, £29 10s. per ton.

Entomology.

MISCELLANEOUS NOTES.

BY HENRY TRYON, Entomologist.

1. STRAWBERRY—RED SPIDER (*Tetranychus telarius*, [L.] Dugès).

During the last two months it has on more than one occasion been brought under notice that on some farms along the North Coast Railway line the strawberry plants exhibited here and there the following abnormal features:—They had individually given promise of an abundance of fruit, but subsequent to flowering this had not set, or if so had remained small and stunted; and in such cases, where individual fruits had matured, these were undersized and misshapen, and presented one or more shallow surface depressions. Moreover, instead of being of a bright pronounced hue, they were dull, and exhibited to a greater or less extent a greyish cast of colour, suggestive of skin-injury, or even one or more pale-brownish blotches. Further, the sepals at the bases of the fruits were similarly marked in some instances, with brown also. The plants themselves manifested a somewhat stunted growth, and the foliage, except in the case of the older leaves, was to a slight extent mottled, and had a general unhealthy appearance.

These appearances, displayed by a typical example of affected strawberry plant, were found to be occasioned by the common spinning plant mite, commonly spoken of as the Red Spider (*Tetranychus telarius*, Dugès). These mites occurred in all stages of development, from the egg upwards, upon the under surface of the leaves; also on the inner surfaces of the green sepals, especially towards their bases, as well as generally all over the affected plants. In all these situations extremely fine threads—only to be seen by aid of the hand lense—traversed the surface of the plant, being especially noticeable on the surface of affected fruits, in which latter situation they were suggestive of the appearance of fungus-threads (mycelia).

The red spider was not as prevalent, under the circumstances and in the situations mentioned, as in some instances of mite attack displayed by other kinds of plant, but it was individually probably more numerous shortly subsequently to the season of flowering.

It is not likely generally to prove prejudicial to strawberry-growing, except in dry weather. Moreover, it may be readily destroyed by copiously spraying the plants with water as hot as they will tolerate; or dusting them with air-slaked lime and slulphur, or the latter only. It also succumbs to the employment of the fungicides recommended for use as a preventive treatment in dealing with Leaf Blight (*Sphærella fragariæ*), especially sulphide of potassium solution (*vid. Agricultural Journal*, Vol. III., p. 307).

It is also profitable to consider that the red spider is harboured by numerous kinds of weeds and ornamental plants, and that, therefore, strawberry plants may derive their supply from such source.

2. PASSION VINE—SCARLET MITE (*Tenuipalpus sp.*).

Mr. G. Williams forwarded from Rockhampton examples of passion-vine leaves attacked in a peculiar manner by Acari belonging to the genus *Tenuipalpus*. These leaves exhibited the following symptoms of injury:—A light reddish-brown band extended all along their toothed margins, and the principal veins were defined by the same colour. In each case blotches of reddish-brown also occurred here and there along the altered tracks of leaf-tissue. The extreme margins of the leaves were, too, somewhat involute, or turned downwards and inwards, and throughout the channel thus formed, as well as on both sides of the veins, occurred the bright scarlet mites in all stages of development in immense numbers, as well as their similarly-coloured glossy spherical eggs. The species of *Tenuipalpus* are allied to the Red Spiders (*Tetranychus*), but do not spin, as do the latter. A second species occurs in Queensland, commonly upon the lemon. As in the case of the red spiders, they are readily killed by any application containing sulphur, *e.g.*, lime and sulphur wash, Gishurst's compound, flowers of sulphur, sulphide of potassium in solution, or fumigation with bisulphide of carbon in the case of pot plants. As in the case of it, however, they do not succumb to hydrocyanic acid gas, and therefore the cyanide process is ineffectual in destroying them.

Vegetable Pathology.

MISCELLANEOUS NOTES.

By HENRY TRYON, Entomologist.

1. Grape Vine Anthracnose (*Sphaceloma ampelinum*, De Bary) on Isabella Grape Vine (*Vitis labrusca*).

This disease, that is so prevalent in some parts of Queensland on ordinary grape vines (*Vitis vinifera*), is less commonly met with on the varieties that have originated from American species of *Vitis*.

The writer, in announcing the existence of this disease in Australia in 1899 (*vide* "Insect and Fungus Pests," pp. 165-168), stated that it had been already met with in this State upon "American vines," Lindly, Goethe, and Lenoir. During the past month illustrations of its occurrence upon the Isabella vine have been received from E. Smallman, he having obtained them from the vicinity of Brisbane. It may be mentioned also that the winter treatment of this formidable disease, consisting in the application of a strong solution of sulphate of iron, supplemented by the administration of Bordeaux mixture as the summer months proceed, suggested in the abovementioned memoir, has since been generally adopted throughout Australia, and that considerable success attends its employment.

2. Grape Vine—Coulure, Infertility.

During the month of October several instances of the non-setting of the fruit of the grape or of the falling of the berry in the earliest stages of its growth were brought under notice. This affection is commonly designated Coulure, especially by those who derive their inspiration from the voluminous French literature pertaining to the subject of the vine, in which it forms a topic that receives considerable attention. Of the many causes of coulure, the following were illustrated by the specimens submitted:—

(*a*) Defective fertilisation caused by a precocious development of its own pollen that rendered the stigmatic surface of the individual flower inaccessible to the pollen derived from other flowers, whilst it served to cover it with the pollen derived from itself. This incident occasioning infertility was especially noticeable in grapes belonging to the Muscat of Alexandria, a variety of *Vitis vinifera* that is especially liable to the affection under notice—a fact that has served to originate a special form of preventive treatment that recognises the physiological cause underlying its manifestation.

(*b*) Insect injury caused by the attacks on the flower of two different kinds of insects. A small plant-bug (*Nysius vinitor*) puncturing the quite recently formed fruit in quest of its fluid cell contents, and a species of *Thrips* attacking the essential organs of the opening flower. The first-mentioned of these two latter instances of coulure was afforded by specimens received from a North Coast Railway township. The second was yielded by material derived from the Roma district. In both cases the supply of the obnoxious insects was derived from weeds, the *Thrips* being supplied by the florets of grasses flowering in proximity to the vines. Coulure that may rob the bunch of its entire quota of berries is often attributed to uncongenial climatic conditions; but these causes operated in producing it less frequently than is supposed.

General Notes.

GIVING MEDICINE TO ANIMALS.

We heard of a case which occurred last month in Brisbane, where a man started to dose a horse for colic. He made use of an ordinary bottle, which the animal crushed with his teeth, and swallowed several pieces of glass. A veterinary surgeon was then called in, but too late to save the animal. Now, if that man had adopted the simple plan of taking a foot or so of indiarubber or cotton garden-hose, and fitted it on to the neck of the bottle, all danger would be avoided. The horse could neither destroy the hose nor the bottle.

THE SECRET OF LONG LIFE.

The well-known Chicago physician, Dr. D. K. Pearsons, is now eighty years of age, and has announced his intention of living to a hundred. He has given away his entire fortune of £700,000. Quite recently he declined to serve on the Dewey Committee, because it would involve the loss of his after-dinner nap, and possibly interfere with his longevity scheme, which scheme he has condensed in a number of hygienic axioms. A few of them are quoted in the *Physician and Surgeon*:—Most men dig their graves with their teeth. No pies or cakes, pains or aches. Don't get angry, and don't get excited; every time you fret you lose a moment of your life. If you catch a cold, lose your quinine and eat an onion. Give away your money; it's exhilarating, and tends to longevity. I don't drink either tea or coffee; they affect the heart. A vegetable and fruit diet will help a man to remain young; it's better than the fountain of life or the medicinal baths.

HOW TO CLEAN A PAINT BRUSH INSTANTANEOUSLY.

Boiling with a soda solution spoils a brush, besides being a dirty and slow process. A much more suitable method is to use amyl acetate, which has a pleasant smell like fruitdrops. If you pour amyl acetate over a dried-up oil paint brush, the varnish or paint dissolves immediately, and, although ever so hard and dry, the brush is rendered serviceable at once. 2½ lb. of pure amyl acetate cost 2s. To remove the amyl from the brush wash it in alcohol.

RELATIVE FOOD VALUES OF CROPS.

One hundred acres devoted to sheep-rearing will provide food for fifty people. The same amount of land under wheat will feed 250 persons. Under potatoes, 520 people could be fed; whilst, if 100 acres were placed under bananas, 995 people could be kept in health and strength.

TO CLEAN THE HANDS.

Most people in the country districts, whatever their social position may be, often do work and handle tools which blacken the hands, and sometimes stain them so that soap and water have no effect on the skin. To overcome the difficulty, rub them well with spirits of turpentine, and then wipe them thoroughly; next rub in a little olive oil or butter. Wipe that off, and soap and hot water will do the rest. A little benzine in alcohol will clean the nails. Coal tar is easily removed by washing the hands with grease. Keep all the lemon skins; they will remove stains resulting from handling fruit which stains the hands. Pineapples are also good.

TRAINING TOMATOES.

The accompanying illustration shows a very simple and effective way of training tomatoes. The dog legs may be placed at any convenient distance from each other, and either wires or thin saplings may be used to connect them, and to act as a support to the tomato vines.

INDIAN LABOUR IN NATAL.

The demand for indentured Indian labour in Natal is greater now than it has been for thirty-eight years past. The supply is unequal to the demand. During 1899, applications were received for 10,542. Of this number, 3,168 arrived during 1900, and 2,186 completed their indentures, and have gone to swell the large number of free Indians working on their own account as farmers, gardeners, hawkers, &c. Freeholds are granted to British subjects (Indians) from India. Large numbers are the registered owners of coast lands. The total number of Indians in Natal is 61,103.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

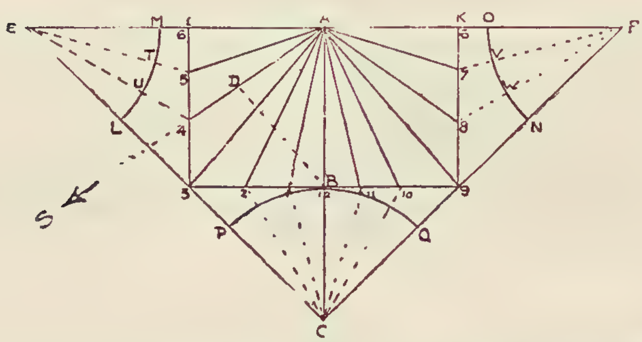
MEASURING STACKS.

FARMER, Yangan.—We have already given several methods of calculating the quantity of hay or wheat in a stack. You will find full directions in the *Journal*, Vol. IV., p. 18, circular and oblong stacks; Vol. VI., page 516, circular stacks; Vol. VII., p. 285, circular stacks; and also in this issue, oblong stacks.

HOW TO MAKE A SUNDIAL.

STUDENT, Rosewood, wants to know how to make a sundial.

Answer.—Why not buy a good clock? A sundial is of no use unless there is always sun to cast a shadow. However, as all scientific knowledge is of value, and to encourage other students, we give the following from the *English Mechanic and World of Science*:—



Draw E F and A C for 6 and 12 o'clock lines, make angle C A S equal to latitude of place, say 57½ degrees. Draw D B at right angles to A S, cutting A C in B. Lay distance D B from B to C, make A E and A F equal to A C. Join E C and F C. Through B draw 3 B 9 parallel with E F. With centre C draw quadrant D B 2, and divide it into six. With centre C through these points, draw C 1, C 2, C 11, C 10. With E and F as centres, draw segments M L and O N, and divide each into three equal parts. Through 3 and 9 draw 3 I and 9 K parallel with A B. From E and F through T U and V W draw E 5, E 4, and F 7, F 8. Lastly, from A draw lines to 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, and these will be the hour lines required.

N.B.—The latitude of Rosewood is about 27 degrees 35 minutes south. The angle which the shadow edge of the stile should make with the plane of the dial should be equal to the latitude at the place, and it should be in the plane of the true meridian, so that the edge is parallel to the earth's axis; this requires that the dial be level and the sides of the stile at right angles to the plane of the dial.

Owing to the sun having a disc of considerable area, the shadow of the stile is not sharply defined, and there is a tendency to read time by the dial fast in the forenoon and slow in the afternoon. For correcting the clock time, therefore, a mean should be taken of a forenoon and afternoon observation if an observation cannot be taken at 12. Write to some mathematical instrument maker, and he will supply you with a dialling scale, which saves a great deal of time and trouble, and is cheap.

PEACH-TREES DYING, &c.

CINTRA JACK.—Black Jack P.C., Charters Towers—

Question 1.—What causes peach-trees to gradually close their leaves, commencing near the main stem to the tips of the branches, when the tree nearly always dies? I could see no sign of white ants.

Mr. H. Tryon, Entomologist, furnishes to questions 1 and 3 as follows:—

Answer 1.—The shedding of the foliage of the peach is occasioned during spring by the curl or blister disease of the leaf, itself caused by the parasitic fungus, *Exosacus deformans;* in autumn by leaf rust (*Puccinia pruni*); and at any time during the summer may result from the presence of root-frequenting gall worms, root-tunnelling weevil-larvæ (*Leptops sp.*, &c.), or constitutional disease, the latter arising from unsuitable soil conditions, either physical or chemical in their nature, and of either transitory or permanent occurrence.

Question 2.—What causes grape vine cuttings to shoot and then die off? I have lost hundreds in this way.

Mr. Rainford, Viticulturist to the Department of Agriculture, says:—

Answer 2.—The causes may be two. One, an unusually dry season whereby the young roots draw insufficient moisture to maintain the leaves; and another, their being planted in badly-drained soil, which causes sickness in the young plant. The former would be an occasional mishap, the latter of constant occurrence. For the first, water till established; for the second, plant in another soil.

Question 3.—Can you tell me how to protect orange and other trees from winter frosts. I lost a number this year, killed down to the ground. Some shot above the graft, some below, and some not at all. This is a dry climate, and I have to water in winter. Is that the cause?

Answer 3.—Methods adopted in Queensland for protecting orange-trees from the prejudicial effects due to frost are as follow:—(1) Burning rubbish during the night on which frost is anticipated along the boundaries of the orchard; the heaps being so situated as will admit of the smoke as generated passing amongst and over the trees. (2) Covering trees with bush hay or placing this or fine brush on a canopy or platform erected over them. (3) Planting lofty shade trees along the eastern border, or, in establishing the orangery, reserving a belt of high timber in this situation. (4) Tile-draining the land. Methods Nos. 2 and 3 have reference to the fact that in Queensland it is not generally the absolute cold that injures the orange-tree, but the too sudden influence of ardent sunshine immediately after it has been subjected to a comparatively low nocturnal temperature. "Freezes," such as are experienced in other parts of the world—did they occur—need be counteracted by still different methods from those specified. Irrigating the soil during the winter months in a dry climate in providing increased evaporation tends to lower the surface temperature, and so also that of the air above it. On the other hand, the vapour passing off tends to render the air less pervious than otherwise to the passage of radiant heat, and so impedes this decrement of temperature. There are additional factors, however, that modify the influence of irrigation on temperature in a dry climate. These vary in their operation with the locality and concern, lie and contour of land, nature of soil, &c.

TO BANISH COCKROACHES.

HOUSEKEEPER, South Brisbane—

Question.—I am greatly troubled with cockroaches, which this summer have invaded all parts of my house. Can you suggest a good remedy?

Answer.—We have the same trouble, and have tried all sorts of remedies without success. Get a few cakes of naphthaline, and put pieces on your shelves and in the safes and cupboards. The people of Jamaica say this will effectually banish them.

TO DESTROY SLUGS (*VAGINULA*).

MARKET GARDENER, Zillmere—

Question.—Will you kindly inform me how to destroy the large brown slugs which every night invade my garden?

Answer.—Mr. Henry Tryon, Entomologist, in an article in this *Journal* on this pest (Vol. V., July, 1899, p. 69), says:—"Amongst deterrents, the use of 'tobacco waste' may especially be recommended. This is composed of the discarded mid-rib or stout, central rib of the leaf after it has been cured, and, at present, may be obtained at the tobacco factories at a mere nominal cost, say about 5s. per load. . . . Lay the waste on the soil round the portion to be protected. When the slugs come in contact with it, they secrete a thin film of transparent mucus from their strap-like feet as if to protect them from injury, but the tobacco waste is fatal to them. You may also make a decoction of tobacco from the waste in this way: Fill a barrel with the stems, and cover with water. Let this stand for twenty-four hours. There will then ensue a slight fermentation. Drain off the water, and boil it down to the strength required. If you want a very strong solution, fill the barrel with fresh stems and fill up with the water already used."

PLOUGHMAN, Torbanlea—

Question.—A few days ago one of my horses appeared to be unwell. I tried to physic him, but he was unable to swallow. When led, he could walk about, but when left alone he would lie down right on his back. He had a curious fashion of turning out his upper lip and breathing heavily through his nostrils. A few hours later he died, and was much swollen in ten hours. The stomach appeared inflamed in places, the lower bowels were full of sour-smelling water. Spleen and liver greenish. Throat full of dark, nearly congealed, blood. In skinning, the small veins appeared to be charged with blood, especially about the throat.

Answer.—Mr. W. H. Quinnell, M.R.C.V.S.L., says that the description points to the animal having died from obstruction of the bowels, probably in the large intestine.

J. K. HUME, Glencoe—

Question.—I and some of my neighbours are troubled about a complaint among our cattle, known locally as "pains." We should feel obliged if you can throw any light on the cause, cure, and name. The symptoms are—great weakness, loss of appetite and condition, evidence of suffering, acute pain, a frightened, haggard look, and a discharge from the nose. Only observed in female cattle of all ages.

Answer.—Mr. W. H. Quinnell, M.R.C.V.S.L., says that from the meagre symptoms given, it is impossible to offer an opinion on this malady.

The Markets.

AVERAGE TOP PRICES FOR NOVEMBER.

Article.		NOVEMBER. Top Prices.		
		£	s.	d.
Bacon	lb.	0	0	7⅛
Bran	ton	3	12	6
Butter, First	lb.	0	0	9⅛
Butter, Second	,,	0	0	7½
Chaff, Mixed	ton	3	5	0
Chaff, Oaten	,,	5	6	3
Chaff, Lucerne	,,	3	2	6
Chaff, Wheaten	,,	3	10	0
Cheese	lb.	0	0	6⅛
Flour	ton	7	10	0
Hay, Oaten	,,	5	0	0
Hay, Lucerne	,,	2	0	0
Honey	lb.	0	0	2
Rice, Japan (Bond)	ton	16	10	0
Maize	bush.	0	2	6⅝
Oats	,,	0	3	1
Pollard	ton	3	12	6
Potatoes	,,	6	0	0
Potatoes, Sweet	,,	2	0	0
Pumpkins	,,	1	10	0
Sugar, White	,,	21	5	0
Sugar, Yellow	,,	18	10	0
Sugar, Ration	,,	15	0	0
Wheat	bush.	0	3	3
Onions	cwt.	0	7	3
Hams	lb.	0	0	9⅜
Eggs	doz.	0	0	7 11/16
Fowls	pair	0	4	0
Geese	,,	0	5	10½
Ducks, English	,,	0	4	6
Ducks, Muscovy	,,	0	5	4½
Turkeys, Hens	,,	0	8	7½
Turkeys, Gobblers	,,	0	19	3

ENOGGERA SALES.

Article.	NOVEMBER. Top Prices.		
	£	s.	d.
Bullocks	8	16	3
Cows	5	16	10½
Wethers, Merino	0	14	8¼
Ewes, Merino	0	12	11¼
Wethers, C.B.	0	14	10½
Ewes, C.B.	0	13	3
Lambs	0	12	6
Baconers			
Porkers	1	9	1½
Slips	0	11	10

Orchard Notes for January.

BY ALBERT H. BENSON.

The Orchard Notes for the month of December apply equally to that of January, especially the remarks anent the handling and marketing of fruit and the treatment of various fruit pests. The fruit of the month is the grape, and growers should take every care to market this fruit properly. The fruit should be cut when dry and cool before the heat of the day, and should be firmly packed in cases of moderate size, as if the grapes are at all tender they are apt to be badly crushed if packed in too large cases. For shipping high-class grapes, such as Black Muscat of Alexandria, White Muscat of Alexandria, Waltham Cross, or even Raisin de Dames, I strongly advise growers to use 5-lb. chip baskets, eight or ten of which go to a crate, as the fruit carries better in them and will reach its destination with the bloom on if well packed and carefully handled. The fruit should be sold in the chip basket, so that the purchaser gets the grapes as packed in the vineyard and without being handled by the retailer. This method of packing grapes is common in California, especially where the fruit has to be shipped long distances; and as our best grapes here come from the Roma and Mitchell districts, and are often more or less damaged in transit, it should be of value to us in that it would enable the fruit to be marketed in a better and fresher condition than is the case at present.

I do not think such chip baskets are obtainable in Queensland, but if not they could be easily introduced, as they are now coming into regular use in Melbourne.

Mangoes will also be ripening in the Southern part of the colony towards the end of the month, and I strongly advise, if any are to be shipped to the Southern colonies, that none be sent unless they are of good quality, as the carrot-flavoured stringy rubbish that has been sent in the past has simply killed the demand for mangoes in the Southern markets, and it will be impossible to open up a trade for our fruit there unless it is of good quality, and this good quality must be maintained. As there is a great deal of uncertainty as to what constitutes a good mango, I may say briefly that a good mango should be fibreless or nearly so, and should have no pronounced unpleasant flavour of carrots or turpentine, but should be either a luscious, high-flavoured fruit or a juicy, good-flavoured, sprightly fruit. Too large mangoes are not an advantage, a round mango of 6 to 8 oz. weight being about the best size and shape for packing and carrying.

I would be glad to receive samples of the fruit and foliage of any mangoes that the grower may consider to be of special merit, with a view to making drawings of and keeping a complete record of same, so that we may have reliable information as to the best varieties of mangoes in the colony, and know which are best to propagate. In addition to sending the fruit and foliage, I would be glad for the grower to supply information respecting the source from which the tree producing the fruit was derived, the nature and habit of growth of the tree, whether it is a good or bad cropper, and the class of soil it is growing in.

During the month see that the orchard is kept well cultivated; and in dry districts, where there is water available, citrus trees should receive a good irrigation. Keep the nursery clean, look after all grafts or spring buds, and see that they are growing clean and straight, and where strong enough head back at the height at which it is desired to form the head of the tree. Budding of all kinds of fruit trees can be done during the month, the only requisites to success being that the buds are fully developed and that the bark of the stock runs freely. For budding use a very sharp knife, and see that you cut your buds thin—*on no account remove the wood from the bud*, as it only makes the operation slower and does no good; in fact, the quicker the budding is done, and the less the inner bark of the bud or stock is exposed, the better will be the take. Always tie your buds firmly, especially so at the base of the bud, as it is there that the union must take place. As soon as the bud has taken properly, the tie should be cut; otherwise they are very apt to cut into and destroy the stock.

Farm and Garden Notes for February.

Farm.—Plough up and prepare the land for the potato crop. This work should be completed before the middle of the month. Plough deep. Get the land into good tilth, and plant small potatoes whole. If large ones are cut and planted, the chances are that many will rot. Where there is a rich deep soil lucerne may be sown, but if weeds abound then defer the sowing until they are got rid of. Sort out the seed potatoes in pit or barn, and plant out any wormy ones at once. On the coast, maize may still be sown, but it will run great risk from early frosts. Under similar conditions panicum, Cape barley, sorghum, vetches, kafir corn, and imphee may be sown. For an early winter crop, sow mangolds and swede turnips. When planting potatoes on poor soils, use bone-dust or short manure.

Kitchen Garden.—During this month dig or plough up all unoccupied ground, and get it ready for the autumn and winter crops, adding well-decomposed manure unless the soil is naturally rich. Leave it exposed in the rough state to the weather, and only harrow or rake such portions as are immediately required for use. Many farmers and gardeners will have cabbages and cauliflowers ready for transplanting. See that the beds are heavily manured and thoroughly tilled. When the transplanting is done, keep a good lookout for the fly, which is almost sure to be troublesome at this time of the year. Force the plants into quick growth by liberal manuring, and spray with one of the mixtures recommended in the *Journal*. Extensive sowings of these vegetables may now be made, as also of Brussels sprouts. Shade the seed beds, and give plenty of water in dry weather. Towards the end of the month make large sowings of swedes. Sow, also, beets, carrots, onions, peas, radish, leek, and lettuce. French beans and the vanity butter beans may now be sown with a good prospect of success. Potatoes may be planted at any time from now to the middle of March. Cucumbers and melons should be in full bearing. Mulch round the plants with a good dressing of long stable manure, as this will keep the fruit clean and free from damp. Pinch back straggling shoots, and remove all fruit as it ripens. Seeds of any selected plant should be gathered, or the pods will become brittle and shed the seed. Eschallots and potato onions may be planted. Keep the cultivator and hoe busy amongst the crops; and when watering is to be done, let it be done thoroughly. Either soak the soil well, or let it alone and depend solely on mulching.

FLOWER GARDEN.—Turn up every square yard of land you intend to utilise during the cool weather. Treat the land liberally with manure. Go on with planting out palms, and all plants which make roots and leaves simultaneously. Bud roses this month, and layer all plants which do best in this way. Geraniums will now strike readily. Put in cuttings where they are intended to remain. Tie up dahlias. Chrysanthemums should be growing vigorously, and should have plenty of water. (See Mr. Soutter's article on chrysanthemums and dahlias in last month's *Journal.*) If aphides attack the tender shoots, dust with tobacco powder or spray with tobacco water or weak kerosene emulsion. This is a good time to plant out camelias, azaleas, &c., as, if planted now, they will be able to make a good start before the cold weather sets in. Towards the end of the month almost all kinds of annuals may be sown for planting in the autumn. Among these may be mentioned snap dragon, daisies, candytuft, cornflowers, marigolds, dianthus, mignonette, phlox, annual chrysanthemums, lupins, sweet peas, &c. Most of these may be sown in the open ground, but it is better to have a seed bed with a light shade over it, and sow the seeds in narrow shallow drills. The ground should be well watered *before* sowing, as many seeds are very small, and are liable to be washed out if water is given after sowing. Soak the bed well over night, and in the morning rake it smooth and sow.

Agriculture.

FIRST STEPS IN AGRICULTURE.

11th Lesson.

SECOND STAGE.

By A.J.B.

In former lessons you have learned much about the soil, about the constitution of plants, about the manner in which they obtain their food, and in a general way you have been introduced to the methods of improving the soil and increasing the yield by the application of manure, by draining, irrigation, &c. We may now go a step higher, still dealing with the same subjects.

Taking the soil first, we will make a few experiments to prove what I have already told you about the constituents—that is, the various ingredients that go to make up a soil. In fact, what follows is a simple lesson on "Analysis."

Let us take a spadeful of soil and weigh it. After weighing, we will expose it to the sun and wind. What will happen? You know, if you take a sponge or a pocket handkerchief and saturate either with water, that it will increase in weight. Now, squeeze out the sponge and the handkerchief and set them in the sun and wind to dry; then weigh them. You, of course, find that they weigh far less than they did when full of water. That is because they have parted with all their moisture by evaporation. The same thing happens with the spadeful of soil. When we dug it up, it held a certain amount of moisture. By exposing it to the sun and air, it parted with much of this moisture, but not with all. You can prove this by putting the soil, after it has been in the sun, into a frying-pan, say in some warm corner, and still more moisture will be given off. Now put the frying-pan over a hot fire; you will notice that sparks appear amongst the soil—in fact, it begins to burn. But I must here tell you that all soils do not show the same results by these heating experiments. You know that rich soils consist of a large amount of organic matter, that clay soils contain scarcely any, and pure sand contains none except what may be mechanically mixed with it. A sandy loam will also contain a certain amount of organic matter. These various soils also differ in the amount of moisture they contain. Well, when you see your soil in the pan emitting sparks, you know that the organic matter (which I told you was called "humus") is what is burning, and this passes off in the shape of steam and carbon, as you already know. But there are other things in the soil which can be dissolved in water. The organic matter cannot be dissolved. If you carefully weigh a portion of soil, and then stir it up in water and allow the mixture to settle until the water is perfectly clear and the soil lies at the bottom of the vessel you mixed it in, you will find when you have poured off the water that it contains something it did not contain before. This you may prove in several ways. One way is by again weighing the soil, which you will find to be lighter than before. But the easiest way is to expose the water to heat until it has all evaporated, and then you will find that there is something left behind, something of a greyish white colour. This is one or, perhaps, a mixture of several salts, such as salt, magnesia, &c., and you can be quite satisfied that these were not contained in the water you mixed the soil in, if you evaporate some of the same water which has not been added to the soil. You will find that it leaves nothing behind it. So you see we have now taken the water, the organic matter, and the salts out of the soil. Now, it is very important that you should remember all this, because, as you are aware, the plants feed on the organic and soluble parts of the soil. By *soluble* parts I mean those that are soluble in water, as you saw in the case of the sugar, alum, and salt which we dissolved during one of our earlier lessons. Those parts that cannot be dissolved in water are called *insoluble*, and these constitute the larger part of every soil, except in the case of some of our scrub soils, which are almost entirely composed of organic matter. The insoluble parts are those which, as I explained, are derived from the crumbling of rocks, by the process called "weathering." Weathering is a term used by geologists to indicate the crumbling of rocks by the action of the atmosphere and of water.

Let us now study more closely the composition of soils. All soils you have long since discovered are originally derived from the solid rocks. I have told you how these rocks are decayed. They furnish the insoluble mineral matter of the soil. If nothing else were added to it, only the very lowest forms of vegetation could find any plant food in it. But these lower forms consist of mosses, lichens, and other humble organisms which botanists describe, and make such an amount of humus by their decay that higher forms of vegetable and also of animal life find a congenial home in it, and these again add still more to the plant food, until, finally, there is a deep rich soil formed which is able to support the higher types of the vegetable world. The islands of the South Seas, which are peopled by many black races, some of whom you see in Queensland working on the sugar plantations, were, many of them, nothing but heaps of coral and sea-sand. There was no vegetation at all. But, by and by, some cocoanuts from other islands came floating along, borne on the currents of the sea, and were left by the side on the beach. Then bits of timber, logs, and seaweed, dead fish, dead birds, and other animals became stranded in the same place, and all these substances gradually decayed and formed "humus." The cocoanuts and other stranded seeds then sprouted and grew, and in course of years they spread over the whole island, and the fallen leaves, trunks, and nuts formed a rich coating of soil over the coral and sand; and thus from a barren island there was formed a fertile one, on which man many years afterwards was able to settle down and get a living from the fruits of the earth.

On such islands lime or, rather, limestone and sand are most abundant, but in older soils clay and also sand are present in the greatest quantity, although a certain amount of limestone is also found with them.

We will now consider the various kinds of soil, but from a higher standpoint than that given you in your early lessons in agriculture.

SAND.—Sand is nothing but finely broken-up stone. Try pouring water on sand. You see that it passes away at once; and if the sand were 20 feet deep, the water would go right through it. On such a soil, if we may call pure sand a soil, nothing can grow—that is to say, no field crops can grow. But there are certain running grasses which derive nearly all their nourishment from the air, which will grow on pure sea-sand, and are most useful in binding it together, and in forming humus for higher forms of plant life. But we are now considering farm soils, and, as a farm soil, sand is valueless, because it cannot furnish plant food. There is, however, one kind of sand which you may have noticed contains shiny glittering particles. These are a mineral called MICA, and such sands are called MICACEOUS. Now, mica, when it has decayed, provides several useful plant foods, such as potash, lime, and iron. Then there is another thing to be said in favour of sand. Although it has no value alone as a soil, yet it is very useful when it is mixed with heavy, stiff, cold soils. It makes them lighter, and when the hot sun shines on such soils its rays warm the sandy particles, and thus the cold soil is also warmed, and is rendered more suitable for producing farm crops.

CLAY.—In a former lesson it was explained to you that when clay forms the subsoil rain water rests on it—it will not pass through it. Such a soil is called *impermeable*. Now, how does clay differ from sand in its composition? You have no doubt seen pieces of white stone called "quartz." This quartz consists of what is called "silica," and sand is a form of silica. Clay, on the other hand, contains other things besides silica, although the purest clay contains only two substances, silica and alumina. Perhaps you have seen bright, golden-looking ornaments in shop windows, and you are told they are made of aluminium. Well, it is from clay that this bright metal is obtained. Now, this pure clay would be quite useless for agricultural purposes, but generally it has been discovered by chemists that clay contains many things which are useful as plant food, such as potassium and magnesium, so that a clay soil may be made to produce crops which would be impossible on a soil consisting of pure sand, notwithstanding its being cold and wet, owing to its retentive nature. It is also valuable on account of its being able to take in and preserve the substances produced by the decomposition of manure.

Another and a very important constituent of the soil is CARBONATE OF LIME, so called because it is a compound of lime with our old friend carbonic acid. Farmers put lime upon the land because it helps to decompose stable manure, and when organic manures are decomposed they add other plant foods to the soil.

Now you see that pure clay and pure sand are of little value to the farmer unless he does something to them by which he can render them fertile. Thus they require more plant food to be added to them in the shape of manure. Clay lands, in addition to this, require to be drained, otherwise the rain water would not be able to get away. It would become stagnant, and the clay soil would remain cold, and all the manure in the world would not help the plants if their roots were resting on the cold, wet bottom. In our next lesson we will endeavour to learn something about manures and about the reasons for manuring.

Questions on Lesson 11.

1. What is meant by the constituents of a soil?
2. Describe an experiment illustrating the fact of water being contained in a soil.
3. Distinguish between a soil of pure sand, of sandy loam, and of clay. How do they differ from each other?
4. How do you find out what soluble constituents are contained in a soil?
5. Name a soluble and an insoluble constituent of a soil.
6. What is the meaning of the term "weathering"?
7. How does a sterile soil like sand become fertile?
8. Give an instance of pure sea-sand developing into great fertility.
9. What is sand? Clay?
10. How does micaceous sand differ from pure sand?
11. What plant food does mica provide?
12. Of what value is sand when mixed with a heavy soil?
13. What is silica? What is alumina?
14. How does pure clay differ from impure clay?
15. What is carbonate of lime? Of what value is it in agriculture?
16. Why do clay lands require to be drained?

12TH LESSON.

SECOND STAGE.

In the first lesson of this book, you learned a little more about soils than I had already told you, and you discovered that some are naturally fertile—for instance, those which contain a large proportion of organic matter, and are thus almost entirely composed of humus, whilst others with a less rich supply are less fertile, such as sandy loams. Then came the least fertile soils, such as the cold, stiff, wet clays, and soils composed of pure sand. There are other classes of soils which I shall not tell you about, because in Australia there is so much good, rich land that the farmers never cultivate them. These are peat soils and marl lands. There are in most countries swampy tracts of land, the soil of which is composed almost entirely of organic matter (or peat), such as the matted roots of plants which have long ago disappeared. Now, a soil which contains too much of any one constituent is always poor, and it requires many things to be done to it to bring it up to fertility.

Marl contains a quantity of lime and clay, and is called "calcareous clay" from the Latin word *calx*, limestone. The principal use of marl is for mixing with very light soils, to make them hold together better, and thus enable them to obtain moisture, which they would not do unless the stiff, clayey marl were added to them.

However, as we do not meet with many such lands in Australia, we need not discuss them here, but will pass on to the subject of manure.

Manure (from the French word "*manœuvrer*," to work by hand), in the old days of farming, was always understood to mean the dung (from the German word *Dünger*) and straw bedding from the stables or the farmyard, and hence it is also called farmyard manure. But now the word is applied to many other substances which are spread on the land to increase the fertility of the soil.

Now, this subject of manures requires that you should have a more advanced knowledge of the requirements of plants than you have gained up to the present. Most crop plants have been carefully examined—ANALYSED is the term used, you remember—by agricultural chemists, in order to find out what they are composed of, and these chemists are able to tell us exactly the elements and the quantities of them which any plant contains, and so enable the farmer to supply just the kind of plant food which is required for his crops.

Plants are made up of organic matter which will burn, and water. They also contain inorganic or mineral matter which will not burn. The former are said to be COMBUSTIBLE, the latter to be INCOMBUSTIBLE. These latter appear as ashes when a plant has been burnt. Now, let us see what the organic portions of the plant are composed of. They are the elements CARBON, NITROGEN, HYDROGEN, and OXYGEN. The inorganic parts are made up of a great many more substances. They are principally minerals, such as LIME, MAGNESIA, POTASH, SODA, OXIDE OF IRON, SILICA, and CHLORINE, besides which we find PHOSPHORIC ACID and SULPHURIC ACID present in them.

You do not, at this stage, require to be reminded that carbonic acid in the air is absorbed by the leaves of the plants, and that the oxygen absorbed with it is separated from the carbonic acid and given out again, and that, by means of the roots, certain constituents, such as nitrogen, phosphoric acid, and potash, are supplied to the plant from the soil. Now, you can easily understand that if you gather no crops, but allow the natural growth to die off and decay, the elements which went to building up that natural plant growth are returned to the soil and to the air, and nothing has been removed. But, when the farmer begins to cultivate the soil and to carry off large crops, you must see that in those crops he takes away a certain quantity of plant food from the soil which is not returned to it naturally. When this occurs, the most fertile soils will gradually lose their fertility, because of the removal of the nitrogen, potash, and phosphoric acid, which have been taken out of them to produce the crop the farmer has removed. It is just the same as if I had a pocketful of money, and kept on parting with some of it. If I did not put more into my pocket, I should, at last, be left with nothing. Or take another illustration. Suppose you make a billyful of tea. At first the tea is good and strong, but you keeping on drinking it, and to make it supply your wants you add water to it, just as you give water to a plant; but if you keep on adding only water your tea gradually gets weaker, until at last you have nothing but hot water left. If you wanted your tea to keep up its strength, you should have added more tea to it. In the same way, if you only give water to a plant and do not supply the other plant food which successive crops have taken out of the soil, the result will be that you will have no crops, because all the plant food they require has become exhausted, and the soil is said to be BARREN, STERILE, or HUNGRY.

In a vast country like Australia there is such a quantity of rich, new land—virgin soil, as it is called—that often it suits the farmer better to plough up new lands than to go to the trouble of refertilising the old land; but where there is a close settlement of farmers such a course would not be practicable. The old land has to be cropped again and again, and therefore the farmer has to resort to some means of restoring the fertility of his land, and this he does in several ways. First, by deep cultivation; secondly, by applying suitable manure; and, thirdly, by irrigation or by artificially supplying any lack of moisture. You have, I daresay, heard of the beautiful farms of Great Britain and France and other European countries. These farms have been cultivated, many of them, for over 1,000 years, and yet they produce to-day far larger crops than they did when William the Conqueror landed in England in 1066 A.D. This wonderful fertility has been kept up during all these years by the help of manure, cultivation, and by the "ROTATION OF CROPS" which I have told you about in previous lessons, and of which we shall again speak later on. But farming nowadays is carried on in a much more scientific manner than it was in the days of our forefathers, and we have to thank the scientific chemist for teaching us how to apply exactly the kinds and quantities of manures required by different plants.

The best method of applying the needful plant food in the shape of manure is one of the most essential studies to which the farmer should devote himself.

You have been told what are the various constituents which go to build up a plant, and that these are supplied from two sources—the air and the soil. If the soil is poor in any one or more of these constituents, that one or more must be put into it by some means, and that means was for a long series of years farmyard manure. We will now further consider manures both natural and artificial.

FARMYARD MANURE consists of the solid and liquid excrement of domestic farm animals, and is usually mixed with the straw or other bedding supplied to the cattle, horses, and pigs when they are housed in byres, stables, and styes. It contains everything that is required by cultivated crops to bring them to perfection. It also has the advantage of containing organic and inorganic compounds which do not all dissolve in the same manner or at the same time, and this is one reason why farmyard manure is better than natural manures like the earth called guano or nitrate of soda, which are obtained in vast quantities from beds on the west coast of South America and in some other countries, as we shall see by and by. The farmyard manure improves the physical condition of the soil, as well as supplying all the plant food demanded by farm crops, because it leaves all that is not immediately required by the first crop sown after it has been applied retained in the soil for the benefit of future crops.

One of the great advantages of supplying plenty of straw bedding to stabled animals is that it soaks up and retains the liquid portion of the excrement which contains the alkaline salts and nitrogenous matter. Thus the urine is by far the most valuable part of the manure. The solid parts contain phosphoric acid, lime, magnesia, and silica, and scarcely any nitrogen The inorganic constituents of farmyard manure are phosphoric acid, oxide of iron, lime, potash, soda, magnesia, chlorine, and carbonic acid. Now, if you look at an analysis of the ashes of a part of a burnt crop, you will see that all these ingredients are present in the ashes. Nitrogenous compounds of different kinds are the organic constituents of farmyard manure, and these, by decomposing, produce ammonia, which is, as you know, a very valuable plant food.

They also produce what is called humic acids, which form humus—that dark-coloured product which I told you of, resulting from the decay of vegetable matter. It is from this that nitrogen is supplied to the crops.

Farmyard manure undergoes great changes by being kept for any length of time. When it is quite fresh, its constituents are not quite so soluble in water as when it has rotted. The consequence is that if the manure, when spread on the land, is not immediately required for some crop, its constituents will be retained (if the manure is fresh) in a stiff soil until the needful changes take place which enable the manure to part with them. If an immediate effect is required to be produced, then well-rotted manure must be used, because those changes mentioned have already taken place in it, and the plant food is at once available.

Now, here is a curious thing connected with farmyard manure, which it is well you should know. You may have seen heaps of manure lying in a field, like a number of great white-ant hills. From what you have just learnt about the constituents of this dung, you might be inclined to think that the rain and wind would carry off most of the valuable elements it contains, but this is not so. Although the constituents of ammonia are present in this "perfect" manure, yet it contains no volatile ammonia—that is, ammonia in such a state as you find it in a scent bottle, from which it rapidly evaporates. Neither fresh nor old manure contains it. So there is nothing for the wind to evaporate except water, whilst, if it rains, the soluble salts are washed into the soil where they are wanted to be. But if you make these small manure heaps in a yard or in a paddock, intending to cart them away some day, you will find that most of their value as a manure is gone, for the salts required for your crop have been washed away by the rain, and have drained away over the yard or across the paddock, and so are lost to you. The loss caused in this manner has been carefully calculated by agricultural chemists, who have prepared tables showing exactly what constituents are lost and how much of each. Some of those tables I intend to give to you in a simple form when we shall have finished our first lesson on manures. For the present I will only tell you that when farmyard manure is left exposed for some, say twelve, months in an open yard, two-thirds of its fertilising matters are lost. Thus, if you exposed 9 tons of manure in this manner, 6 tons would have disappeared in twelve months.

You will now answer the following questions:—

Questions on Lesson 12.

1. Why is a soil which contains too much of any one constituent a poor soil?

2. Define *peat* and *marl*.

3. Of what value is marl in agriculture?

4. What is meant by farmyard manure?

5. Of what is the organic part of plants composed? Name also the substances forming their inorganic parts.

6. What is the object of applying manure to the land?

7. What is one of the most important studies for a farmer?

8. Why is farmyard manure better than any other?

9. What are natural manures? Whence are they obtained?

10. Why is the liquid portion of farmyard manure more valuable as plant food than the solid portion?

11. What are the inorganic constituents of farmyard manure? What the organic?

12. What do these organic compounds produce when decomposed?

13. What kind of manure should be used if an immediate effect is to be produced on the crops?

14. What would be the result if small heaps of manure were left exposed for twelve months in an open yard?

13th Lesson.

SECOND STAGE.

Sometimes on farms, where a large number of horses and dairy cows and pigs is kept, a quantity of farmyard manure accumulates, and perhaps the farmer has so much other work on hand that he has not time to cart it on to the field. What is he to do? The stables and cow houses and piggeries have to be regularly cleaned out, and if he piles it up in an open yard you know he will lose more than half of its value as a manure. So, if he is a sensible man, he will have large pits dug. These pits must be made water-tight by lining them with concrete. This will prevent the drainings from the manure which is stacked in and above them from soaking into the soil. Then, a little way off, there should be underground tanks into which all the drainings are led, and these are occasionally pumped up into the manure heap, through which they again pass, collecting the valuable constituents of the urine as well as many of the soluble solids. The manure heap should be as solid as possible, and should always be kept moist. In the pit, fermentation will soon set in.

Fermentation is a term used by chemists, and is derived from the Latin word *fervere*, to boil, and it is used to indicate the changes which compound organic substances undergo under certain conditions. You would not at present be able to comprehend the exact nature of the various changes to which fermentation renders complex organic bodies liable. It is enough for you to know that it is caused by the action of the oxygen of the air on the manure. If no air were admitted to the heap there would be no fermentation, because the oxygen is necessary to produce it. The oxygen acts on the component parts of the manure, and these soon begin to heat. If you put your hand into a heap of manure which has been lately stacked you will find it is very warm, and, if the fermentation goes on rapidly, much heat will be developed. Now, what does this prove? It proves that the more air which can get into the mass of manure the more rapid will be the fermentation, but if the mass is trampled down solidly, either by the hoof of cattle or by any other means, the air cannot readily reach the interior of the heap, and so the fermentation will go on less rapidly.

During the fermentation, the manure is always losing portions of its elements. Much of the *non-nitrogenous* organic matter passes off in the shape of carbonic acid and water. Other constituents also pass away by drainage (as you have already learnt) and by evaporation. But the mineral matters—potash, lime, silica, soda, &c.—remain behind, provided that the manure heap is covered over, so as to prevent the rain soaking into it, and so dissolving some of these substances and carrying them away in the shape of drainage. I have now told you all that you need know at present about farmyard manure, but, before passing to *natural* and *artificial* manures, I may tell you this: That whilst farmyard manure possesses all the advantages described, still there are many reasons why, in certain cases, the natural or artificial manures would be preferable. It is all very well to apply stable manure to the land, but a large quantity is required, varying, of course, with the nature of the soil and of the crops it is intended to grow. But I will suppose, in order to give you some idea of the quantities required, that a turnip crop is to be sown on a sandy clay; 10 or 12 tons or even 15 tons of farmyard manure are required per acre. See what a quantity would be required for a 20-acre field—from 200 to 300 tons; and even then a careful farmer would add to this about 400 cwt. of artificial manure per acre.

Now, as two-thirds of farmyard manure is composed only of water, just consider what great quantities of a substance are carted on to the field which are practically useless, the fertilising matter bearing such a small proportion (one-third) to the bulk of the manure. Sometimes manure is scarce, at others plentiful. In the first place, it will be found to be too dear to use to any extent, because the resulting crop would probably not pay for the increased cost of fertilising it. So modern farmers have found it to their advantage to use *artificial* manures. I use the term artificial, although it is not strictly correct, for, as I explained to you before, there are some valuable manures which are found in a natural state, and are used in that natural state. These are GUANO, NITRATE OF SODA, KAINIT, SALT, GYPSUM, &c. Other manures are manufactured from various substances. But it is the custom to merely distinguish the two classes of fertilisers as FARMYARD manure and ARTIFICIAL manures. We will, therefore, consider all manures which do not consist of dung as artificial.

Now, before going further, we will sum up in a short way the contents of this lesson, so that you may the more easily answer the questions I shall shortly give you.

You were first shown how the farmer disposes of the manure from his outhouses and yards when he has no time to cart it on to the fields. Next I explained to you how proper dung pits should be made, and why it is necessary to make tanks to receive the drainage from the pits. It was then shown how the action of oxgen on the manure heap caused fermentation to set up, and how this fermentation could be controlled so that it would proceed rapidly or slowly. The constituents lost in the process of fermentation and by evaporation. and the constituents contained in the manure, you also heard about. Finally, I told you that artificial manures are for several reasons preferred by farmers to farmyard manure alone.

We will now discuss the natural and artificial manures separately, for you will find there is much to learn about them. Now, what are the constituents of the soil which are the first to become exhausted by successive cropping? They are POTASH, NITROGEN, PHOSPHORIC ACID, and LIME, and it is to supply the loss of these constituents, as well as to bring into activity the dormant sources of fertility which are still in the soil, that artificial manures are applied. But you must remember that, whilst farmyard manure improves the condition of the soil, these artificial manures do not do so. They supply the needful plant food, and merely *assist* to keep the soil in proper condition, but do not make the soil fertile. The great advantage of their use is that they furnish a quantity of plant food in very small bulk, and thus save great expense in labour and carriage. Some of them contain only one fertilising ingredient, and these, therefore, are distinguished as NITROGENOUS, of which class Peruvian Guano is an example: PHOSPHATIC, as Superphosphates, Phosphate of Lime, Basic Slag, &c.; and POTASH MANURES, as exemplified by Kainit and Muriate and Sulphate of Potash.

All these have their own special uses, and some, when mixed in certain proportions, are termed PERFECT OR COMPLETE FERTILISERS.

Some act very readily, such as Guano and Nitrate of Soda. They are very active stimulants, and have to be used with great care, and generally in conjunction with other manures.

Amongst the nitrogenous manures we will discuss Peruvian Guano.

The value of this natural manure consists in the Ammonia, Phosphoric Acid, and Potash it contains. It is supposed to be the excrement of birds accumulated during a long series of years in a climate where there is no rain to wash away the soluble salts it contains. I may tell you that I have visited the guano islands of Peru, named the Chincha Islands. When I was there, three large islands were covered with solid guano to a depth of from 50 to 250 feet. The labourers have often to use powder to blast it out. It contains immense quantities of Carbonate of Ammonia, and the sailors pick out large lumps of this and take it home with them. There is very little left there now, but guano is obtained from the main land of Peru, and on some islands on the coasts of New Zealand, and parts of Australia. The Chincha Island guano used to be very rich in ammonia—as much as 18 per cent.; but of late years it barely has contained half as much, sometimes only 4 per cent. It should always be used mixed with some soil, or injury would result to seeds and plants if it were used pure.

Sometimes sulphuric acid is applied to guano. This has the effect of making the phosphate it contains soluble, and also of fixing that volatile gentleman I mentioned to you by the name of Ammonia.

In our next lesson I will describe the rest of the artificial manures.

Questions on Lesson 13.

1. In what manner should farmyard manure be stored?
2. What is the meaning of the word "fermentation"?
3. What takes place in the manure pit when fermentation begins?
4. How can fermentation be controlled?
5. What ingredients pass away from the manure during fermentation? What ingredients remain behind?
6. Why are artificial manures preferred by farmers to farmyard manure?
7. What quantity of farmyard manure should be applied per acre to a crop of turnips?
8. What proportion of farmyard manure is water?
9. Are *all* the manures outside farmyard manure really artificial?
10. What plant foods become first exhausted from the soil?
11. How do artificial manures differ from farmyard manures in their action on the soil?
12. Name the artificial manures which contain only one ingredient of plant food.
13. Whence do we obtain guano? What is guano?
14. What percentage of ammonia is contained in the best guano? In the poorest?
15. Why should guano not be used by itself?

GROWING MANGEL WURZEL.

By C. ROSS, Manager, Westbrook State Farm.

It may not be out of place to offer a few remarks on growing mangels, as the season will soon be round to prepare the land for such crops. Growing root crops of all kinds will, doubtless, very soon be recognised as one of the most important concerns of dairy and other farmers.

The Mangel Wurzel (*Beta vulgaris*, var. *mantina*) delights in a deep, strong soil, but will return a handsome yield from any ordinary farm land. This crop is often used as a corrective for very stiff, heavy clays, which are strongly impregnated with saline ingredients—sodium, chlorine, magnesia, and the like—where scarcely anything else will grow, with such good results as to indicate the use of common salt as a fertiliser being indispensable. If manure is used at all (and it will always pay to do so, especially on worn-out land), I can recommend the following as a perfect dressing :—Ten loads of farmyard manure, 2 cwt. superphosphate, $\frac{3}{4}$ cwt. kainit, and 1 cwt. or more of salt; the two latter applied as top dressings to the growing plants, and horse-hoed in. If on very light soils, deficient in lime, Thomas's Phosphate (basic slag), in conjunction with superphosphate and station slaughter-house refuse, where much salting is done, will give excellent results. Mangel is a very good succession on any kind of straw or stalk stubble. The land should be ploughed early so as to allow the surface soil to become thoroughly disintegrated by August, when it should be deeply harrowed to form a good bed of free mould; it will so retain more moisture, and the seed will not be so dependent on rain. I usually allow 30 inches between the drills when sowing. The distance from plant to plant may be regulated according to the variety and the size of roots required. A distance of 15 or 20 inches, I think, averages the best results, but if very large roots are wanted they should be thinned out to 30 inches. The quantity of seed per acre varies according to the condition of the seed bed and time of sowing. If conditions are favourable, 8 lb. of seed is quite sufficient, but for early or very late sowings heavier seeding is to be commended, because it is easier and less expensive to hoe out a thick crop than to patch up a thin one. When the plants are up and into their first and second rough leaf—*i.e.*, past the cotyledon stage—they must be thinned out with the hand hoe. This operation will probably have to be partly done by the hand. The seeds being contained in a rough, hard capsule which cannot be separated, it frequently occurs that two or more plants grow up together and must in consequence be singled out by the fingers. All the after cultivation required consists of horse-hoeing, and the oftener this can be performed the better will be the result.

For the information of those who have never grown mangels, I may state that on the Hermitage Experimental Farms, on heavy stiff clay, without the aid of any fertiliser, I have grown over 50 tons to the acre; and at Dalveen, on a very light soil, up to 40 tons per acre. I have no hesitation in saying that nearly double this weight can be produced under favourable conditions. From the many varieties I have grown, I recommend the following. The main object is to go to a reliable seedsman, and get the best possible strain of whichever variety you intend sowing; don't buy job lots or seed saved from your neighbour's garden varieties:—

Long Mammoth Red.—Best for deep strong lands; very large roots; heavy cropper.

Yellow Globe.—More suitable for light shallow soils; a large round bulb, sits well on the surface of the ground; heavy cropper.

Golden Tankard.—Fine oval shape; not so large as the above, and might be left a little closer in the drills; the richest in saccharine.

I shall be glad to furnish any further particulars to those who desire them.

GROWING MANGELS.

The accompanying photographs are illustrative of experiments in mangel, beet, and turnip growing at Biggenden State Farm.

The varieties experimented with were Champion Yellow Globe, Long Yellow, Red Globe, and Long Red. Previous to sowing the seed, the land was well cultivated, although no special preparation was given. During the first week in March, the seed was sown in rows 3 feet apart, by means of the Planet Jr. The seed was drilled at the rate of about 4 lb. per acre. The young plants were thinned out by the hoe to a distance of 15 inches apart. This was found to be too close—an increase to 18 inches would have answered better. No manure was applied to the crops. The spaces between the rows were gone through on three occasions with the Planet Jr. horse-hoe. The crop took about seven months to mature. Part was then taken up and stored in a shallow pit, and part used for pigs and horses as required. The remainder was harvested in November. Those stored in the pit were recently taken out, and found to be in excellent condition. Those left on the field also kept well, only one or two of the Long Yellow variety showing signs of rotting. The plan of taking the roots up when reaching maturity is to be recommended, as, when covered up in a shallow pit, they remain quite hard, and, if anything, improve in condition.

Although the area planted was not large enough to give an accurate estimate as to the weight per acre, still, says the manager of the farm, Mr. G. B. Brookes, sufficient was grown to show that, given an ordinary season, enormous quantities of mangels could be grown as feed for dairy stock, pigs, &c. In the Long Red variety roots weighing from 25 lb. to 30 lb. were quite common, whilst some went as high as 35 lb. in weight.

Plate X.

I

II.

III.

BEETS, MANGOLDS, AND TURNIPS, GROWN AT BIGGENDEN STATE FARM.

The Long Yellow variety came next with roots weighing from 20 lb. to 25 lb.; next, the Red Globe, 18 lb. to 22 lb.; and last, the Yellow Globe, 15 lb. to 20 lb.

As an experiment, a small area was planted out from plants raised in a germinating bed. They rooted readily, and when grown no difference in size was noticeable between them and those raised from seed sown direct in the row.

The fact that they will transplant readily is worth knowing, as the young plants can be raised while the land is being prepared for the crop. A saving in seed is also effected, no after thinning out being required; neither has any hand-weeding to be carried out on the land during the time the seeds are germinating. On the other hand, it would be useless to attempt to transplant unless the ground is in a moist condition.

There is no better preventive of "lampas" in horses than a few whole mangels or swedes. Mr. Brookes also sends photos. of beets, kohl rabi, &c., produced on Biggenden State Farm, which are here shown.

THE LITTLE IRON COWPEA.

We have not heard of any pests attacking the roots of the cowpea in Queensland, but pests are so easily introduced and thrive so well in this grand climate that it is well to be prepared for anything that may happen in that way. In South Carolina tiny little worms in countless numbers attack the roots of the plants, causing them to languish and die. The United States Agricultural Department, seeing that there was danger almost of extermination of this useful forage and green fertiliser crop, made a series of experiments with a view to finding a resistant strain of cowpea. To this end some seventy-five varieties of cowpea were sown on the worst infested land of South Carolina. Of these, seventy-four withered and died; one only, the Little Iron Cowpea, flourishing, immune to the attacks of the worms. Next year the Department hopes to have plenty of seed; and advises all farmers to try it whenever they can get the seed, even although all the local strains of this variety have not yet been proved to be immune. The Department is making similar tests with other plants subject to root-worm disease. It has been found that in nearly all families of plants there are certain individuals in an infested crop which escape attack, so that by saving the seeds of these, sowing them and saving the seeds again of those that survive, an immune variety is at length produced. The Little Iron Cowpea is rather rare in the United States, but seed will soon, it is hoped, be plentiful.

AGRICULTURE ON THE GOLD COAST.

In the beginning of the eighteenth century, the enterprising Dutch had trading settlements on the famous Gold Coast in West Africa. Readers of the history of trade of that period and the previous century are familiar with the rise and progress of the infamous slave trade then considered a quite legitimate business. Large fortunes were made by owners of slaving vessels, and thousands of unhappy natives were slaughtered by the traders. There is a very old book which was published in 1665, entitled "The Golden Coast or a Description of Guinney together with a relation of such Persons as got Wonderful Estates by their Trade thither." Putting aside the exaggerations which were common to most seafaring adventurers of the time, the book contains much that is interesting concerning this, the most unhealthy of all British possessions. Its coast line extends for 225 miles, and, since the Ashantee war, it stretches far into the interior. The British bought out the Danes in 1851 and the Dutch in 1871, and since then has set in an era of prosperity of which few in this country have the remotest idea.

The land is marvellously fertile owing to the great amount of moisture in the atmosphere. The coasts are lined with lagoons and swamps over which broods a deadly miasma, and the very base rock of the country—granite with iron ore and hornblende—gives off large quantities of foul-smelling sulphuretted hydrogen. The vegetation is marvellous; and now that the British are civilising the natives and teaching them the proper methods of agriculture, the exports of various products which, in 1876, reached £465,268, by this time total up to £1,000,000.

We are induced to give this slight outline of the country in consequence of having been favoured with the Annual Report upon the Botanical Department of the Gold Coast Colony for the year 1900, by Mr. W. H. Johnson, the Curator of the Gardens, addressed to the Colonial Secretary at Victoriaborg, Accra.

From this report we make the following extracts for the benefit of our young readers who may think the Gold Coast to be still the haunt of the slave brig and pirate schooner. To them it will no doubt seem funny that there should be in the gardens 31,000 economic plants in pots and 23,000 in nursery beds for distribution. To read the names of the recipients is also a revelation. Thus plants were sent to King Mate Kole, Chiefs Odonkor, Nyako, and Kwadjo Dech, Kings Akuffo, Akrobetto, and Kwadjo Wayo, &c. These and other native chiefs send their sons to Aburi to be trained in agricultural work. What do our farmers' lads think of an agricultural college tenanted by the sons of men who not fifty years ago indulged in awful human sacrifices and revelled in bloodshed and cruelty? The curator in his report states that requests for advice on agricultural subjects are very numerous, the chiefs often writing their applications. All requests from native planters are promptly attended to, and Mr. Johnson travels round the country, just as does our Queensland Agricultural Adviser, meeting the planters and advising them what to do.

During the last year he visited thirteen of the kings and chiefs, men ruling over territories of which a single village will contain from 4,000 to 10,000 inhabitants. These he induced to form plantations of kola and rubber, supplying them with the necessary plants from Aburi. He also instructed them fully in the planting operations. Over 6,000 plants were distributed on this occasion, and many other chiefs are about to form plantations.

Cocoa is now extensively planted in various districts. From the gardens alone 22,500 pods of cocoa were sold. Coffee is also grown, but the low price obtainable militates against much extension of the plantations. Coffee grown by native planters and sold in London in 1900 realised 40s. per cwt. in bond. The duty being 1½d. per lb. and ¼ per cent., the Gold Coast coffee would fetch somewhere about 55s. per cwt., or a little under 6d. per lb. One would be inclined to think that, with the swarms of native labour available, a planter—certainly a native king planter—could afford to raise coffee and sell it at 2d. per lb. Cocoa from the colony was sold in London as high as 71s. 6d. per cwt. in bond.

There is a great future before the Gold Coast Colony in the way of agriculture, seeing that the most valuable products of the soil can be successfully grown, that labour is cheap and plentiful, and that the British officials are alive to the value of education for the natives, as the extracts we take from the report will show.

Mr. Johnson made certain proposals to His Excellency the Governor, some of which were:—

(*a*) The Curator of the Botanical Station to draw up simple instructions for the planting and general work of a farm, these instructions to include general directions as to methods of planting, the requirements in the way of soil, climate, and cultivation of different plants, and, generally, the information necessary to enable school farms to be conducted in a methodical manner.

(*b*) The Curator to distribute to schools plants that can be furnished from the Botanical Station.

(*c*) Every boys' school to have attached to it a piece of land, and four hours a week to be devoted to its cultivation. The area of the land to be 3 acres to every twenty-five boys attending the school, on an average; the ground to be planted with cocoa, coffee, rubber, fibre, &c., with native food crops between the rows. The master of each school to keep a diary of the work done each week.

* * * * * *

(*e*) An annual prize to be offered to boys of the school which has the best farm in any district.

(*f*) A course of instruction both practical and theoretical for teachers to be instituted at the Botanical Station, and the Missionary Societies to be invited to send teachers to go through this course. Teachers who have qualified in this manner to receive 10 per cent. of the grant given to their schools for agricultural work.

(*g*) A certain number of schools to be selected for meteorological observatories and to be furnished with rain gauges, the observation to be recorded by the schoolmasters, and to be communicated to the Curator of the Botanical Station.

His Excellency's minute attached to the paper was—

"I concur in recommendations (*a*) and (*b*), and I wish the Acting Curator to give effect to them with the least possible delay. Application for plants should be made by the Director of Eduction for the schools which it is decided, in the manner suggested below, should have farms."

Mr. Johnson concludes his very interesting report with a few words on the teaching of agriculture in the Gold Coast schools. He says:—"It appears to me that the agricultural industries of the colony might be materially improved and extended by causing the elements of agriculture to be taught as a specific subject in the assisted schools, and encouraging the formation of plantations worked in a systematic manner by the pupils. The advantages accruing from work of this kind, inculcated upon the young minds, would no doubt encourage some of them to take up planting as a means of earning a livelihood. At the present time the lads upon leaving school seem possessed of one ambition—viz., to become clerks; but, as the supply exceeds the demand, numbers become mere loafers. Plantations, of a kind, already exist in connection with some of the schools, in which the grant offered by the Government for industrial work is earned by the scholars., My various tours this year afforded me opportunities for visiting a number of these plantations, and I must confess the efforts were in most cases very futile, the system of work poor, and the crops meagre; yet I learn, from a list kindly furnished me by the Director of Education, that the grants earned by these schools varied from 25s. to £42 in 1899. It is very evident that unless the teachers are themselves instructed they cannot instruct their pupils. In some of the West Indian Islands the school teachers are given lectures and practical instruction in agriculture, and I feel convinced that if some such scheme was introduced into this colony the school plantations might be converted into useful training grounds for the scholars and serve as object lessons to planters."

DROUGHT-RESISTING MACARONI WHEAT.

The United States Department of Agriculture has just announced one of the most valuable discoveries of recent years. It is the introduction of the drought-resisting macaroni wheat, imported from the Volga region of East Russia. This wheat is adapted to semi-arid districts, and can be profitably grown in the great plain regions of the United States far beyond the one hundredth meridian. Already great results have been obtained, the yield in South Dakota being at the rate of from 35 to 40 bushels per acre, which is one-third more per acre than the average yield of the regular wheat from this section. Macaroni wheat differs radically from the ordinary bread wheats. The grain is much harder, and in the best varieties contains an unusual amount of starch. The quantity and quality of the gluten make it exceedingly valuable for making macaroni.

There is no doubt that such wheat as described above would prove a great boon to wheatgrowers in the Central districts, where the rainfall cannot always be depended upon to occur at the right time, provided that there were a certain market for it. Russia and the United States could probably furnish the demands of the world for this class of wheat.

RED WHEATS.

Wheat exporters to the British markets know that white wheat is not so valuable as red by from 1s. to 2s. per quarter. Why is this? It is explained by an American farmer, who says that the former wheats have a thick bran, are of a fibrous nature, and do not yield so much flour as red by 15 to 20 per cent. The flour, moreover, is of an inferior quality as regards colour, strength, and flavour. It is also a fallacy to think that white wheat yields more per acre than red wheat. The very opposite is the case. If farmers would drill good red wheat of, say, the "square head" and leave alone those fancy "stand up" kinds, they would certainly find it more profitable. We should like to have a Queensland farmer's opinion on the subject.

THE DIFFERENCE BETWEEN BUNT AND SMUT.

In the course of a report on the grain experiments carried out at the Cheshire County Council's Agricultural and Horticultural School, Holmes Chapel, during the year 1901, Mr. Edric Druce, M.R.A.C., remarks that there is a certain amount of confusion between bunt and smut, and he therefore gives a brief description of both diseases, which we reproduce:—

Bunt (*Tilletia caries*), locally known as "Smut," is a fungoid disease, which attacks wheat and barley, but seldom oats and rye. Its effects are not seen till harvest time, when it is found that apparently healthy ears of corn contain only grain filled with a greasy, foul-smelling mass of black spores. The only outward difference between a healthy and a diseased grain is that the affected grain is plumper and generally darker in colour than the healthy grain. The presence of bunted grains in a sample of wheat greatly deteriorates the quality, as it blackens the whole bulk, and the flour from such can only be used for inferior purposes.

Smut (*Ustilago carbo*), locally known as "Black Strike," is also a fungoid disease, which attacks wheat, oats, barley, rye, and some grasses. The disease appears in June and July, when it is seen that certain ears of corn are covered with a dark powder. If such ears are examined it will be noticed that the floral organs and their coverings are destroyed and replaced by a mass of dark chocolate-coloured powder, which consists of innumerable spores. The spores of the disease become blown away before harvest time, and many of them settle on the healthy grains and remain there till seed time, when the disease is again produced. The result of smut in grain is a greatly diminished yield.

Both bunt and smut are reproduced year after year by the very minute spores adhering to the grains of corn, and these grow along with the seed when it is sown. The result of pickling is that it leaves a film of copper sulphate on the seed, which destroys the spores when they begin to grow. The mode of pickling or steeping seed with copper sulphate is as follows :—The solution is mixed at the rate of 1 lb. of copper sulphate dissolved in 1 gallon of water ; this will steep 4 bushels of wheat. The grain is then spread out on a smooth floor, and the solution poured over it ; the grain is afterwards turned over once or twice with a shovel and left spread out thinly until sufficiently dry to sow.

BARLEY-GROWING.

For several years experiments have been carried out at Wye Agricultural College (England), with the object of improving the quality of barley; and last November, Professer Hall, principal of the college, delivered a most interesting lecture on the subject of barley-growing, much of which may be read with profit by Queensland barley-growers. "The brewers," said the professor, "contended they could not do without substitutes, as there was not sufficient good barley. If they used English barley they must use sugar. He was not going to discuss that point ; but he thought there was no doubt that the barley was not quite what the brewers required. The question, therefore, was whether they could not improve the barley to meet the requirements of the brewers, who would, no doubt, give a good price for it. A bag of barley was chiefly a bag of starch with albumenoids or flesh-forming substance. It was starch the brewer wanted—starch to turn first into sugar and then into alcohol. The albumenoids got into the beer, and the result was it would not keep so long or be as bright or good. From a chemical point of view, the brewers wanted barley composed mostly of starch and with little albumenoids. The brewers liked to see barley round and plump, with a thin wrinkled skin, for that contained most starch.

"The long thin barley with a thick skin should not contain so much starch. They wanted also a bright-coloured barley. They would find that at the Brewers' Exhibition almost all the prizes for barley were taken by the 'Chevalier' type. The 'Goldthorpe' and one or two other sorts were good on certain land, but it was the 'Chevalier' kind that was prized mostly by the brewers. There was the question of kiln-drying the barley before it was sold, and the maltster claimed that this improved it, inasmuch as it all germinated at one time. It had been tried at Wye, but had not been found to answer well. Probably this was because the harvest had been done under favourable conditions, but perhaps when they got damper seasons the kiln-drying would prove to be satisfactory, and the opinion of those who had tried it justified. To grow malting barley, one wanted to sow thickly to stop 'tillering,' if aiming at quality.

"The next question was the time to sow. Putting the present year out of the question, the best barley produced was sown in February (March to May in Queensland.—Ed. *Q. A. J.*), and those sown later rarely got the prizes. This year was an exceptional one, for the barley that secured the gold medal was sown on 26th April. To get a crop for malting they must sow early to give the seed time to grow, for this kind of barley needed every day possible before harvest. Then in sowing early there was the question of 'tills.' The usual style, in nine cases out of ten, was to grow barley after roots. But by the records of the Brewers' Exhibition they would find that the crop was not so good. The reason for this was that the ground was too rich, and the defect was that there was too much growth. After a root crop had been fed off there was too much manure, and of the wrong sort, and a further reason was that after being fed off the ground was not left in that even condition required.

"They found that the best barley, that most suitable for malting, was that obtained after a straw crop. This could not be done on all lands, for the ground was not strong enough, and manure would be wanted. After roots they found that there were insufficient phosphates, and in their experiments they had fed the land with superphosphates to bring the manures more in proportion. The result showed there was a better crop, and an increased price of from 2s. to 6s. was obtained. This was the result of several years of experimenting, and he felt justified in recommending it. Analysing the gold medal barley, it was found to contain nearly 63 per cent. of starch and $1\frac{1}{4}$ per cent. of nitrogen; while the second prize barley contained 62 per cent. of starch and $1\frac{1}{10}$ per cent. of nitrogen. The average of twenty-one samples of barley grown in 1899 showed an average percentage of under 58 of starch and 1·55 of nitrogen. They found also that the superphosphates put the starch up and the nitrogen down. They had tried salt also, but the quality was worse, and the colour also, though a little more was grown. He was speaking on the question as a chemist and not as a farmer of barley. As the result of his experiments for five years, he came to the conclusion that his advice was sound, for the experiments had been tried on a large and also a small scale, and in several seasons. Nitrogen gave quantity, but did not give quality."

PLOUGHING MATCHES.

Ploughing matches are an established and favourite institution in Queensland, and it comes with rather a shock to read an English farmer's opinion of such matches. Writing to an English journal which had published an article entitled "Why should the ploughing match be considered an institution of the past?" he replied: "Because it serves no useful purpose. The principal requisites for taking a prize at a ploughing match were—that the furrow should be absolutely straight, that the furrow slice should be quite unbroken with a sharp crest, and that it should be absolutely rectangular and of the same dimensions throughout, and when lifted out it should leave the bottom of the furrow smooth and level. These are some of the points on which the judges award the prize.

"Now, the farmer being the man that usually finds the money, I ask, are these the points he wants when he sets his man to plough a field for wheat or for barley? I think not. The requisites of good ploughing are (1) that the furrow slice shall be inverted in such a way as to bury all rubbish, and to leave as large a surface as possible exposed to the weather; (2) that this surface shall be in such a state as to harrow down with as little labour as possible without again exposing the buried rubbish; (3) that there shall be as little shine on the bottom of the furrow as possible, so as to prevent the formation of a pan, and to allow the capillary action between the furrow slice and the subsoil to establish itself as quickly as possible; and last, but not least, that as much as possible should be done in a day.

"Very few people realise that the ploughing should vary according to what it is required for. In ploughing a clover stubble on which to broadcast wheat we want our furrow slices as sharp on the edge, as upright, and as closely pressed together as possible, but if we are going to drill the wheat we want the furrow slice with a broken edge, so that one stroke of the harrow will make a tilth; flat, so that the harrows will not turn them over when harrowed across, and loosely pressed so as to avoid shine.

"How many men out of a hundred could so alter a plough as to make it produce furrow slices showing these differences at will? There are, indeed, very few ploughs on the market sufficiently adjustable to produce both these effects easily, but there are many with a considerable amount of adjustment.

"The schedule of a ploughing match which read something like the following would be of considerable interest to farmers:—

(1) To the man who shall set out the cleanest and straightest ridge in the shortest time.

(2) To the man who shall plough in the most workmanlike manner twenty furrows, leaving ten of them in the best condition for broadcasting wheat, and ten of them in the best condition for drilling barley. The time taken and the amount of ground ploughed will be taken into consideration."

REPORT ON WORK, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1901.

Farm.—The following harvesting operations have been carried out during the month:—32 acres of wheat have been cut and carted to shed; 34 acres of barley cut and housed; 67 acres of lucerne cut, cured, and placed in shed; 9 acres of *Paspalum dilatatum* grass have also been cut with reaper and binder, and saved for seed. An area of 37 acres, on the Tarampa road, has been ploughed in readiness for planting, as has also the land formerly under malting barley (17½ acres); 6 acres of potatoes in the garden paddock have been harvested. The total rainfall for the month has been ·86 inch, of which ·29 fell 7th November, and ·53 18th November.

Garden.—The orchards and vineyards, both on the hill and creek, have been thoroughly cultivated and cleaned, and are now quite free from weeds. There will be fairly good crops of peaches and plums, and a very large crop of figs. In the vegetable garden, a large amount of weeding and watering has been done, and the following crops planted:—Melons (water and rock); also marrows, cucumbers, and squashes; these are making good progress in spite of the dry weather. Several rows of butter, French, and Lima beans have also been planted. The tomatoes have been staked and trained, and are doing well.

Dairy.—During the month 1,245 gallons of milk were converted into butter for a yield of 507 lb., and 788 gallons gave a return of 821 lb. of cheese; 502 gallons were supplied to the dining-hall, and 201 gallons fed to calves. The increase of pure dairy stock was as follows:—3 purebred Ayrshires—2 males, 1 female; 1 purebred Jersey, female; 1 purebred Shorthorn, male; 1 Jersey bull calf died. The dairy cattle were fed on natural pasture throughout the month.

Piggery.—The increase during the month was as follows:—17 Middle Yorkshires—9 boars, 8 gilts; 24 Berkshires—9 boars, 15 gilts. We sold during the month to various purchasers:—6 Berkshire boars, 4 sows, 3 Middle Yorkshire boars, 1 Tamworth sow.

Poultry.—All the new poultry-houses are now completed and in use. The increase for the month included 50 chickens, including Dorkings, White and Silver Wyandottes, Black and Buff Orpingtons, Brown and White Leghorns, and Black Spanish. The new incubator works satisfactorily, and will prove a great acquisition. Considering the time of year, the poultry are laying well.

Mechanical Department.—The poultry houses and yards have been completed, the work being carried out by the students, under the charge of the Mechanical Instructor. One large paddock has been subdivided into several for use as pig paddocks. Repairs have been executed at the stables, and bee frames and other requisites made. The men's quarters have been painted. In the smithy a large amount of work has been done: farm machinery and implements have been repaired, mountings made and fitted on swingle-bars, and a number of horses shod.

DECEMBER, 1901.

Farm.—Fifteen acres of oaten hay were cut and carted to the shed. This area, together with the land formerly under maize, as well as that from which barley and wheat crops were lately removed, has been ploughed and cross-ploughed, making in all about 100 acres in good tilth, after repeated ploughings, ready to be planted on the breakup of the drought. The remainder of the lucerne crop was cut, made into hay, and carted to the shed. The mangolds and other root crops sown in August, are very light, owing to the dry weather, but the crops of the same nature, sown in March, had the benefit of the spring weather, and gave phenomenal yields.

Dairy.—During the period under review, 1,830 gallons of milk were converted into butter for a yield of 770 lb., and 360 gallons gave 384 lb. of cheese. One hundred and fifty-eight gallons were supplied to the dining-hall. The increase in the dairy herd comprised 5 Ayrshires, 3 males and 2 females; 2 Shorthorns, females; and 5 crossbreds. The average number of cows milked was 58. The milk cows were allowed one hour's grazing daily on the lucerne field, and for the last week of the period had in addition a quantity of green maize daily.

Piggery.—The natural increase for the month comprised:—Fifty-two Berkshires—28 boars, 24 sows; 9 Tamworths—2 boars, 7 sows. We sold during the month: Thirteen Berkshires—5 boars, 8 sows; 1 Middle Yorkshire boar; and 4 weaners. A steady demand exists for Berkshire boars and sows for breeding purposes.

Mechanical Department.—The subdivision of the pig paddock has been completed, and the gates made and hung. The fences in the railway and other paddocks have been repaired. Towards the end of the month, a commencement was made on the work of dismantling one portion of the laboratory, with a view to providing extra dormitory accommodation. In the smithy, in addition to the ordinary routine work, five pairs of wheels were tyred, and some of the wagons put into a good state of repair. This has been a very heavy month for pumping, as, owing to the heat and dry weather, the consumption of water has been exceptionally large.

Garden and Orchard.—In the orchards and vineyards, both on hill and creek, no horse cultivation has been required, the small quantity of couch-grass which made its appearance having been easily eradicated by hand labour. The crop of grapes on the hill is a poor one, the Red Muscat and Black Pinean being the only varieties to give a fair yield. A better yield will be obtained from the creek vineyard. Owing to the drought, the crop of figs will not be so large as was anticipated, large numbers having dropped off. Good yields of tomatoes, marrows, squashes, and melons have resulted in spite of the dry weather. It has been found impossible, in consequence of the scorching winds, to raise a supply of young cabbage plants, although water was liberally supplied.

SOUTH AFRICAN FARMING.

A beginning is said to have been made with land settlements in the Orange River Colony, in the Thabanchu district, says the *Scottish Farmer.* Land is being cultivated in the Transvaal for the supply of cereals and vegetables for the army. There are nearly 70 farms, averaging 72 acres each, under the direction of Colonel Morgan and Mr. S. B. Schlam, an Australian farmer, and Mr. T. Hogg Robertson, a Cambridgeshire farmer. Each farm is managed by an overseer with a few white assistants. These are selected from among the men of the Irregular corps and the Yeomanry who have obtained their discharge after good service in the field. Under them there are some 3,000 natives and coolies, who are paid from £1 to 30s. a month, with rations of mealie meal or rice, and occasionally some meat. There are growing fields of magnificent cabbages, peas, beans, turnips, and potatoes, and other vegetables were growing in quantities proving more than sufficient to supply the local army. Besides these there were large areas under barley and oats. The barley was being cut green and sent in daily to freshen up the horses in the remount camps. One thousand bundles of 4 lb. each were estimated to be the average yield per acre. The oats were a magnificent crop, and when reaped will materially lessen the quantity of forage to be hauled over the railway from the coast. An experimental field of lucerne has been planted, and was doing splendidly, the estimate of the yield being 6 tons per acre green and 4 tons dry. From some farms produce to the value of £500 is being taken every week. It must be remembered that cabbages are worth from 9d. to 1s. 6d. each; the value of the produce of 2 acres in many cases is more than £500.

Dairying.

CAUSES OF VARIATION IN THE BUTTER-FAT PERCENTAGES OF MILK AND CREAM.

By G. S. THOMSON, N.D.D.,
Government Dairy Instructor, South Australia.

As this subject has been freely discussed of late and various opinions expressed, it will be to the gain of suppliers and butter-makers alike to have an explanation given of the various causes that influence the quality of milk and cream.

THE COW.

Let us first of all consider the cow and her milk. Cows in good health and those that are well fed and well treated will give an almost equal daily quantity and quality of milk extending over a period of weeks. On the other hand, when they are either unhealthy or irregularly fed, and the quantities of feed insufficient to meet requirements, the milk yield and butter-fat percentages will fluctuate morning and afternoon. Again, the hours of milking, times milked, and efficiency or otherwise of milkers will all influence very considerably the morning and afternoon quantity and richness of the yield. Let us discuss the hours of milking and see what results have already demonstrated. In experiments conducted cows were milked on three different farms at the following hours:—

	a.m.		p.m.
No. 1	3·45	and	3·45
No. 2	7	,,	5
No. 3	5·30	,,	12·30

For convenience we will take one cow in each lot, giving her average daily milk yield and butterfat percentage for one week of the test.

	Quantity of Milk. Morning. lb.	Quantity of Milk. Afternoon. lb.		Quality of Milk. Morning. Per Cent. Fat.	Quality of Milk. Afternoon. Per Cent. Fat.
No. 1	16	16	...	5·2	5 2
No. 2	5½	5	...	3·9	4·6
No. 3	8½	6	...	3·9	5·0

These extracts furnish evidence that the fluctuation principally occurred as a result of the hours of milking being unevenly balanced. What then must be the daily differences when there is a disregard of attention to other equally important factors. Take, for example, rough treatment of cows either immediately before or during the operation of milking. Experience has shown to everyone that heavy losses in quantity and quality of milk are sustained when a cow becomes nervous by fright, and these ruinous changes are recognised to be of almost immediate occurrence in the udder of the animal.

So strikingly injurious are they that in some instances the effects would seem incredible. Take this illustration as an example. Two cows were milked at 5 a.m. and 5 p.m., morning and afternoon; the following morning both were milked at the same hours, but, contrary to rules, the animals were hunted into their milking bails and otherwise roughly handled. The results of the evil practice will be found in the accompanying table:—

	Before Rough Usage. Quantity of Milk. Morning. lb.	Afternoon. lb.		After Rough Usage. Quantity of Milk. Morning. lb.	Afternoon lb.
No. 1	12¾	11½	...	6	10
No. 2	9	9	...	5	8
	Per Cent. Fat.			Per Cent. Fat	
No. 1	3·9	4	...	3·2	3·7
No. 2	4·1	4·2	...	3·1	3·8

Neglect to strip cows thoroughly will also reduce the butter-fat returns by a large percentage, and this is made clear when we consider the richness of the last milk (8 per cent.) compared to the first drawn (1·8 per cent.).

Again, exposure to a cold night will so quickly alter the flow and fat-reading that by the next milking it may regain its former quantity and quality (proved by experiment).

Further, freshly calved cows will cause a change in the milk, and quantity of water consumed by animals in hot weather will have an almost immediate effect. There are other conditions at work that need not be mentioned, all of which possess an influence on the formation of milk in the udder of the cow.

On the above part of our subject, and before concluding, let me give a summary of the rules to be studied by owners of milking stock:—

1. Breed.
2. Feeding and changing of rations.
3. Hours of milking
4. Kind treatment
5. Efficient stripping.
6. Protection against exposure.
7. Abundant supply of drinking water in hot weather.
8. Health of cows and freshly calved animals.

THE SEPARATOR.

To accomplish separation in a satisfactory manner attention must be devoted to the condition of the milk and to other requirements in the machine. So important are these conditions that a full explanation of each is necessary, but before doing this I will enumerate the points worthy of our consideration. Permit the numbers given to be a continuation of the rules already written and which will be extended to the conclusion of the article.

9. Solidity of foundation and working efficiency of separator.
10. Physical condition of milk and temperature.
11. Speed of separator and inflow of milk.
12. Practice of separation
13. The uses of water or skim milk at conclusion of separation.
14. Alteration of cream screw.
15. Thickness of cream skimmed.
16. Warming the bowl before separation.

Rule 9 directs attention to a weakness that is not of uncommon occurrence, and where it exists uniformity in skimming will not be attained. Sometimes we again find that the parts of the separator are out of gear, and under such a circumstance, when the work is of so delicate a nature, variations in the cream returns must necessarily accrue.

Rule 10. It is universally recommended to separate milk immediately after it is taken from the cow, and why this should be so persistently advocated is because of the following reasons:—

(*a*) The milk possesses a very fluid condition.

(*b*) It is free from acidity.

(*c*) It is not dense.

(*d*) The fat globules are not dangerously grouped.

(*e*) The adhering power of casein and other substances to the fat globules is decreased.

In cold milk we find exactly the opposite to the above, which at once explains the inability of the separator to accomplish clean skimming. Although to a less extent, we find when cold and warm milk are mixed together there is a loss in cream, but this does not happen in hot weather, being met with frequently in the colder temperatures of winter. In the summer time when milk is kept overnight and separated by itself in the following morning there is less fat in the cream obtained, owing to a degree of acidity or sourness having developed, and an increase in the density of the milk. For this reason it is preferable to separate cold milk by itself at a time when the weather is unfavourable to a low degree of fermentation. We also suffer losses in our cream returns when milk is carted long distances before being passed through the separator, and jolting in carts and exposure of cans of milk to high temperature cause a condition in the milk that taxes the efficiency of separation to its utmost, and results in the abstraction of a considerable percentage of cream and butter fat.

Rule 11. The speed of the bowl should not be less than the number of turns recommended by the manufacturers, otherwise a falling off in the revolving power will reduce the skimming qualities of the separator. The inflow of milk must not exceed the quantity that the bowl is capable of treating, otherwise excess of butter fat will pass away in the separator milk.

Rule 12. In separating, the operator should be particular to keep a continual flow of milk passing into the bowl, and not to stop or slacken speed because the receiver is empty. Arrangements should be carried out so that the receiver is never permitted to exhaust itself, and this will reduce the chances of loss.

Rule 13. When irregular quantities of water or skim milk are poured into the machine at the close of working the percentage of butter fat in the cream will suffer accordingly. Care should be devoted to the addition of regular quantities of separator milk, which will prevent interference with the quality of the cream, and is also preferable to the use of water.

Rule 14. As all owners and those engaged in the working of separators know that shifting the screw causes a variation in the thickness of the cream, it should not be practised except when there is a just and reasonable cause given.

Rule 15. The best results are got from cream containing from 25 per cent. to 30 per cent. of fat; beyond 40 per cent. the losses are considerable.

Rule 16. To prevent cream from adhering to the discs of machines and other parts of the bowl and escaping the skim milk, it is recommended to run a small quantity of warm water through before the addition of the milk.

Losses of Fat in Separator Milk.

In the Government butter test of January, 1900, eighteen analyses were made of the separator milk furnished by the competing factories, and out of that number the highest percentage of fat found was ·045. It is of some importance to note that in this instance the milk was separated at the lowest temperature of all the factories. The cleanest skimmed sample showed ·0025 per cent. fat, and the temperature of separation was 160° F., the milk in this case being pasteurised for a definite purpose.

Important Factors in the Separation of Milk.

(*a.*) Separate the milk as it comes from the cow.

(*b.*) When this is inconvenient heat up to 90° F. in cool weather.

(*c.*) Do not mix cold and hot milk together.

(*d.*) Milk that is over fifteen hours old in hot summer weather should be separated alone and heated.

(*e.*) Have your separator firmly fixed and all parts in thorough working order.

(*f.*) Run a little warm water through the machine before separating the milk.

(*g.*) Regulate the inflow of milk.

(*h.*) Keep the receiver well filled throughout the whole period of working.

(*i.*) Do not alter the cream-screw more than is necessary, but skim an equal percentage of fat daily.

(*j.*) Be careful in the quantity of water or skim milk used in washing the cream out of the bowl.

(*k.*) Take down and thoroughly clean the parts of the machine at the close of each separation.

(*l.*) Put the parts together immediately before use.

VERY IMPORTANT CAUSES.

Cream.

We now arrive at a stage that should command the attention and thought of all cream suppliers, and that is the age and mixing of cream and conveyance of same to factories. It is here where we attribute the heaviest losses, and it is to be regretted that many lose sight of the agencies that are working injuriously against the butter ratio of farmers' cream. Let the remaining portion of this paper be studied until a clear understanding is made of each factor explained, and when this is done the veil will be removed from the eyes of a few suppliers who have been labouring under a misconception of the truth surrounding the "mystery" of the variability in the butter return of cream. I will refrain from entering into the charges that have been made against butter manufacturers, and I sympathise with the farmers and manufacturers alike, on the ground that there are circumstances and conditions which are unfavourable to both parties concerned.

Age of Cream.

The ripeness or degree of acid is a responsible factor in the butter ratio of cream. If the percentage or quantity of acid that has developed is high, churning will be irregular, and the chances of losses greater compared with cream that contains an average proportion of acid. Proof of this will be found in the table to follow, which illustrates thirteen successive tests that were made at one of our factories :—

	Percentage of Acid in Cream and Churning.	Percentage of Fat in Buttermilk.	Temperature of Cream at Churning.
High ...	0·89	0·4	56 degrees Fahr.
	0·80	0·4	57 ,, ,,
	0·88	0·6	58 ,, ,,
	0·90	0·6	59 ,, ,,
	0·84	0·5	57 ,, ,,
	0·84	0·6	58 ,, ,,
	0·63	0·3	55 ,, ,,
Average	0·56	0·2	56 ,, ,,
	0·57	0·2	56 ,, ,,
	0·57	0·2	56 ,, ,,
	0·55	0·2	56 ,, ,,
	0·55	0·2	56 ,, ,,
	0·65	0·3	45 ,, ,,

From these figures it will be gathered that the losses in fat are greater when the acid has exceeded 0·57 per cent., and this again is undoubtedly increased when the temperature of the cream at churning is high. In other experiments it was found that cream with 0·85 per cent. and 0·90 per cent. of acid did not lose much of its fat when the churning temperature was kept as low as 55 deg. Fahr. The above result, however, does not treat suppliers' quantities of cream, otherwise the fat losses would have been greater, caused by want of uniformity in ripening and increased age, which are conditions not usually found in the factory-treated product. It must be accepted by farmers that age seriously affects the butter returns of cream, and what must the losses be in some instances where cans of cream are sent many miles by road and rail and exposed to scorching hot weather. The bacteriological and chemical changes that are produced, and which need not be explained here, work disaster in the composition of the cream, insomuch that refrigeration is unable to save a great part of the fat from passing away in the butter-milk.

Mixed Cream and Butter-making

Sweet and acid samples that have been mixed together shortly before churning will also lower the butter ratio, as the ripe cream will yield its globules of fat to be changed into butter sooner than the sweet cream. Just take an instance of sweet cream churning which is given in the report of the butter test of last year. It states as follows :—" Let us consider one example where the period of ripening occupied fourteen hours, and the time in churning twenty-three minutes. These few hours given to ripening, and a cool cellar selected for the keeping of the cream, one would naturally expect that the condition of the cream when put into the churn would be of a low acidity. This is confirmed by the 'practical' examination. From the knowledge that when sweet cream is churned fast a loss of butter fat follows, in the instance given we may attribute the loss to this cause, as the percentage of fat found in the butter-milk reached the high figure of 1·4." Now, assuming that this cream had been mixed with an acid quantity, what would have happened? Churning would have taken less than twenty-three minutes, and notwithstanding a low temperature the cream would not give up its fat in a way profitable to the supplier. In order to obtain equal results from two given quantities of cream, the following conditions must practically correspond at the time of churning :—

(*a*) Thickness of cream.
(*b*) Percentage of fat.
(*c*) Ripeness or degree of acidity.
(*d*) Temperature at churning.
(*e*) Kind of churn.
(*f*) Quantity churned.
(*g*) Speed of churn.
(*h*) Washing of butter.
(*i*) Working of butter.

(*a*) If the consistency differs there will be a variation in the fat percentage in the butter-milk, as thick craem under ordinary circumstances churns quickly, and the difference in time will influence the yield of butter obtained. (*b*) When one of two samples of equal weight or capacity contain more fat than the other, and both contain the same percentage of acid, and are treated in exactly the same manner, there will certainly be more butter got from one lot than the other. (*c* and *a*) Ripeness and temperature have already been explained. (*e f g*) Difference in make of churn and care in handling alter the butter ratio of cream. One churn might be too large or too small, and the concussion which accounts for the breaking of the cream into butter grains will accordingly vary, also the quantity churned, and the regularity in speed of churn will influence the freedom of the butter-milk from high fat percentages. (*h* and *i*) Over-washed or under-washed butter will raise or lower the weight of the finished product. A poorly-washed and half-worked quantity will increase the weight, while that which is freed from butter-milk, thoroughly drained in the churn and the water well worked out, will cause a lighter weight in the yield of butter. In continuation of the rules already given in the first portion of the article, the following will complete the number :—

17. Cream must be equally ripened.
18. „ must not be too thick or thin.
19. „ must not be overheated.
20. „ must not be sent in unfilled cans.
21. „ must not be injured with preservatives.
22. „ must be churned in a suitable churn.
23. „ must be churned at a suitable temperature.
28. Butter must be carefully washed in the churn and also worked carefully.

In looking over these last rules I might draw attention to the dangers which accompany the transit of consignments of cream in partly-filled cans. When this is done, and the cream has to suffer shaking during long journeys, churning of the fat is sure to follow. This change is more marked in high temperatures, and which are so common in the heat of summer; and in the cold weather, I might remark that difficulty is experienced in getting the fat globules to unite, the cream showing a "sleepy" condition. This may also take place in summer when preservatives have been indiscriminately used, as the natural ripeness in cream is arrested, and the escape of fat in some cases must be unusually high, while the butter suffers in flavour. Unfortunately the practice of using preservatives is becoming very common, and there is much need for warning before serious damage is done to the butter industry. In concluding this paper, I hope all interested in this industry will study the subject carefully and do all in their power to minimise the losses that retard the progress of butter-making. Country factories should receive the support of their districts, as the less handling that cream receives the better for its butter ratio and the quality of the product manufactured.

It cannot be too generally known that the use of the most modern improvements in the equipment of our dairy factories—not the least important of which is the provision of refrigerating machinery and cool chambers—enhances the money value of the product dealt with, and saves serious losses in the aggregate returns from the dairy herd.

Lastly, let us admit that the supplier to any factory is in a sense at the mercy of the manufacturer; that the magnitude of his operations with milk and cream compels him to deal with the milk and cream of several suppliers at one operation; still, with his almost perfect system of tests, checks, and averages, he should not recklessly be charged with unfair dealings if his returns to the supplier do not come up to wishes or expectations. There are so many factors tending to reduction of butter returns that suppliers are not justified in forming hasty conclusions that they are being unfairly treated.—*Journal of Agriculture*, South Australia.

TICKS AND LUCERNE.

In August, 1901, we published an exhaustive treatise in the *Journal* (Vol. IX., p. 252) on the Transmission of Bovine Malaria by Professor Lignières, in which he mentions (p. 272) that cattle grazed on lucerne or other artificial grasses are free from ticks and malaria. This simply means that, if cattle not otherwise immune are constantly grazed on fields of such grasses, there is no danger of their becoming infested with ticks; also, that when ticks have attacked them in the natural grass plains or forests, the simple remedy is to drive the infected beasts on to a lucerne area, when the ticks at once disappear.

We have heard expressions of incredulity on this matter, but scientists like Professor Lignières never publish anything until they have proved it to absolute certainty. We have lately received confirmation of the properties of lucerne in the way of tick destruction. The Inspector of Stock for the Brisbane district has reported a case which he says fully confirms the professor's statement. A Mr. Clay, of Samsonvale, had a cow badly infected with ticks. He turned her into a lucerne paddock, and shortly, to his suprise, the ticks all dropped off, and the cow has not been troubled with any since.

Of course one cow is easier to manage than 10,000, but in the Argentine cattle-owners lay down as much as 100 square miles in lucerne for stock-feeding purposes. That means a field 10 miles long and 10 miles wide, embracing 64,000 acres. Large herds are thus kept free from ticks, and it is only when being driven to market, and hence passing through tick-infested country, that they are in any danger of disease. Even then the danger may be minimised or completely eliminated by allowing the cattle to graze occasionally on tick country, and, when they are infested, driving them back on to the lucerne fields, where the ticks die off, and the animals thus become immune to tick fever.

JUDGING DAIRY COWS.

The Year-book of the United States Department of Agriculture, amongst other matters of interest to farmers, gives the following points in judging a dairy cow (our illustration is a reproduction from *Station, Farm, and Dairy*):—

SCALE OF POINTS FOR JUDGING A DAIRY COW REGARDLESS OF BREEDS.

1 head, 2 muzzle, 3 nostril, 4 face, 5 eye, 6 forehead, 7 head, 8 ear, 9 cheek, 10 throat, 11 neck, 12 withers, 13 back, 14 loin, 15 hipbone, 16 pelvic arch, 17 rump, 18 tail, 19 switch, 20 chest, 21 brisket, 22 dewlap, 23 shoulder, 24 elbow, 25 forearm, 26 knee, 27 ankle, 28 hoof, 29 heart girth, 30 side or barrel, 31 belly, 32 flank, 33 milk vein, 34 fore-udder, 35 hind-udder, 36 teats, 37 upper thigh, 38 stifle, 39 twist, 40 leg or gaskin, 41 hock, 42 shank, 43 dew claw.

In judging dairy stock, 100 is assumed to represent the ideal or perfect dairy cow. The following is a list of general qualities and particular parts considered, with the figures indicating the "weight" or importance attached to each in making up the total of 100 points, which stands for perfection :—

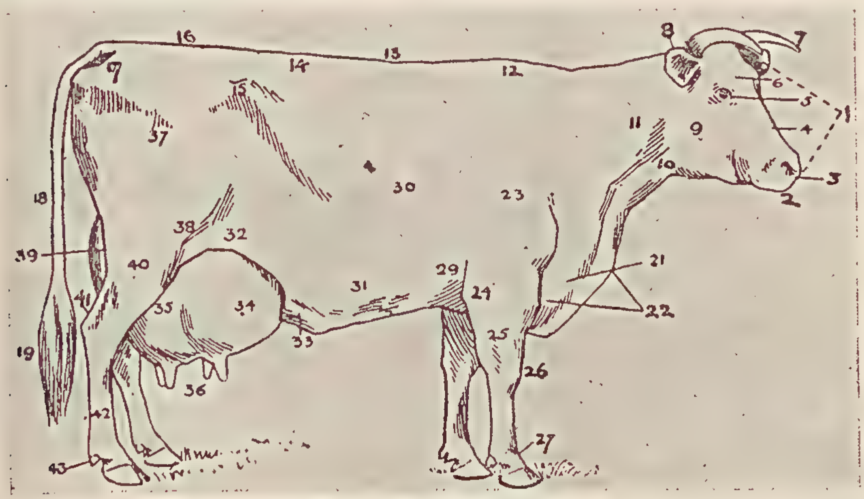
General Appearance.

Constitutional vigor, as shown by size, apparent health, strength, activity, and "general appearance," 5.

Form, wedge-shaped, as viewed from front, side, and top, 5.

Quality—Hair, fine, soft; skin, medium thickness, loose, mellow, and unctuous, with yellow secretion, 5.

Temperament—Active and nervous, but not wild; indicated by movements eyes and lean appearance, 5.



Head and Neck.

Forehead—Broad and full, 2.
Horns—Small and fine, not too long, set well apart, 1.
Eyes—Large, prominent, bright, and yet placid, 1.
Face—Lean, not too short, straight, or slightly dished, 1.
Muzzle—Clean and strong, mouth and nostrils large, 1.
Ear—Medium size, fine in texture, yellow secretion abundant, 1.
Neck—Rather long and thin, fine, clear throat, and light dewlap, 1.

Forequarters.

Chest and brisket—Broad and strong, low, but not too fleshy, 3.
Withers—Well defined, firm and lean, 1.
Shoulders—Light, not fleshy and oblique, 1.
Legs—Straight, rather short, and not too large or coarse, 3.

Body.

Back well defined, lean, open-jointed, not too level and smooth; a good spine, 3.

Barrel or Body—Long and large; ribs broad, well arched, open, and well defined; a large strong body, 8.

Heart Girth—Large and deep, abundant room for active heart and lungs, 4.
Belly—Large, broad and deep, with a large and strong navel, 6.
Loin—Broad and strong, 3.

Hindquarters.

Hips—Wide apart, 2.
Pelvic Arch—Prominent and strong, 3.

Rump—Long and wide, 2.

Tail—Long, fine, with a good switch, 1.

Thighs—Long and lean, no beefiness, thin flanks, 3.

Legs—Straight, rather short, wide apart, giving open twist, and not too large or coarse, 3.

Fore-udder—Full, broad, and extending well forward, not fleshy, 8.

Hind-udder—Full, broad, and attached, high, not fleshy, 8.

Teats—Of good size and form, evenly placed, 5.

Milk Veins—Upon the udder and in front of it, prominent, large, and tortuous, leading to large, open milk wells, 5.

NOTES.—In scoring or marking give to each part the number of points which it appears to deserve on the scale given; use fractions of one-fourth, if necessary. Thus, if the forehead is broad, full, and satisfactory, mark 2; if neck is short, thick, and beefy, mark ½ or ¼, or perhaps 0; if fore-udder is deficient or defective, mark 6, 4, or 2, as the case may be. A good cow closely criticised and scored, should have a total of 80 points or more.

THE DAIRY HERD.

THE PROPERTY OF THE SCOTTISH AUSTRALIAN INVESTMENT COMPANY LIMITED, TALGAI WEST, *VIA* HENDON.

RETURNS FROM 1ST TO 31ST DECEMBER, 1901.

Name of Cow.	Breed.	Date of Calving.	Yield.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Lilly ...	Holstein	14 May, 1901	657	3·8	27·67	Heifer in first calf
Victoria ...	Jersey	21 May ,,	449	5·2	26·55	
Jean ...	,, ...	30 May ,,	435	5·0	24·61	
Kate ...	,, ...	17 Aug. ,,	450	4·4	22·12	
Jubilee ...	,, ...	22 Nov. ,,	584	5·2	34·53	
Scarlet ...	Grade Jersey ...	15 May ,,	434	3·8	18·28	Heifer in first calf
Goldenspray	,, ...	25 June ,,	499	4·4	24·59	
Favourite ...	South Coast ...	6 May ,,	427	3·7	17·46	Heifer in first calf
Countess ..	Shorthorn ...	15 May ,,	457	3·8	19·24	
Bess ...	,, ...	27 May ,,	520	3·6	20·67	
Julia ...	,, ...	15 June ,,	442	4·1	20·14	
Edith ...	,, ...	17 June ,,	448	3·6	17·81	Heifer in first calf
Jeannie ...	,, ...	20 June ,,	415	3·6	16·50	Heifer in first calf
Rusty ...	,, ...	17 Aug. ,,	511	3·8	21·52	
Primrose ...	,, ...	6 Feb. ,,	92	4·0	5·01	Dried off, 9-12-01
Vanity ...	,, ...	3 March ,,	167	4·4	8·63	Dried off, 20-12-01
Cowslip ...	,, ...	7 Oct. ,,	749	3·8	31·55	
Fortune ...	,, ...	10 Dec. ,,	348	3·7	14·23	
Majestic ...	Grade Shorthorn	2 March ,,	454	4·4	22·37	
Nellie ...	,, ,, ...	29 April ,,	336	4·4	16·56	Heifer in first calf
Lizzie ...	,, ,, ..	3 May ,,	304	5·0	17·20	Heifer in first calf
Dairymaid ...	,, ,, ...	24 June ,,	441	4·6	22·80	
Bridget ...	,, ,, ...	17 July ,,	199	4·4	9·80	Dried off, 24-12-01
Midget ...	,, ,, ...	24 Aug. ,,	539	3·8	22·70	
Milkmaid ...	,, ,, ...	31 Aug. ,,	537	4·0	23·84	
Buttercup ...	,, ,, ...	4 Oct. ,,	726	3·8	30·58	
Hope ...	,, ,, ...	5 Oct. ,,	632	3·6	25·13	Heifer in first calf
Camelia ...	,, ,, ...	18 Oct. ,,	607	3·8	25·57	
Bunnie ...	,, ,, ...	5 Nov. ,,	796	3·7	32·55	
Revenue ...	,, ,, ...	11 Nov. ,,	636	3·0	20·79	Heifer in first calf
Eleanor ...	,, ,, ...	18 Nov. ,,	424	4·0	18·82	Heifer in fiıst calf
Sunbeam ...	,, ,, ...	11 Dec. ,,	375	3·8	15·79	
Dolly ...	,, ,, ...	16 Dec. ,,	255	3·8	10·74	
Janie ...	Ayrshire... ...	18 Oct. ,,	619	3·8	26·07	Heifer in first calf
Mermaid ...	Grade Ayrshire	23 Jan. ,,	167	4·6	8·63	Dried off, 20-12-01
Victory ...	,, ,, ...	6 July ,,	477	3·8	20·09	
Faith ...	,, ,, ...	15 July ,,	580	4·0	25·75	Heifer in first calf
Promise ...	,, ,, ...	26 July ,,	422	4·2	19·76	
Madeira ...	,, ,, ...	12 Sept. ,,	568	4·0	25·22	Heifer in first calf
Spec ...	,, ,, ...	2 Oct. ,,	615	3·2	21·57	
Charity ...	,, ,, ...	4 Dec. ,,	399	3·5	14·00	

CURING CANADIAN CHEESE IN COLD STORAGE.

By Professor H. H. DEAN.

Readers of *Cold Storage* will be much interested in the following preliminary report of the season's experiments with curing cheese in cold storage at the Ontario Agricultural College, Guelph, Canada, for which we are indebted to Mr. H. H. Dean, professor of dairy husbandry:—

The Plant.

Our cheese-making room is the one used for instruction in cheese-making as given to our dairy classes. It contains four vats holding 30 gallons each, two vats holding 150 gallons each. It also has a gang press, curd mill, and all other requirements of a modern cheesery. The floor is made of cement.

The curing-room is made of brick outside, and lined with matched lumber and building paper inside. It is quite well insulated. The room is ventilated and cooled in summer by what is known as a sub-earth duct, which consists of tiles laid 6 feet under ground, through which the air passes and is cooled on its way to the curing-room. This plan enables us to maintain a fairly uniform temperature of about 65 degrees in summer. When heat is required, the room is heated by means of steam, which passes through coils of pipe placed on the walls of the room.

The cold store is a wooden building, erected in December, 1900. It is built on what is known as the Hanrahan automatic cold storage system. The ice compartment was filled during the early winter of 1900. The chief point about the system is that no handling of ice is required after it is packed in the ice chamber. The cold air circulates from the ice through the refrigerator room and back over the ice again. The plan has given good satisfaction during the past season. The refrigerator has remained at a uniform temperature of about 40 degrees Fahr.

The Milk.

The milk used for making the cheese was partially supplied by the college dairy herd, and the remainder was obtained from farmers in the vicinity of the college, who supply milk for experimental and instruction purposes. Fifteen hundred pounds of milk (150 gallons) were used in making each lot. The cheeses were made in the usual way, but the curd was divided evenly among five hoops after salting, and these were pressed in a gang-press. After remaining in the press for about 20 hours, the cheeses were removed from the hoops, and each cheese was weighed and marked A, B, C, D, and E. The average weight of each cheese was about 30 lb. The A cheeses were placed directly in the refrigerator after weighing. The remaining four were placed in the ordinary curing-room. At the end of one week the B cheeses were put into cold storage; at the end of two weeks the C cheeses were put into cold storage; and at the end of three weeks the D cheeses were also removed to the cold store. The cheeses marked E were allowed to remain in the ordinary curing-room. This work has been continued once a week since 26th April last.

The Quality of the Cheese.

The cheeses were scored once a month by myself as soon as they were properly ripened, but on 21st September we had three experts come to the dairy to score all the cheeses made between 26th April and 15th July. The cheeses were divided into three lots, and mixed with cheese belonging to other experiments, so that the scorers did not know what kind of cheese they were judging. A clerk attended each judge, and recorded his score. When one lot was finished he moved to the second lot, and then to the third. In this way we obtained the separate judgment of each expert on all the cheese. After the scoring was completed, the average of each judge's score for flavour, closeness, even colour, and texture was obtained by adding together the number of points awarded under each heading and dividing by three. The maximum points given for each quality were 40 for flavour, 15 for closeness, 15 for even colour, 20 for texture, 10 for finish, and 100 for the total. All cheeses were scored 10 points in "finish."

When the averages were completed it was found that in flavour the cheeses placed in cold storage at the end of one week stood first, those put directly into cold storage second, those placed in at the end of three weeks third, those put in at the end of two weeks fourth, and those cured in the ordinary curing-room last. In closeness they ranked in the order of time in which they were placed in the cold storage, those put in directly from the hoops standing in the first place with an average score of 14·56 points out of a possible 15. For "even colour" those placed directly in cold storage stood first, those put in at the end of a week second, and of the other three lots there was very little difference in their scores. In texture, the order of merit was according to the time of placing in the cold storage—those put in at once standing first with an average score of 17·39 out of a possible 20. The totals were also in the same order.

From these preliminary results, which are not to be considered as final, we may safely conclude that the prospects are favourable for curing cheese at so low a temperature as 40 degrees Fahr. directly the cheeses are taken from the hoops. The chief advantages of this plan are: The uniformity of the product, the less loss of weight in curing the cheese, the improved quality of the cheese, and the fact that the manufacturers of cheese are independent of hot-weather conditions and unfavourable markets. During hot weather, factory-men are obliged to sell whether the markets are favourable or not, as the cheeses kept in ordinary curing-rooms deteriorate very rapidly in quality after the first two weeks, while the prevention of loss in weight would more than pay the cost of cold storage.

We believe that the British consumer is interested in obtaining the finest quality of cheese—at as low a price as possible. It should make no difference to him whether these cheeses are made in July or September. If, by a system of cold storage and an improvement in the quality of the milk furnished to our cheese factories during the hot weather, we can make a quality of cheese equal to that produced in September, it will be a great advantage to both producer and consumer.

A Practical Suggestion.

The Legislature of the Province of Ontario at its last session made provision whereby municipalities and co-operative companies may erect cold stores for the storing of farm produce, and also enacted that a sum not exceeding one-fifth of the cost of erecting cold storage should be paid to such persons. It would seem to be an easy matter for every cheese factory and creamery to have within its reach a cold store for storing dairy produce, especially during the hot season.

It is customary in Canada, especially in the Province of Ontario, for buyer and seller to meet at central places, at stated times, usually weekly during the cheese season, for the sale of cheese and butter. The cheese is sold subject to inspection at the factory or in Montreal. This system has given rise to considerable friction. It is certainly a very expensive method, especially the plan of inspection at factories, as all the firms buying cheese have to keep several men on the road going from factory to factory inspecting and shipping cheese. If all the cheese and butter made for export in a certain district were sent weekly to a cold store at a central point, all this factory and Montreal inspection worry and expense would be saved, and the factory-man could accept or reject an offer for his cheese as he thought best, knowing that the cheeses are perfectly safe in cold storage. Other advantages are: Saving of buildings and expense at the cheese factory, saving of time in attending to the cheeses while curing at the factory, and a reduction in the expenses of manufacturing and marketing cheese.

Poultry.

CAMPINES.

A special correspondent of the *Adelaide Observer* writes :—

Campines, which have now become all the rage in England, are a very old-established breed in Belgium. Mr. E. Cobb, F.Z.S., says :—"Whether the Campine is bred from the pencilled Hamburgh or the Hamburgh from the Campine is a point as yet unsettled, but I am strongly of opinion that the Hamburgh derives its origin from the Campine. I could quote several reasons in support of this argument, but will content myself with two or three. Firstly, the silver Campine never throws a rose comb, but every breeder of silver pencilled Hamburghs knows that he gets many single-combed Hamburghs. Secondly, the silver Campine is a much larger bird than the silver pencilled Hamburgh (quite a few hens weighing 6 lb. and over each), and this can easily be accounted for by the amount of in-breeding that has been going on for many years in order to perfect the grand pencilling of a present-day show specimen of the pencilled Hamburgh. Thirdly, the silver Campine has a dark, nearly black eye, and the silver pencilled Hamburgh a red eye. At first sight there may not appear anything in this to uphold the argument that the silver Campine is the parent of the silver pencilled Hamburgh, but I think I can show that there is, and a strong one too. Among the silver Campines there are some that have more or less a light eye, and I am perfectly certain that, in a very short while, it would be most easy to produce red-eyed Campines by simply selecting those that show a tendency to deviate from the dark eye. Old Hamburgh breeders probably thought—as they would now—that the colour of the eye was a secondary consideration compared to the pencilling, and, therefore, mating solely for pencilling, they probably bred from many light-eyed specimens, and inbred such, and, in consequence, eventually produced the red eye ; or it might even be that they endeavoured to produce the red eye. But in any case the red eye could easily be produced from the Campine, though, in my opinion, it would be almost an impossibility to establish the black eye from the silver pencilled Hamburgh."

The silver Campine is kept in Holland almost exclusively for its grand laying qualities and for the rapidity of its growth, enabling the farmers to sell "spring chickens" at a much earlier date than most other breeds. The majority of what few fanciers there are in Belgium appear to scour the farmyards in the country a short time previous to a show, and to pick up the best specimens, the consequence being that there has been no serious attempt to scientifically breed the Campine to standard, and, although it was necessary to go to Belgium for the original stock, it is becoming more apparent every day, especially as the adopted English standard differs considerably from the Belgium, that it will be useless to do so in the future.

In Belgium the Campine is called by two names—viz., Campine and Braekel—but to all intents and purposes they are one and the same breed, and English fanciers designate them under the same heading, Campines. The fact is there are two well-known districts in which the breed has for many years been produced. In one, owing probably to mismanagement, though they put it down to the soil, they are bred far smaller than in the other, but the standard is the same, and I think the whole matter speaks for itself when I quote the words of a well-known Belgium breeder, who informed me that—"We don't know when they are chickens whether they will be Braekels or Campines ; it all depends on whether they grow big or remain little." To any impartial critic there can be no question as to the utility powers of a Campine as a layer. Given a good strain, they lay what may be fairly called a large market size egg, and an abundance of them both winter and summer. They are very hardy, small eaters, and if given their liberty will find more than half the food they require. They are non-sitters (there are always a few exceptions to every non-sitting breed), and, like all non-sitters, lay a white-shelled egg, but I have always found that two white-shelled eggs fetch more than one brown one.

As an exhibition fowl they are most pretty, and have taken a strong hold on the British fancier. All the principal shows and many others in England are now giving classes for Campines, which are always well filled, and there is no doubt that silver Campines are one of the most profitable breeds in which to invest, not only for their laying qualities, but as one of the coming most popular exhibition varieties. It is to be noted that there are three varieties of Campines—viz., silvers, golds, and whites; but the silvers are the only ones that are finding genuine favour in England. The following is a copy of the revised standard as issued by the English Campine Club:—

THE CAMPINE STANDARD.

General Characteristics.

Beak—Short.

Eyes—Bright and prominent.

Comb—Single, medium, with even serrations, coming well back, free from excrescences, upright in cocks, falling over in hens.

Face—Smooth.

Earlobes—Medium, inclined to almond shape, free from wrinkles.

Wattles—Longish, fine in texture, in proportion to comb.

Neck—Medium length, nicely arched, well furnished with hackle.

Breast—Very full, round, carried well forward.

Back—Rather long.

Body—Broad, tapering to tail, close and compact.

Wings—Large, neatly tucked up.

Tail—A good length, sickles and secondaries broad and plentiful, carried well out from the body.

Legs and Feet—Medium length, toes slender and well spread.

Size—The larger the better.

Carriage—Very alert and graceful.

Colour (Silver Cocks and Hens).

Beak—Horn.

Eye—Iris dark brown, pupil black.

Comb, face, and wattles—bright red.

Earlobes—White.

Legs and feet—Leaden blue; toenails horn.

Neckhackle—Pure white.

Body, Wings, and Tail—Rich, beetle-green, mackerel markings or pencillings evenly distributed on a white ground, forming as near as possible "rings" around the body.

It is to be noted there are no specimens in existence conforming to this standard in every respect; but these particulars represent an "ideal" bird for breeders to strive to produce.

Scale of Points (for Guidance of Judges).

Comb	5
Eye	5
Earlobe	5
Legs	5
Hackle	10
Condition	10
Beetle greensheen	15
Tail	15
Distinction and evenness of markings ...	30
	100

Disqualifications.

Legs other than leaden-blue.

White in face.

Red eyes.

Notice has been given to add at the general meeting this year:—

"These markings to be broad and not fine like a Hamburgh's pencillings."

Standard for gold Campines the same as silver, merely substituting the word "gold" in "white" as above. The gold ground colour to be as rich as possible and not a washed-out yellow.

SITTING HENS.

One often hears a tender-hearted henwife pitying the poor hens for having to sit so long and so patiently in hatching out a brood, and they think they are doing the birds a kindness by preventing their sitting. This is all a mistake. It is no hardship to a hen to sit; on the contrary, it is a rest and an advantage to her. When a hen becomes too fat to lay profitably, the proper remedy is to allow her to incubate. While she is on the nest she is resting from her labours, and undergoes no exertion or fatigue. There is little loss of vitality, and she has such an amount of fat about her that she is quite able to support her strength and life on one meal a week. Every poultry-keeper knows that, when feeding time comes for the rest of the poultry, the sitting hens, if at liberty, will seldom respond to the voice of the feeder. It is a natural state of affairs, and should not cause any commiseration. If, however, hens persist in becoming fat and lazy, the best thing to do is to sell them in the best market.

MEAT FOR POULTRY.

Fowls generally require a certain amount of nitrogenous food, which is wanting in cereals. Especially do laying hens improve their production when given a liberal supply of meat in some form or other. It has a very stimulating effect on egg-production. The food should be varied; a constant diet of wheat and maize will result in many fowls rejecting it. Give plenty of green food as well.

A NEW FIRE EXTINGUISHER.

A long-felt want in the bush (says the *Pastoralists' Review*) is that of some fire extinguisher that can be quickly carried in sufficient quantities to prove effectual. A new preparation, termed "Kilfyre," seems likely to supply this want in an effectual manner. It is a dry powder, and is sold in tubes of some 2 feet long. The tube is opened at one end, and the powder is thrown on to the burning building or haystack. As soon as the powder reaches the flame it gives off a gas that kills the fire. The rapidity with which the flame dies out when once touched with this powder is marvellous. A special advantage of this extinguisher is the small space it occupies and its light weight. One horseman could easily gallop through the bush with half-a-dozen of the tubes under his arm, which would be more than enough to put out any fire in any ordinary wooden building. A few of these tubes kept in a woolshed, and others at the homestead, would prove a great safeguard. One of its advantages is that it is only a matter of throwing it into the flames, and no physical strength is required, so that even women or children could prevent a fire that was seen before the whole building was enveloped.

The Orchard.

FRUITGROWING IN THE BOWEN DISTRICT.

By ALBERT H. BENSON.

Although one of the oldest settled districts in tropical Queensland and possessing one of the finest harbours in Australia, Bowen is comparatively unknown to the greater portion of the people of this State; and even fewer persons have any actual knowledge of its agricultural and horticultural industries —industries that are capable of considerable extension, with a promise of paying returns should they be carried on in a business-like and up-to-date manner. In the culture of fruits adapted to the climate there is room for considerable extension, as the quality of the produce is undeniable and is fully recognised as such by the fruit trade generally.

Citrus fruits and mangoes are especially adapted to the district; and when they have been placed on our local markets in good condition, they have met with a ready sale.

I have, therefore, thought that a short article on fruitgrowing in the Bowen district as at present carried out, together with my ideas concerning the profitable extension of this industry, may be of interest, not only to the Bowen fruitgrowers, but also to agriculturists and fruitgrowers throughout the State.

In the first place, there is a large area of land suitable for fruit culture, the greater proportion of which is at present practically unremunerative. For several miles along the Don River, from its mouth upwards, there are stretches of land adjoining the river on one or both sides. Amounting to some thousands of acres that are as a rule fairly level and of which the soil is of an alluvial character, varying considerably in texture from sharp, sandy loams of great depth to medium and heavier loams of a dark colour and fine texture. Some of the heavier loams approach a "black" soil in character, but are not as adhesive. They would probably require to be sub-drained before they would make first-class fruit land; in fact, they are more suitable for vegetable-growing and the raising of maize, potatoes, and other farm crops.

In addition to the land adjacent to the Don, there are large areas of nearly level country lying between Bowen and the Don, right on to the coast, and to the north of the Don, that are well adapted for fruit culture.

The soil is not usually as deep as on the lands adjacent to the river, but it is usually of a friable nature that is easily worked, and that will retain moisture well when properly cultivated. In places, a more or less clayey subsoil is met with, but as a rule the land has good natural drainage.

Bowen possesses one great advantage over many parts of Queensland, as, in addition to the suitability of the soil for fruit culture, it has a never-failing supply of rain and underground water throughout all the district that I have described.

The river may not be running, as was the case at the time of my visit in August last, but an unfailing supply can be obtained by sinking a short depth in the sand, and underground water is met with at shallow depths—10 to 50 feet—over the district mentioned.

The water is suitable for irrigation, and it is on the extension of systematic irrigation that the future development of the district will depend, as the good water supply renders droughts ineffectual if the water is systematically and intellectually applied.

I shall have more to say about irrigation presently, but, in the meantime, many of my readers may not know that the climate of Bowen and of the delta of the Burdekin is different to that of any other part of Eastern Coastal Queensland in that rain during the end of winter, spring, and early summer is almost unknown or only falls in such small quantities that it is of practically no help to vegetation. Summer rains are usually heavy, and the autumn has a fair rainfall. This excessive dryness during the earlier part of the year renders irrigation essential to the profitable cultivation of citrus fruit, vegetables, and farm crops generally, as, without it, trees remain in a more or less dormant condition, and only start into vigorous growth and blossom when the summer rains fall. This was very clearly demonstrated last year (the season of 1899-1900), when few, if any, of the unirrigated citrus trees bore any main crop fruit ripening from April to June, but bore a heavy second crop produced by the summer and autumn rains of 1900, which ripened during August last. Where the trees are irrigated, the growth is normal, the trees keep in vigorous health all the time, and ripen their fruit in the proper season, but when unirrigated there is practically no spring growth, a quantity of wood dies, and the bark becomes hide-bound, so much so that when the rain comes it cracks and peels, often causing heavy gumming.

Periods of long droughts followed by heavy rains and the heat of the tropics produce conditions that are too drastic for vegetation, especially citrus trees; hence, having the necessary water, irrigation is essential to profitable culture. This has been recognised by many of the growers, who have erected small irrigation plants for the purpose of watering their trees. The water is pumped from wells either by wind or steam power, and is distributed over the land by means of piping. The method of applying the water is by means of circles round the trees, taking care that the water does not reach the trunk of the tree. A thorough soaking is given, and as soon as the surface of the land will bear working without packing it is broken up with a hoe or fork, so as to prevent caking, the broken surfacebeing sometimes covered subsequently with a mulch of weeds or dry grass. Irrigation is repeated as required, the condition of the trees indicating when irrigation is necessary. This is found to act fairly well, and the trees so treated bear good crops of fruit of fine quality. As the existing orchards are pretty widely separated from each other, no general scheme of irrigation has been adopted, but in future plantings I should strongly recommend the erection of a powerful irrigation plant capable of irrigating a considerable area of land both for fruit culture, the growing of vegetables, and the more valuable farm crops. This would induce close settlement, and enable the water to be applied in large quantities at a small cost to each grower. With close settlement the handling and packing of the fruit could be carried out to better advantage than is the case with the present isolated orchards, as a number of orchards near together could support a central packing-house, where the fruit would be systematically graded and properly handled and packed. In the different orchards that I visited I found that the trees were as a whole well pruned, the middles being well thinned out, though in some cases there was a good deal of dead wood, due to the causes I mentioned previously. Cultivation was usually somewhat deficient, though I noted instances where it was well carried out. I feel confident that, given a good supply of water and with proper cultivation, the production of citrus fruit of first-class quality can be greatly extended in the district without any fear of causing a surplus, as the quality of the fruit is such that, if the requisite care is devoted to the gathering, grading, handling, and packing, it will meet a ready sale in any market of Australia or any oversea market to which it may be consigned.

Like all other fruitgrowing centres, pests are pretty numerous, but they are capable of being kept in check to a much greater extent than is being done at present, provided the means advocated from time to time in this *Journal* were systematically adopted.

So far, I have confined my remarks principally to citrus fruits, but there are other fruits well worthy of notice. The mango grows to perfection, and when once fairly established stands both drought and wet better than any indigenous tree. Trees grow rapidly and to a very large size; they bear well, and much of the fruit is of good quality, though a large proportion is only fit for chutney-making. The other great chutney fruit, the tamarind, also grows remarkably well, and, judging from the trees I saw in bearing, is a very heavy cropper. Green ginger, pepper, and the other accessories of mango chutney can be grown in the district. I see no reason why the manufacture of chutneys on a commercial scale should not turn out a profitable industry, especially now that the markets of Australia are open to our produce.

Papaws do well when free from frost. Custard apples do well, though the soursop is rather too delicate for the district. The bulk of the custard apples grown are of poor quality, being the small-leafed, very seedy, sweet-sop, which however, bears heavily. Some of our southern raised custard apples, such as those grown by Mr. L. G. Corrie and Mr. J. Collins, of Redland Bay, would be a great acquisition to the district. Pines should do well, especially if planted on light, well-drained soils, but no one should undertake their culture on a large scale unless able to give them plenty of farm manure, as this will be found necessary once the plants come into bearing, if pines of large size and good quality are to be produced, and, needless to say, no others are of commercial value, either for export or canning.

The latter industry could be established in conjunction with a chutney factory, and to these a marmalade plant could be added, as the Seville orange will, in my opinion, do well in the district.

Bananas are not grown to any great extent, their cultivation being almost entirely in the hands of Chinese gardeners. The plantations I saw were by no means first-class, and did not compare favourably with either Northern or Southern plantations when planted on the right soil and in suitable locations. The long, dry spring is not conducive to the vigorous growth of bananas, and, although they would be greatly benefited by irrigation, I do not consider that they can be produced as cheaply or of as good quality as those grown at Cairns or Geraldton; hence there is not much reason to expect any great increase in the production of this particular fruit.

Vegetables of all kinds do well when well watered and properly looked after, and, given a good system of irrigation, should be produced in sufficient quantities to supply not only the local market, but those of Townsville and Charters Towers. Early vegetables, such as tomatoes and cucumbers, could also be grown for the Southern markets, but would require special packages for their successful carriage, similar to those used by the southern States of America for the supply of vegetables to the northern market during the winter months. The question of getting such vegetables into our Southern markets is one of care in handling and packing, and the use of suitable cans or crates.

What I have just stated with respect to the handling and packing of vegetables applies with even greater force to fruit, as this is one line in which the Bowen growers have a great deal to learn. As previously stated, the fruit, especially citrus, is of very high quality, being of medium to large size, very juicy, and having a very fine skin. Fruit of this character requires special care if it is to carry properly, but once given that care it will carry equally as well as if not better than a thicker-skinned and coarser fruit. In the first place, much greater care must be taken in the handling of the fruit. It must be cut from the trees, not pulled; it must on no account be bruised, but should be handled as carefully as eggs, for a bruised fruit is a spoilt fruit, which will probably rot on the journey, and not only that, but it will cause other fruit brought in contact with it to decay. It is not at all an uncommon thing to find 10 to 20 per cent. of loss in the fruit when sent to Brisbane, and this loss is entirely due to careless handling that can be obviated by the exercise of proper care.

When first gathered from the tree, the skin of the fruit is very tender, brittle, and full of water, and before it is in a condition to ship this surplus of moisture must be sweated or dried out of the skin, which then becomes tough and leathery, and will not easily bruise, so that it will carry in good condition without loss. No citrus fruit should ever be packed straight off the tree, especially early in the season, as this always results in heavy loss to the grower; this not only applies to Bowen fruit, but to that of Maryborough, the North Coast, and other citrus-growing districts in the State. When cut from the tree the fruit should be carefully placed in clean cases, in which it should remain from three to five days before being packed for market. The cases containing the freshly-cut fruit should be placed in a shed or lean-to where they will be subject to a fair draught, which will dry the skins, and the fruit will have gone through what is technically known as "the sweat." Another great advantage in sweating the fruit for, say, five days is that in this time any fly-infested fruit will be easily detected as well as any bored, thorn-pricked, or badly bruised fruit, and all such can be culled out, only sound fruit being packed. Owing to the toughening of the skins, the fruit can be much more firmly packed, and this in itself is worth all the trouble, as the firmer the fruit is packed in the case the less liable is it to injury on the journey, and the better the condition in which it will arrive at its destination.

The treatment of citrus fruit that I have described will not add materially to the expense of handling, for all a grower has to do is to cut his fruit a week before shipment, instead of leaving the cutting and packing to the last moment before the boats leave.

In conclusion, I may say that the general impression that I formed of the fruitgrowing capabilities of the Bowen district was a very high one, as, with the good soil, the abundance of available water, and a suitable climate, I see no reason why the industry should not be considerably extended, but to do so it will be necessary in the first place to go in for systematically destroying all fruit pests, which can only be brought about by an active co-operation of all growers, and, secondly, by adopting a system or systems of irrigation benefiting a number of growers, instead of depending on small individual irrigation outfits. Bowen has the three great essentials for fruit production—suitable soil, water, and climate; and, if these are used intellectually, I see no reason why the industry should not become a very profitable one.

DO BEES INJURE FRUIT?

This question has been repeatedly asked, and as often answered in the negative. Mr. H. Tryon has stated his opinion to that effect in this *Journal*. Two or three years ago, the question came up in a practical way in Hungary, says a writer in the *Rural New Yorker*, when grapegrowers in a certain district accused the insects of puncturing the ripe berries. The matter was referred to Professor Josef Jablonowsky, the State Entomologist at Budapest. All the evidence known to him was against the charge, and none of the observations at and near Budapest gave the least support to it. But no amount of negative evidence can discredit even a single positive observation, and he visited the district where the crime was committed.

I saw Professor Jablonowsky at Budapest in June, 1900, and he told me there was no doubt that the bees were guilty as charged. But in extenuation it was said that there was absolutely nothing else for them to eat at that season. The region is semi-arid, and, while there are plenty of spring flowers, there is nothing for the bees after midsummer. What was at first an occasional feeding on a broken grape developed into an occasional attack on a sound one, and this became a universal habit in a surprisingly short time.

The mouth parts of a bee, while beautifully adapted for gathering nectar, have also well-developed jaws or mandibles, and there is absolutely no reason why they should not puncture ripe fruits to get at the juices if there is nothing else equally attractive. I do not believe that the fruit-piercing habit is at all a normal one, and, so far as my own observations go, I have never seen a bee on any fruit not previously injured by some other cause. I would be always inclined to seek a prior break rather than consider the bee guilty.

I am a believer in bees, and frequently suggest beekeeping in large orchard areas. I think their work in securing a set of fruit far outweighs the little mischief they may cause on ripe examples. And after all, if lack of suitable food is really at the bottom of their raid, why not feed the bees? Deliberately sacrifice a few juicy fruits to them, or a few pans of sugar water or diluted molasses. Or plant a clover patch where they can get it, or buckwheat, or whatever else may be in honey-yielding condition when the fruits ripen; but keep the bees by all means. The trees need them.

Against this, we have a statement in another American journal that bees injure pears by spreading the pear blight, and its verdict is—"Get rid of the bees—put them five miles away from the orchard."

Do our Queensland orchardists and apiculturists not study this question? It is natural to suppose that they are as competent judges as American fruit-growers. The latter, however, differ from their *confrères* in Queensland in that they are constantly investigating for themselves, and they are only too glad to publish the results of their investigations. They make experiments in api-, horti-, agri-, and every other culture—they invent little labour-saving appliances, and give them to the world. We seem to be content to follow where they lead. We rarely take the initiative. This is not as it should be. Our agriculturists are quite as intelligent as any in the world, as witness the small farmer who, years ago, invented the first corn husker and sheller ever seen in Queensland, or he who invented the cane-planting machine not long ago.

We should like to see our farmers study things out for themselves, and give the results to the many newspapers which gladly give space to such matters.

A LARGE MANGO.

The October Bulletin of the Trinidad Botanical Department describes a very large mango produced on a seedling mango-tree of the "Gordon" type. The fruit measured 7·5 inches in length and 4·5 inches in diameter, and was of excellent flavour. Compare this with the mulched shrivelled specimens exhibited for sale as mangoes in the Brisbane fruit shops. Yet there are several growers in Southern Queensland who have grown mangoes larger than the Gordon. Such fruit, however, rarely finds its way into the market. The mangoes of North Queensland are noted for their size and excellence, but the Southern market price does not offer sufficient inducement to ship them in quantity.

PROTECTION FOR ORANGE-TREES.

Last month a correspondent asked for information as to how to protect his orange-trees from frost. Here is an idea propounded by an American Professor of Horticulture. A farmer writes on the subject as follows to the *Florida Agriculturist*:—While the past winter was not one to stimulate interest in "protection," it may not come amiss to give my experience with the "triangular" or combined windbrake and fire idea advanced by Professor McKinley in his very valuable paper, read before the Florida Horticultural Society in 1900.

As a sample of my experiments, I will take a tree with spread of 6 feet and 10 feet high. The material used was re-sawed 1-inch cull cypress boards, made into sections 5 x 8 feet, using three 1 x 3 cleats, preferably of pine.

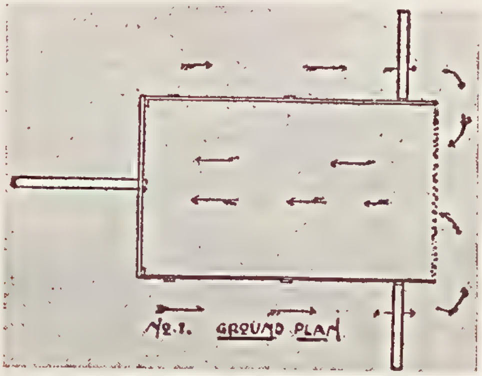
I adopted the four-sided form as most satisfactory, though excellent results were obtained with the three-sided form on small trees and the five-sided form on larger ones.

Rough sketches attached may give an idea of the construction and use of this method. One of the sections is placed on end, facing the north-west, and

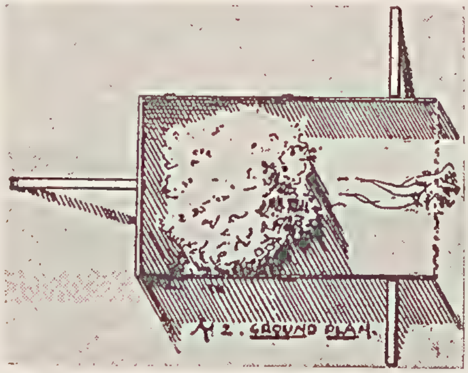
Plate XI.

OLIVE TREES AT WESTBROOK STATE FARM.

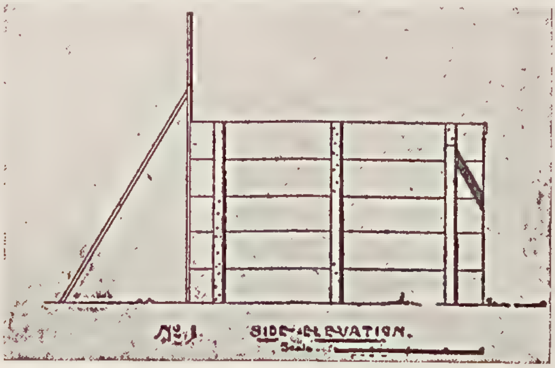
should be lapped or battened. The sides need not be either lapped or battened, and are set on edge, thus giving a face, fronting the wind of 5 x 8 and sides extending 8 feet back and 5 feet high. The tree occupies the north-west end in this enclosure, just touching with the tips of its branches the upright side.



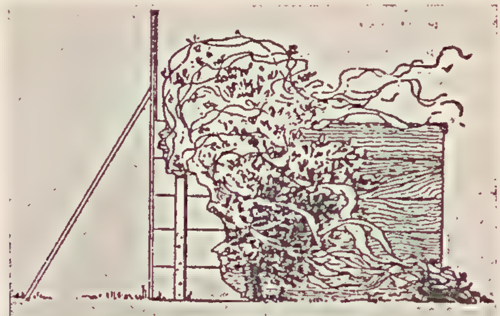
The fire is placed as near the tree as may be without scorching the leaves, and it need not be large. The air currents act as they do with the triangle, carrying the smoke and heat forward, through the tree, against the north-west side and up over the top, and back with the direct current of air through that part of the tree which may be above it, if the tree should be higher than the face or north-west side.



I like this style of protection because it is effective, easily managed, and cheap. The re-sawed material—about ⅜th of an inch thick—should not cost much above 5 dollars per 1,000 surface feet. The sections are quickly made up, and, if properly cared for, are durable. It is easily set up and quickly removed. With proper bracing—one good stick for each section and a tie across the south-east end of the sides—is safe against hard blows, and there is not enough shading of the tree to cause injury.



The fire is always laid and primed with fat pine kindling and refuse resin, and an extra supply of which is conveniently placed. Thus one escapes the task of closing tents or boxes. The tree has almost normal out-of-door conditions, and there is no encouragement of insect pests.



No. 2, SIDE ELEVATION.

Last, but not least, is its effectiveness as protection. After many trials, I am convinced that one can count on raising the temperature surrounding the tree at the rate of ½ degree per minute till an increase of 15 degrees to 30 degrees above the outside air has been reached.

So far I have discovered no important drawbacks to this style of protection.

THE THRESHING OF BARLEY.

A circular, signed by Thomas Bernard and Co., Leith; the Edinburgh Brewers' Association; Hugh Baird and Co. Glasgow; and Robert Hutchison and Co., Kirkcaldy, has been circulated among farmers in Scotland on the subject of the threshing of barley. They say:—"With the view of drawing the attention of farmers to the loss which they are sustaining by the damage done to their barleys in the process of threshing, a memorial on the subject was submitted to the Highland and Agricultural Society, signed by the leading maltsters in Scotland and others, pointing out that, since the introduction of the travelling threshing mill and high-speed drums, the proportion of broken, skinned, and bruised corns had largely increased, and in this way many parcels of barley had been rendered unfit for making into brewers' malt, and the value of same, therefore, seriously affected. The directors of the Highland and Agricultural Society, considering the question involved of the utmost importance, appointed a committee to confer with the memorialists, and ultimately a meeting took place at the Highland and Agricultural Society's Show at Inverness in July last, at which there were present the leading maltsters of Scotland, barley merchants, and implement makers. As a result of the discussion which then took place, it would appear to be the opinion of the implement makers that the trouble complained of is due in great measure to the drum and concave not being properly set. We would urge upon you, therefore, the necessity of seeing, before having your barley threshed, that the drum, concave, hummeller, &c., are so set that your barleys may not be damaged in the way described. Barleys of heavy bushel weight are no longer sought for, and those that are carefully threshed, and not too closely dressed, will fetch a higher price than if they are in the condition complained of. Therefore we have no doubt you will find it to be in your interests to exercise careful supervision of the threshing to obtain the required results. In conclusion, we might point out that the unsatisfactory threshing of Scottish barley in late years has greatly increased the importation of heavy foreign barleys."

Apiculture.

SOME APIARY DO'S AND DONT'S.

By H. R. STEPHENS, Toowoomba Apiaries.

1. Don't feed bees near hives. You may start robbing.
2. Don't leave the honey house door open, and keep the combs covered.
3. Do not let the bees go without worker eggs when their queen is lost.
4. Don't nurse weak colonies. It is better to unite and have one strong one.
5. Do not go in for elaborate hives if you are keeping bees for business. As in other things, simplicity is best.
6. Don't bustle your bees. Work quietly. Let them do the bustling for the honey.
7. Keep a record of the state of your hives, and date when looked at last.
8. Fix foundation firmly in frames before giving to bees, especially to the top bar.
9. Don't allow too many swarms to come from a hive; the first is usually best and most easily controlled.

BUSY BEES—TRANSFERRING.

In almost every apiary there is a little transferring to be done each year, either from box hives or odd-sized frame hives.

There are almost as many ways of transferring as there are beekeepers using them; the most of them are faulty, causing the beekeeper to get his clothes all daubed with honey and his temper far from "sweet."

The Heddon method is the most generally used, but I do not like it, as there is too much tinkering about it. The writer hit on the following plan some years ago, and I have used it ever since. I think I was the first to make it public, which I did in the "Australian Bee Bulletin" of September 23, 1894, page 137. The following description of the method is re-written from that journal:—

To transfer from a box hive to a bar frame hive I proceed as follows:—Remove the box hive from its stand, first blowing a little smoke in at the entrance. Invert the hive and remove the bottom; place a box on the inverted hive and drum nearly all the bees into it. Now place the hive that we wish to transfer our bees into on the old stand, being sure to have the entrance in exactly the same place that the old one was in; hang four or five combs in the new hive. It is all the better if one or two contain brood of all ages and some honey.

Put on the cover, and spread a sheet in front of the new hive, lean a board from the sheet to the entrance; now lift off the box into which the bees were driven (if you have made a good drive there should be very few bees left in the old hive), set the box on the sheet, and throw a bag or sheet over the old hive, so that the bees cannot see it. Now throw the bees out of the box upon the sheet, letting them fall a few inches from the board leading to the entrance to the new hive; we want them far enough away so as to give us a chance to see the queen as they crawl into the hive. If they are black, you want to watch them pretty close, as the black queens are rather hard to see, and we want to be sure that she goes in with them. As soon as you see her, pick her up by both wings and place her in the hive; the bees will soon all follow her in. If we do not see the queen, we had better drum and smoke out all the remaining bees from the old hive, and shake them in front of the new hive, drive all of the bees into the new hive, and then remove it from the old stand, placing it at one side, so as to be out of the way. Now place the old hive back on its former stand, still leaving it inverted, as we want the bottom or open part to be upward so that the combs are inverted, place a queen-excluding honey board on what is now the top of the old hive, and set the new hive on the honey board.

Of course the new hive is not to have any bottom board, the honey board taking the place of the bottom board. Leave an entrance into the new hive directly above where the one was in the old hive (the entrance may be formed by lying pieces of lath under three sides of the hive, between the hive and honey board, lean a wide board from the ground to the entrance of the new hive, so as to prevent the bees from going to the place where the old entrance was.

They will alight upon this board and crawl up to the entrance to the new hive, attracted thither by the humming of their sisters.

Leave the hives thus for twenty-one days. By this time all the brood will be hatched in old hive, and the young bees gone up to the colony in the new hive, and if sufficient empty combs were given the bees in the new hive they will have carried up all the honey from the old hive. I have never known bees to rear a queen in the old hive when following this method of transferring, whereas with the Heddon plan they will always do so; and, besides, we have to unite the young bees that hatch in the old hive with those in the new hive. With my method, the young bees go up to the others as fast as they hatch, only enough bees staying below to keep the brood warm and feed the larva. This I consider a great advantage over all other metheds, as we have the full working force of the colony in the one hive.

When all the brood has hatched from the combs in the old hive remove the old hive, and set the new hive on a bottom board in the place that the old hive occupied; always have the entrance face the same way that the old one did, thus avoiding as much as possible confusing the returning bees.

The colony should now be a prosperous one and ready for a super, which should be placed upon it if there honey is coming in, and the bees have all the frames full of combs, and said combs full of brood and honey.

If we gave all full frames or comb to the bees when transferring them, they may need a super before all the brood has hatched from the combs in the old hive; this should be given as soon as needed, otherwise the bees will fill the combs in the old hive with honey, and we want to avoid this, as the combs in the old hive are so much better to handle when free from honey.

We are now ready to dispose of the old hive and its contents; many advise melting up the old combs and burning the old hive. From a supply dealer's point of view, no doubt, this is the best and only way, but from the apiarist's standpoint I say it is all wrong. My advice is to save all the straight worker-comb and fix it into brood-frames, and the straight drone comb may be fixed in frames for the extracting super.

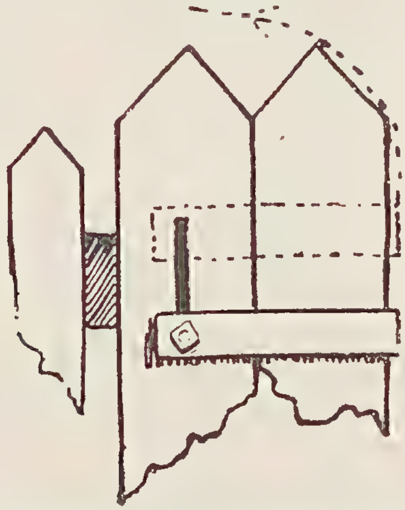
To transfer bees from one size frame hive to another, I remove the hive to be transferred to one side and set the new hive on the old stand, having it filled with frames full of worker-comb, or, if these are not to be had, frames filled with foundation or frames with starters will do, but the comb is by all odds the best. Now find the queen in the old hive and pick her off the comb, set her on the centre frame in the new hive, and shake the bees off of the frame over her. You want to be smart about it, or else she will take wing, unless her wings are clipped. Shake the bees off from three or four frames in front of the new hive; set the frames back into the old hive: place a queen-excluding honey board on the new hive; set the old hive on the honey board, replace the cover, and the job is finished; the bees will store honey in the combs in the old hive (or super, as it now is). The honey may be extracted as stored, or left for twenty-one days, when all the brood will have hatched.

After the brood has all hatched and the honey has been extracted, the comb should be returned to the hive just at nightfall, and removed early the next morning. The bees will have licked them clean, and but very little fresh honey will have been stored in them. The combs may now be transferred to the desired frame. Perhaps some will say, I would rather shake the bees off the frame to be transferred, cut out the comb, and fasten it in the frames I want it to occupy. Stop a moment and think what a lot of brood you kill by cutting out the comb while the brood is in it, and also think what sticky work it is with all the honey in the comb; whereas when the combs are free from honey and brood it is clean and pleasant work. I feel sure that all who once try the above method will never go back to the old ways of transferring.

[The above was written for *Garden and Field* by Mr. G. Colbourne, junr., editor of the *Australian Beekeepers' Review.* No doubt the method of transferring bees here described is known to many beekeepers of Queensland, but, as they rarely give amateurs the benefit of their knowledge through the Press, we print the article for the benefit of the latter.—Ed. *Queensland Agricultural Journal.*]

GATE FASTENING.

Wandering cows and horses become very knowing in the matter of opening gates, and we are often appealed to to give an idea for a perfect gate-fastener. Amongst those which we have described there are several good ones, but the fastener here illustrated appears to be about as good a one as can be tried. The illustration and description are taken from *Garden and Field*:—Mr. A. G. Hill, of Coleraine, Victoria, has sent us the above sketch of an effective and simple device for preventing horses from opening gate clips. The idea is to



have a slot to run the clip bolt in, so that the clip must be raised (as shown by dotted outline) before it can be carried over the post to release the gate. The clip is made of hoop or other iron in the ordinary way, but, instead of merely having a single hole to carry the bolt, two are made, say, 3 inches apart, and the wood between is morticed out to make the slot. When the gate is shut and the clip put over, it drops and cannot be lifted until the bolt is raised in the slot.

Tropical Industries.

RAISING TOBACCO IN OLD KENTUCKY.

HOW THIS GREAT CROP IS CULTIVATED AND PREPARED FOR MARKET.

Mr. R. S. Neville, Tobacco Expert, has handed us the following interesting article which appeared in *The Weed*, a journal published at Louisville, Kentucky, U.S.A., devoted to the interests of tobacco-growers:—

While the fragrant wreaths of smoke encircle his head, does the reader ever stop to think of the labour necessary for the proper growth of "the weed." The vast majority of us take our luxuries and necessities too much as a matter of fact. We are reaching a point in our civilisation when we lose sight of the labour necessary for the production.. It is all a matter of cost. In just this manner we lose a great amount of pleasure which is ours if we take it. Of course, everyone knows that Louisville is a great tobacco market; in fact, the largest on the globe, and yet ask any of them something about the growth of the crop and they have to confess their ignorance.

When the hardy pioneer and his family formed what might be termed a close community, everything was done in the home. They not only produced and manufactured all the necessities of life, but in each garden the hardy settler raised a small patch of tobacco. He did not have to give it the time and patient work which tobacco gets to-day, for it matters very little whether the leaf was long or short, or light or dark cured, so long as he raised enough for his family the coming season.

HOW TOBACCO HABIT SPREAD.

To-day "the weed" is almost universally used, and by its use the various races and colours of man soothe themselves as they can in no other way. Tobacco came into use as a narcotic very soon after the discovery of this country, and its use spread with wonderful rapidity over the whole of Europe. Strenuous efforts were made by State and Church to stamp out what was considered a growing evil, but the use of "the weed" grew steadily.

The growing of tobacco has been a large and increasing business in this State for a great many years. It is a very peculiar business in that it has a certain class of people who follow it as a special work, and thus make it picturesque. In the old days before the war the large and small landowners grew the tobacco with their slaves. To-day it is grown by a class of men called tobacco tenants, who rent from the large landowners. There are some few men in the State who make a speciality of tobacco-growing and hire their work done for them just as in other farm work. But these men are few.

WHITE BURLEY IN BLUE-GRASS.

The tobacco grown in the old slavery days was the heavy, dark tobacco, which is still grown over a great part of the State. The tobacco tenant of central Kentucky grows almost exclusively the white Burley for "wrappers." The Burley being grown mainly for "wrappers," great care is taken to obtain the proper size of leaf, fine colour, and good texture. The great difference in the selling price of Burley is just on these points which make or mar a good "wrapper" for plug tobacco.

The Burley grows luxuriantly on any of our blue-grass uplands; but when grown on the virgin soil it has a fine texture and colour which it is hard to get from any other soil. When grown on alluvial bottoms along our Kentucky streams it is apt to become too heavy to make a good and economical "wrapper." The lands uncleared in the central portion of the State are yearly becoming less and less common; and to-day the forest is upon some very steep and rocky hill slope. In just these localities you find the "clearings" for tobacco. The trees on the top of the hill were not fit for lumber; so when the land was cleared they cut a gash about their bases and left them to die that their leaves might not shade the tobacco nor their roots use the moisture. When quite a number of these "girdled" trees are left on a "clearing," it is called a "deadening." Near the crest of this hill the rocky character of the ground can be seen. It is a great pity that such lands should be cleared, as, even after centuries of forest growth, they have not been able to make any depth of soil. When they are left after raising a few crops of tobacco, they simply wash away and leave what they call "galled" points which can never be reclaimed without a vast outlay of money and time.

Late in the fall and all through the winter months the tenant is busy with ax and grubbing hoe clearing the ground for the next "crap." Part of the logs and underbrush which he hauls off his "clearing" are piled in a long narrow rectangle, and after it dries he burns it for his "plant bed." As the larger logs burn slowly they are rolled over the ground, in order that all the weed seed may be killed where the tobacco seed are to be sown. After "the burning," the bed is thoroughly worked with hoe and rake until there is not the trace of a clod or lump in it. Late in February or early in March, the tobacco seed is sown in the bed; and small logs or planks are placed about it, and a light piece of cotton is tightly stretched over the bed about 6 inches above the ground. In this manner the tender young tobacco plants are protected from frosts and the late light freezes of early spring.

During the early spring months, while the tender plants are growing under cover, the tenant is not idle, for his land has to be put into condition for setting the plants. He must plough and harrow, and clear off the roots which his plough brings to the surface. Late in May or early in June the plants, if they have grown properly, fill his bed and the cover has been taken off so that they may become accustomed to the direct rays of the sun. Everything is now ready, and he waits impatiently for rain enough to make a good "settin' season."

When the longed-for rain has wet the ground, he and the boys hurry to the plant beds and pull the largest, strongest plants and pack them in home-made bushel baskets. The baskets are carried to the "clearing," and the plants are dropped in rows, while men follow setting them by hand. Often a "season" lasts only half-a-day, if the rain has been light, and the tenant must wait until another rain makes the ground moist enough for setting again. In this manner a crop is often set piecemeal, some parts being two or three weeks in advance of others. The same thing often happens when the plants do not grow well, and the tenant has to wait for a week at a time for a new lot of plants to grow large enough to set.

Here's where Real Work Begins.

As soon as the plants take good root and begin to grow, the hard, grinding, persistent work commences. No weeds must be given any chance at all. The plough or double shovel must be going in between the long green rows, that the soil may be kept stirred and moist, and the hoe must be used between the plants themselves in the rows. When your correspondent went into the field to get pictures of the growing fields the tobacco tenant was busy breaking a young horse to walk well in the narrow rows of tobacco, so one had to lead him while the other guided the double shovel.

Use of Child Labour.

The tobacco tenant in growing a crop can use a great amount of child labour, as the work in the new ground, although continual, is rather light. Children are largely used in "worming" tobacco, as, being so much shorter than grown men, there is not the tremendous amount of stooping necessary. In this work the children are not kept from school, as most of this work comes in vacation, when they are at leisure. Early in the growth of the tobacco the flies begin to lay their small green eggs on the bright green leaves. Unless one is accustomed to finding these green eggs, they are apt to escape notice, as they are almost the colour of the leaf. When the worm emerges from the egg it at once attacks the leaf, and unless it is killed will in its short life eat a tremendous amount of leaf.

PROCESS OF "WORMING."

To realise the amount of care and labour required to keep a patch free from worms, one must see the work as it is done through a whole season. "Worming" must be done largely in the early morning and late in the evening, as the worms often hide in the fresh earth during the heat of the midday sun. To one who has not seen the work before, it is not what might be termed pleasant, for the worm is pulled in two before it is dropped. When one is not expert in the work, they have a bad manner of bursting in one's face. For years the tobacco-growers have striven to find something to kill the tobacco worms without injuring the sale of their crop. Paris green in very small quantities has been used as a spray upon the plants; but it is not thoroughly satisfactory. The manufacturer and buyer do not like the idea of using and selling tobacco that has had Paris green upon it. I am sure the man who uses tobacco would not knowingly buy "the weed" that had Paris green used upon it. Of course if a very small amount is used and a good rain is allowed to wash it clean before "housing," it would be perfectly safe—but all growers are not as careful as they might be.

Another pest which the grower had to contend within the past few years is a small grasshopper, which, if anything, is a worse feeder than the worm. The worm stays on one plant usually, and often will eat one leaf before moving to another. But the grasshopper eats small holes in many leaves, and thus ruins them for "wrappers." Not long ago a small boy asked if some grasshoppers were not very smart. In explanation of his question he said:

"Well, you see, grasshoppers been eatin' grass and other stuff, an' when you catch 'em an' say 'Spit tobacco an' I'll let you go,' it would take 'em a long time. But now they jes go into the tobacco patches an' chew it, and when you say to 'em, 'Spit tobacco an' I'll let you go,' why they kin right away."

THE PESTIFEROUS GRASSHOPPER.

The reason the grasshopper is such a pest is that there is no way to catch them. The worms cannot get away, and it is simply a matter of finding and killing them before they do too much damage to the leaves; but with the grasshopper it is an entirely different matter. The moment you walk through the patch they hop and fly in every direction, and are gone only to return the moment you leave again.

Every tobacco man's wife makes it a point of turning out as big a "gang" of turkeys as she can. She does this not alone to provide herself with Christmas pin money, but to protect the tobacco patch as well. As soon as the young turkeys are of any size the little children drive the whole "gang" to the tobacco patch every morning, and leave them there all day. Soon the feast of tobacco worms and grasshoppers impresses itself upon the limited minds of the turkeys, and they go to the patch of their own accord. It is very interesting to watch the "gang" as it follows the dusty path up through the woods toward the "clearing." Each turkey has its head on one side scanning the dusty grass for any stray grasshoppers which lurk there. Suddenly a youngster sees one, and makes a wild dash for it, only to have it jump from under its eager bill and fly up the road. A splash of fine dust from the middle of the road shows where the hopper has dropped again, and the whole "gang" stalks after it. Thus it goes on all day long in and about the clearing in the woods, and there is really no telling how many hoppers a turkey will eat in the course of a day.

SUCKERING.

During the midsummer months "the weed" is apt to grow what is commonly called "suckers" from a point where the leaves join the main stalk. To keep all the strength of the plant in the growing tissue of the leaves, these suckers must be broken off; and this is what is technically called suckering. When, in the judgment of the grower, the plant has reached a proper height, it is topped. The blossom or terminal bud in the top of the plant is nipped off, thus keeping the plant from shooting to seed and wasting any of its strength. Just at this point the grower has to use some nice judgment if he wishes to have good wrapper leaf. for it is now a matter of the season. He wishes the plant to produce as many fine leaves as possible, but must not leave enough to have them of poor quality. Here and there through the patch an extra fine plant is left to shoot seed, and raises its pretty cluster of flowers high above the rest of the crop. Each capsule of seeds which is left when the blossom drops is full of minute seeds. Indeed, some idea of the smallness of these seeds can be gained when it is said that one plant will sometimes produce as many as forty thousand seed.

A tobacco tenant's cabin is a typical Kentucky scene. The cabin, except for its glass windows, is practically home-made. The logs of which it is built were cut, hewn square, and fitted on the ground; the small open spaces between the logs were chinked and daubed with clay and small pieces of limestone from the branch near by. The huge open fireplace and the large chimney are made without the use of any mortar; only a small amount of heavy clay mud being used next to the logs to protect them from fire. Clapboards made from clear-grained oak are used to cover the structure. But even more typical than the cabin itself is the open tobacco shed. It is simply a cover to keep the rain off the curing tobacco, but does not protect it from driving rains or wind storms in the least.

Your correspondent was fortunate enough to see one of these primitive tobacco barns in the process of construction. The whole framework was made of tall young timber which was not heavy enough for lumber. These poles and uprights were taken from the clearing near at hand, and were dressed on one or two sides with an axe and pinned together with wooden pins, such as were used fifty years ago. The same process of pinning timbers can be seen in any of the old covered bridges in the State. The only nails which were used in the construction of the barn were those used for nailing the clapboard upon the steep roof. In this manner the cost of the whole structure in money was the cost of the nails, as everything else was made by the tobacco tenant himself.

THE DATE PALM IN QUEENSLAND.

Although the date palm flourishes so well in many parts of the State, yet it apparently takes a longer time to bear in some parts than in others. Mr. W. A. Compton, of Mount Marlow, Proserpine, Bowen, informs us that he has a tree, eleven years old, which has never borne fruit. He obtained the seed from Myrtle Brook, only 6 miles away, from bearing trees on the Messrs. Bradley's property. Mr. Compton does not state how old the latter trees are. At Lake Harry, in South Australia, the palms flowered at four years old. At Helidon, below the Main Range in this State, they bore on Mr. Pentecost's farm in fifteen years. In Egypt, the average time before bearing is from five to six years.

It might be supposed that Mr. Compton's tree is either a male or female, and hence not fecundated, but it does not appear that a male plant is absolutely necessary to induce a female plant to bear dates. It is, however, probable that such dates would not be fertile. Again, plants raised from the seeds of imported dates take many years before fruiting. Offshoots from fruiting plants are the best to plant, as these will fruit in about five years. There are several varieties of the date palm, which are, however, useless, except for decoration purposes. Therefore care should be taken to obtain the true palm, *Phœnix dactylifera.*

In response to our invitation to growers of date palms to supply information to the *Journal* as to their success with this fruit, Mr. J. D. Wilson, of Howdonville, near Beerburrum, writes:—I have at present six date palms grown from seeds picked up in Edward street in April, 1892. They were planted in a flower bed, and all (about three dozen) germinated. When ready for lifting, I put some into small boxes, and left nine or ten growing in the original ground. For want of proper attention, those in the boxes died off in a year or so. Two I put out on the poorest land I have—a mere sandbed with a stiff subsoil. These are now from 5 to 6 feet high to the tops of the leaves. In the case of four other plants, I dug holes about 6 feet in diameter and planted them after they had been four years in the seed bed. As I was told it would be fifteen years before they would bear, I took no particular trouble about them, and for the first year one could not tell whether they were dead or alive. But they are now beginning to grow. There are two trees also at Mr. Peters's slip, at Kangaroo Point. These have fruited, and I tasted the fruit two years ago, but to my taste it was rather insipid.

ANALYSES OF TOBACCO SOILS.

AMERICAN AND QUEENSLAND SOILS COMPARED.

By R. S. NEVILL, Tobacco Expert.

In order to give those who may contemplate tobacco-growing an idea of the character of the soil likely to produce the best quality of tobacco, I herewith submit an analysis made by Mr. Brünnich, together with his foot-note, of some of the best American tobacco soils and of the soil of Texas (Queensland). It will be borne in mind that these soils grow only the heavy or export types of tobacco. This analysis shows a great similarity in all of these soils, and, I may state, corresponds very closely to the analysis made by the United States Department of Agriculture as to their physical properties.

These soils are all in limestone country, which is nearly always the case where our best heavy tobaccos grow. It may be well to state that very heavy soils, producing rank growth, never produce good tobacco. All tobacco land should be well drained. It may be well for the further information of intending growers to quote from the United States Bulletin No. 11, Division of Soils, that they may understand that all does not depend upon soil:—

EXPERIENCE THE ONLY SAFE TEST OF CLIMATE FOR TOBACCO.

One must still judge, so far as the climate is concerned, mainly from the experience of others as to the class of tobacco to be raised, as the ordinary meteorological record will be of very little value in determining this point. The plant is far more sensitive to these meteorological conditions than are our instruments. Even in such a famous tobacco region as Cuba, tobacco of good quality cannot be grown in the immediate vicinity of the ocean or in certain parts of the island, even on what would otherwise be considered good tobacco lands. This has been the experience also in Sumatra and in our own country, but the influences are too subtle to be detected by our meteorological instruments.

Little, therefore, can be said at the present time in regard to the suitable climatic condition for tobacco of any particular type or quality.

SOILS OF THE TOBACCO DISTRICTS.

Under given climatic conditions the class and type of tobacco depend upon the character of the soil, especially on the physical character of the soil upon which it is grown, while the grade is dependent largely upon the cultivation and curing of the crop.

DESCRIPTION AND ANALYSIS OF SOILS.

—	American Tobacco Soils.								Queensland Tobacco Soil.	
	Valley Soil from Davis County, Kentucky.		Upland Soil from Henderson County, Kentucky.		Valleyland Soil, Henderson County, Kentucky.		Valleyland Subsoil, Henderson County, Kentucky.		From Texas District.	
Properties of the Soil—										
Reaction	Neutral.	...	Neutral.	...	Neutral.	...	Neutral.	...	Neutral.	
Weight of soil per acre, 6 in. deep ... tons	731	...	790	...	805	...	774	...	806	
Capacity for water ... ... °/o	55·2	...	47·6	...	52·4	...	54·0	...	56·4	
Absorbed weight per acre, 6 in. deep tons water	403	...	376	...	422	...	418	...	454	
Capillary power, after 6, 12, 24, 36, and 48 hours	9¼, 11¾, 15¼, 19, 22 in. high	...	9¾, 12, 15, 19¼, 22½ in.	...	8¼, 10¾, 14¾, 19, 22 in.	...	8¾, 11¼, 15, 18¼, 21¼ in.	...	6½, 10, 12½, 15½, 17¾ in.	
Absorptive powers for salts ... c.c. nitrogen	70 c.c.	...	...	...	62 c.c.	...	64 c.c.	...	66 c.c.	
	Ordinary Elutriat.	Schöne's Elutriat.	Ordinary Elutriat.	Schöne's Elutriat.	Ordinary Elutriat.	Schöne's Elutriat.	Ordinary Elutriat.	Schöne's Elutriat.	Ordinary Elutriat.	Schöne's Elutriat.
Mechanical Analysis of the Soil—		Diam. of grains.								
Stones over 5 mm. diameter ... ... °/o	Nil.	·1-·2 mm. = 15·79°/o	Nil.	13·02	Nil.	·1-·2 mm. = 11·81	...	10·25	...	29·28
Gravel over 2 mm. diameter ... ... ,,		·05-·1 = 23·99		19·76		·05-·1 = 17·77	Nil.	21·88	Nil.	7·58
Sand (fine) ... ... (Fine earth ,,)	43·72	·02-·05 = 29·61	37·59	39·51	34·81	·02-·05 = 36·99	34·57	33·15	37·25	19·58
Fine sand (very fine) ... (Fine earth ,,)	30·00	·01-·02 = 7·59	40·06	4·76	38·06	·01-·02 = 7·97	38·19	9·91	30·54	12·23
Clay ... ... (Fine earth ,,)	15·64	Clay = 12·38	15·84	17·44	19·76	Clay = 18·09	19·34	16·91	24·97	24·09
Organic matter and moisture (Fine earth ,,)	10·64	= 10·64	5·51	5·51	7·37	= 7·37	7·90	7·90	7·24	7·24
Vegetable fibres and roots ... ... ,,	Traces	...	Nil.	...	Traces	...	Nil.	...	Traces	...
	Agric. Analysis.	Absol. Analysis.	Agric. Analysis.	Absol. Analysis.	Agric. Analysis.	Absol. Analysis.	Agric. Analysis.	Absol. Analysis.	Agric. Analysis.	Absol. Analysis.
Chemical Analysis of the Soil—										
Moisture ... ... ,,	2·572		1·168		1·970		2·092		2·288	
Humus (humic acid, &c.) ... ... ,,	5·798	10·636	2·980	5·508	3·765	7·372	3·490	7·904	3·346	7·244
Other organic matter and combin. water ,,	2·266		1·360		1·637		2·322		1·610	
Chlorine ... ... Cl ,,	·008	·008	·005	·005	·007	·007	·006	·006	·009	·009
Carbonic acid ... ... CO_2 ,,	·322	·322	·108	·108	·195	195	·220	·220	·120	·120
Total nitrogen ... ... N ,,	2·46	...	·134	...	·202	...	·110	...	·179	...
Soluble in HCl of 1·1 sp. gr.—										
Sol. silica ... ... SiO_2 ,,	·016	Diff. 69·496	·015	78·292	·041	75·707	·009	74·308	·182	71·191
Sulphuric acid ... ... SO_3 ,,	·061	·061	·039	·039	·041	·041	·025	·025	·117	·117
Phosphoric acid ... ... P_2O_5 ,,	·172	·176	·067	·072	·115	·115	·110	·114	·139	·146
Iron ... ... Fe_2O_3 ,,	3·598	14·664	2·560	11·557	2·881	12·975	2·719	13·066	2·723	4·048
Alumina ... ... Al_2O_3 ,,	3·230		2·283		3·084		2·821		5·168	12·866
Lime ... ... CaO ,,	·605	1·442	·185	·740	·265	1·122	·315	1·320	·515	1·646
Magnesia ... ... MgO ,,	·261	·565	·243	·762	·421	·743	·413	·886	·502	·840
Potash ... ... K_2O ,,	·260	1·250	·152	·956	·213	·971	·190	1·280	·489	1·275
Soda ... ... Na_2O ,,	·263	1·380	·243	1·961	·192	·752	·180	·871	162	·498
Insoluble in HCl of 1·1 sp. gr. ... ... ,,	*80·779	...	*88·681	...	*85·344	...	*85·130	...	*83·374	...
Total ... ... ,,	100·211	100·000	100·089	100·000	100·171	100·000	100·042	100·000	100·744	100·000

* Insoluble matter contains clay = 15·26 ... clay = 9·47 ... clay = 12·07 ... clay = 13·04 ... clay = 16·78

REMARKS :—Special care was taken in these analyses, and not only the ordinary agricultural analyses, extraction with boiling hydrochloric acid of 1·1 sp. gr., but also absolute analyses, by making the whole soils soluble with the aid of hydrofluoric acid, were made. The clay, also, was determined by chemical methods in the matters insoluble in HCl. The elutriations of these very finely textured soils were also made by two different methods, the clay found by both methods agreeing fairly well.

The analyses show that our Queensland tobacco soil resembles the samples of American tobacco soils very closely. The Queensland soil contains a little more of the coarsest sand, and also a little more clay; it is also not quite so porous, with regard to capillarity for water, as the American soils.

The absorptive powers for salts are in all soils rather low, as compared with some of our fertile heavy Queensland soils, which reach an absorption co-efficient from 200 to 300; it means that if the soils are heavily manured oss of manure may easily take place.

GINSENG CULTURE.

Seven thousand pounds per acre for a crop seems an incredible return, yet it is quite within the bounds of possibility. There is a root called "Ginseng," which is highly esteemed for its medicinal properties by the Chinese, who give enormous prices for it. The *Encyclopædia Britannica* says it is the root of a species of *Panax* (*P. Ginseng*). The demand for it is so great that many other roots are substituted for it, notably *Panax quinquefolium*, distinguished as American Ginseng, imported from the United States. The ginseng prepared in Corea is the most esteemed variety. Lockhart says that all the ginseng collected in China is imperial property, and is sold to those who have the privilege of dealing in it at its weight in gold.

Ginseng of good quality generally occurs in hard, rather brittle, translucent pieces, about the size of the little finger, and varying in length from 2 to 4 inches. In price it varies from 6 or 12 dollars to the enormous sum of 300 or 400 dollars an ounce—that is to say, from 24s. or 48s. to £60 or £80 per ounce. [Presumably the prepared article.—Ed. *Q.A.J.*]

Now, we ask how it comes about that a root which is as easy to grow as yams or cassava or ginger is not grown universally in tropical or semi-tropical countries? In Manchuria it grows wild, so it does in Corea, and it is also cultivated in those countries.

Here is what a farmer of New Mexico (U.S.A.) writes about the plant and its cultivation to the *Florida Agriculturist*:—The increasing scarcity of ginseng, together with the high prices paid for it, drew my attention to its cultivation for the market. There is no question but that the plant can be as easily grown as any other cultivated plant, provided it is furnished with the right kind of soil and with shade. It was my plan to follow Nature as near as possible, and consequently I began planting the roots and seed in the rich fertile soil of the forests where there was plenty of natural shade. But, with the experience I now have, I think garden culture with artificial shade or lattice shade is the best. Yet one can grow it successfully in the forest. Lattice shade is more manageable and economical of space. In the forest the plants are checked in their growth by the trees absorbing the moisture, while under the lattice work they have a more thrifty appearance. Open field or garden soil, suitable for growing garden vegetables, is preferable. Old worn-out land can be made profitable by planting it in ginseng if made rich by the use of fertiliser.

I consider ginseng the most profitable crop grown, as but little land is required, and, if properly cared for, will yield a greater profit than many large farms. It requires no great amount of money invested in lands, no expense in building large barns to store your grain, and no expense for stock or help. In fact, it is one of the best occupations one can get into. If our farmers would investigate such a valuable industry as ginseng and grow more of it, in a few years they will find themselves prospering. The demand far exceeds the supply, and it will be many years before the supply of cultivated ginseng will change the price of the root. There is ready sale for it at all times, and it is a sure crop, standing drought better than any other plant.

What ginseng wants most is soil rich in vegetable matter, moisture, and shade. It is of such a nature that it propagates itself by means of its seed only. When seed are planted they produce roots; when roots are planted they produce seed. The bud at the top of the root makes the next year's plant and seed crop. The root sends up each year a new stem, leaving at the top leaves, flowers, and berries. The berries are the seed. Ginseng increases very fast. Plants two years old produce seed. At the first seed crop each plant produces about ten seed, the second about twenty, and the third about forty, and so on, doubling itself every year. Ginseng should be seven or eight years old before digging, as the root continues to grow all the time, and the larger the roots the more valuable they are. Plant a bed every year, and in a few years you can have a bed to dig for market each year. Well-dried ginseng root is worth now from 4·25 dollars to 5·75 dollars (18s. to £1 15s.) per lb., and the cultivated root is worth still more, and is more even in size, of a nicer shape, and better in every way than the wild root. My lowest estimate on 1 acre planted in ginseng, and allowed to grow for five years, at the price it is sold at to-day, is 35,000 dollars (£7,000) for roots alone, and the seed crop on 1 acre for five years would be great. You can always find a market for your seed. There are but few ginseng farms in the United States at the present time, but in my opinion in the next ten years there will be a great number.

[The only wonder to our mind is that there are not already hundreds of ginseng farms in the United States. Five ½ acres should satisfy any reasonable man's desires.—Ed. *Q.A.J.*]

THE ROMA CO-OPERATIVE FLOUR-MILLING COMPANY.

Ever since this *Journal* was presented to the agricultural world, we have persistently advocated co-operation amongst farmers of every branch of their profession, but the idea is very slowly being absorbed by the conservative agriculturists.

We have, however, one good instance of the value of co-operation in the case of the abovenamed milling company. In an exhaustive report sent to us from Roma, the history of the formation of this company is detailed at length, and we regret that, owing to exigencies of space, we are unable to publish the voluminous extracts on the subject taken from the *Western Star* and *Maranoa Advocate*. The history of the successful establishment of the company, which was mainly due to the energy and enthusiasm of Mr. F. E. Glazier, one of the present directors, and Messrs. T. Shanahan, J. Nimmo, G. Horneeks, of Wallumbilla, Mr. P. Fallon, Mitchell, and Mr. J. M. Hunter, who has been the backbone of the mill, is detailed in the above journals.

On the 22nd March, 1898, matters were so far advanced that a provisional directorate was formed; and four months later 2,630 shares had been taken up, the deposits were paid, and the company was declared floated.

When the tender for the erection of the mill was accepted, the company's credit balance was a little over £2,000, including £1,750 Government advance, the latter to be repaid in fourteen years with 5 per cent. added. The price of the mill to be handed over in working order was £2,287, and was erected on a piece of freehold land 3 roods 7 perches in extent, purchased at the upset price of £100 per acre.

The whole of the material and plant was conveyed by rail at a reduced rate of 50 per cent.

On 26th April, 1900, the mill started gristing, and everything was found to run smoothly. Up to this time, the total cost had reached to something over £3,672—£1,500 of which had been received from the Government in consideration of a bill of sale and mortgage covering the entire property.

At the end of the first year it was resolved to pay the managing director £50 per annum, and each of the other directors 10s. per monthly sitting.

In October, 1900, £370 was expended in building a wheat shed estimated to store 12,000 bags of wheat.

At the third annual meeting in 1901 the directors, notwithstanding the adverse season, had a most satisfactory report to lay before the shareholders, there being a profit of £572 16s. 8d. for the time the mill had been at work. After writing off 2½ per cent. on the value of the machinery, plant, buildings, &c., a dividend of 5 per cent. on the subscribed capital was paid in paid-up scrip, and £140 11s. 8d. was placed to a reserve fund.

In moving the adoption of the report, the chairman said that never in the history of Roma had better prices been paid for wheat when the price paid for flour was considered. This was largely due to the farmers having a mill of their own.

Forestry

IN CONNECTION WITH THE SAND DUNES OF QUEENSLAND.

By A.J.B.

MANY parts of the coast of Queensland are remarkable for the sand dunes which, in some localities, attain considerable elevation and gradually work their way inland. Wherever the natural coast timber, whether mangrove or cypress pine, has been destroyed, there the sea and the winds combine to form banks of sand which shift at every occurrence of a storm. From the Tweed River on the Southern border to Southport, and beyond Brisbane at Caloundra, the same thing may be observed. Stradbroke Island, which forms, with Moreton Island, the sheet of protected water called Moreton Bay, is practically an immense dune, 40 miles long by 6¼ miles broad, with an average width of 3 miles, the maximum height being 739 feet. This island is protected by a dense growth of scrub timber, but the northern and southern extremities are periodically washed away, and re-made on the occurrence of strong south-easterly winds. On the southern coast at Swan Bay to the south of Canaipa Passage, the sea, during a storm, broke through the great dune at a place formerly known to boatingmen as Jumpin-pin, and which forms the eastern shore of the Bay, burst through the dune and made a very extensive opening, which daily widens by the washing away of the sand. At present the opening is nearly 1½ miles wide. The same thing occurred at Mackay, in North Queensland. To the north of Townsville the coast dunes are extensive, but the natural growth of timber prevents them from shifting inland. As before stated, where the timber has been removed, the sand accumulates and encroaches upon the land. This is greatly in evidence at Southport, where the dune is piled high above the main roadway of the township. Inland the shifting sands are a source of great trouble to the residents. A large portion of the township is built on a second dune, and some again on a third.

The third dune, and in many places the second, is covered with a dense growth of timber which has sprung up owing to the protection afforded by the littoral dune. But the very fact of the timber growth, and especially of the luxuriant undergrowth, has led to the destruction of large areas. Were there none of this undergrowth the large trees would be safe from destruction, because with plenty of clear space the easterly winds which, in this district, blow the sand into hills wherever the slightest obstruction in the shape of marrem-grass (*Psamma arenaria*) or the trailing Ipomæa (*Pes-caprae*) occurs, here meets with no obstruction, consequently no dune is formed and the trees are safe. Wherever there is any undergrowth a dune will form, and it will continually grow higher and move further inland as the easterly gales drive the sand from its summit against the obstruction. Thus the sand may be seen rolling down like a river from the land side of the dune, slowly but surely engulfing the timber. This is clearly shown in the accompanying photographs. In the first may be seen the forest in process of destruction. The undergrowth has all been buried, and the trees, which are nearly all dead, are engulfed to a depth of from 15 to 20 feet. The second picture shows how large trees have been buried, killed, and have decayed beneath the sand, and finally have been uncovered only to go through the same process again.

At the spot shown in the fourth picture enormous trees have been buried. About two years ago, during a tremendous south-easterly gale, the sea washed away the sand and left an immense hole, having an area of a couple of acres. Here could be seen trunks of large trees which had been buried for an unknown period. Shortly afterwards the hole was filled up by the sand, which encroached on the dune, as here depicted, and buried the trees seen in the foreground in the fifth picture. Fig. 6 illustrates the surface of the dune with patches of marrem-grass, which are alternately buried and exposed, whilst in Fig 7. may be seen the littoral dune, in rear of which is a second, and the third in the background is heavily timbered, but is being encroached upon not only by the sand, but also by the sea, which threatens to break through the dunes and roll into Nerang Creek, which is shown in Fig. 8. The bank of the creek here depicted is merely the third dune. The sea has broken through the littoral dunes, and efforts are being made by the Port authorities to prevent its incursion at a spot a little beyond the scrub on the left, by means of fascines lashed to the bank. The nearness of the catastrophe may be deduced from Fig. 9, which shows the high-water mark on the seaside and the creek in the background.

Coming into the township of Southport, the encroachments of the sand are very marked. For instance, trees planted on the street side, and protected by posts and palings, have been completely buried and killed, as shown in Figs. 10 and 11, whilst the process is still in progress in Fig. 12. The two next illustrations show the intrusion of the sand on the sea-wall, which is covered for several hundred yards, and on the approach to the jetty, where men are daily employed in shovelling away the sand which has already covered the top of the handrail.

Fig. 15 gives a very vivid idea of the enormous quantities of sand blown on shore. The timber structure uncovered constituted an attempt to preserve the foreshore, and arrest the progress of the sand. The concrete structure on the left is the new sea-wall in process of erection. The dune on the right will show to what a depth the log wall was buried.

Finally, Figs. 16 and 17 are illustrative of the flow of the sand over the main street, and even across it to the grassed and wooded dunes beyond.

Having thus shown the irresistible advance of the dunes, the question next arises : How is it to be prevented ? I need not here detail what has been done in Europe and in America, when thousands of pounds have been expended, notably in France and Holland, to check the advance of the enormous sand-dunes, which have overwhelmed whole villages and fields. Space will not admit of an account of this work. Suffice it to say that the work has been carried out successfully and eventually with profit to the State.

It is generally supposed that sea-sand is the most barren of all soils. Probably, if sea-sand were carefully washed and burnt, it would be so, but as it is constituted, it contains a considerable quantity of plant food, such as lime, and an intermixture of humus from sea-weed, &c. This being so, we have a starting point from which to proceed to arresting the inland movement of the dune. The littoral dune affords very little scope for the forester's art. Nature shows clearly that nothing in the way of tree-planting is likely to succeed on the white shifting hill facing the sea. But it is by the help of this dune that we are enabled to arrest the progress of the others.

All along our coasts we see that marrem-grass and the Ipomæa thrive. Wherever these are growing thickly, the sand is fixed. Now, if the littoral dune is bare of any binding grass, the sand will drive off its summit and gradually advance inland, but once fix the sand of this dune, and, provided that its height is from 30 to 40 feet, a protection is afforded for operations on the second, and here the work of tree-planting should be done. What trees to plant would be matter for experiment, but the Cluster Pine (*Pinus pinaster*), the Cypress Pine, and some other varieties would be eminently suitable, the latter being indigenous. If young plants of these or their seeds, preferably the latter, were set under the lee of the littoral dune, they would make rapid growth, and in the course of a few years would form a source of income to the

Plate XII.

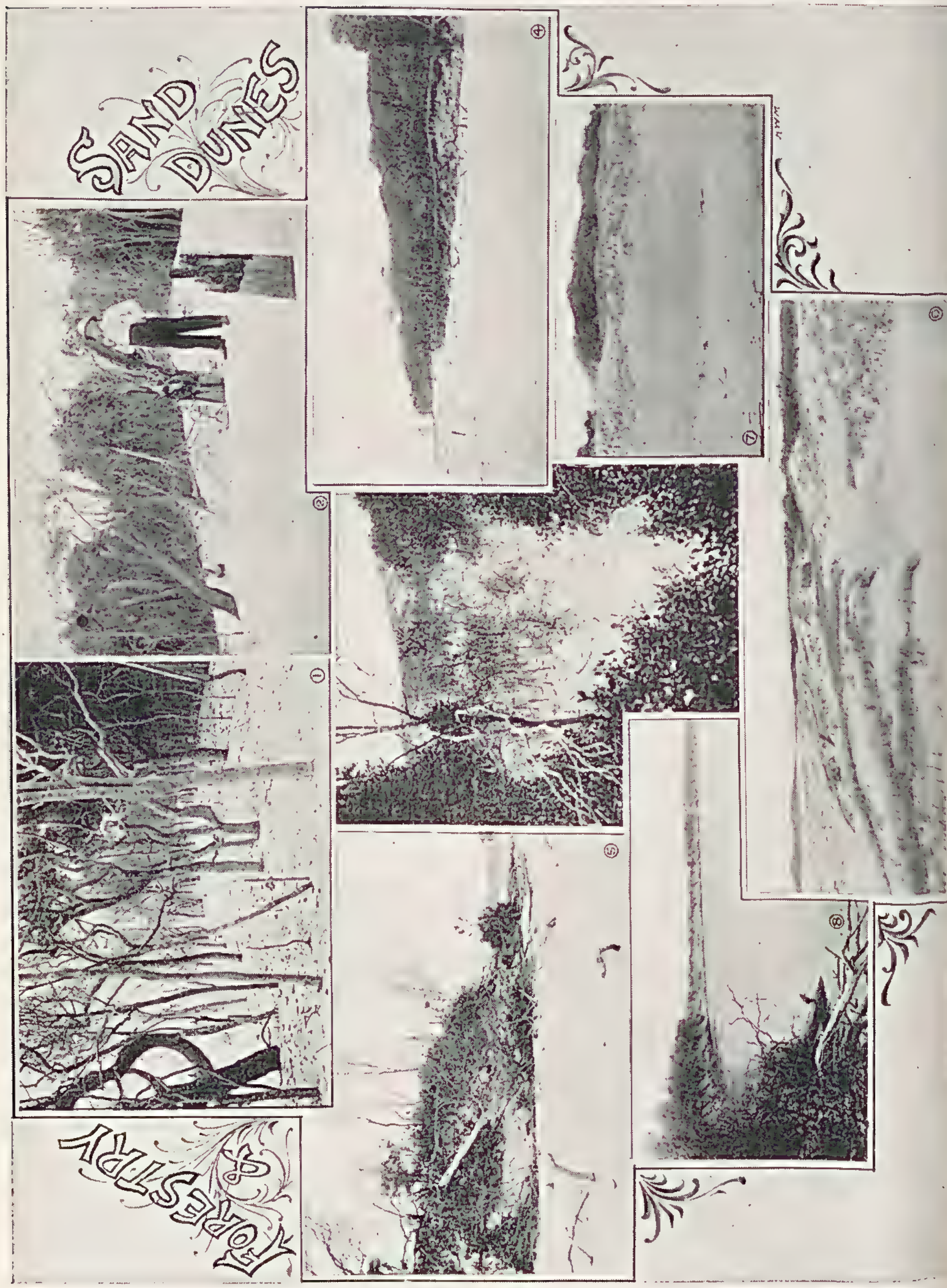


Plate XIII.

municipalities or divisional boards concerned. Why should thousands of acres of at present absolutely useless sand-hills for ever remain useless? Experience has shown that the barren-looking sea-sand which is driven before every gale, and piled up in vast mounds along miles of beach, is able to produce a splendid growth of forest timber, and to produce it at a most remarkable rate. All that is required is that the planted areas be protected until the growth is established.

Professor John Gifford, D. Œc., who has had great experience in the matter of afforesting sand dunes, in an interesting report on the Forests of the State of New York, describes how the fixation of the dunes on Cape Cod was accomplished. These dunes were the result of the ruthless destruction of the timber over several thousands of acres of land. After 63,000 dollars had been expended in building jetties, sea-walls, &c., which were all either buried in the sand or carried away by storms, and in the planting of beach-grass to bind the sand, the Hon. Leonard W. Ross was consulted, and he commenced work on the extreme outside dune (there are three of them) in the most exposed part. First the base sand which was blown inland was fixed by planting clumps of beach grass (*Calamagrostis arenaria*) in alternate rows 18 inches apart. Then a woody growth was established of *Pinus maritima*, *Pinus Austriaca*, *Pinus rigida*, *Pinus Sylvestris*, *Quercus rubra*, &c., which were found to succeed the best. A nursery was established in a sheltered spot, where many thousands of young plants were produced. These were afterwards transplanted to their permanent situations. It was soon found, however, that this process was too expensive, and that direct seeding produced very satisfactory results. Once the outside dune was fixed (this was in 1895), operations were begun on the greater area to which the sand from it was blown. Again, pines and oaks were planted alternately, and in 1898 they were all thriving and healthy, averaging from 12 inches to 30 inches in height. The problem was solved, and the progress of the dunes was not only arrested, but a large area of hitherto valueless, barren sand was turned into a waving forest.

It is clear from this that to attempt to reclaim the beaches here on a large scale would be beyond the power of private individuals or municipal bodies. It is a matter for the State to undertake. To some extent the planting of sandy areas has already been done by the Government, notably at Fraser's or Great Sandy Island, which forms Harvey and Wide Bay. The work has proved fairly successful, and, doubtless, under our newly formed Forestry Department, much more will be done in this way once the revenue of the State has recovered from its late depression. The town lands of Southport, however, could be to some extent reclaimed at no very great expense. In a future issue I shall deal with the sand dunes at Caloundra to the north of Brisbane.

FORESTRY IN THE PHILIPPINES.

The people of the United States are nothing if not practical. Like their British cousins, they carry their civilisation, their manufactures, their industries, and their institutions into every land they enter. So in the Philippines, the excellent forest laws of the United States have been introduced with the best results, backed up as the Americans are by the most enlightened of native chiefs, such as the Sultan of Moro. A New York journal, the *Weekly Post*, says:—

The Moros are proving effective allies in the matter of forestry, which, to our credit be it said, is conducted in the Philippines more extensively and intelligently than we have seen fit to insist upon at home. The bureau was organized by Captain George P. Ahern, of the Ninth Infantry, upon the Spanish system, already in force here for half-a-century, but more particularly modelled upon the successful form practised in India and Java. We have at present in the archipelago 40,000,000 acres of protected forest, in which concessions for one year are granted under conditions. No tree less than 14 inches in diameter may be cut, and in some species even larger ones are preserved, while certain rare or especially valuable varieties may not be taken at all. The method of felling is also insisted upon, and is planned to injure as little as possible the trees remaining.

A COLONIAL EXAMPLE TO THE EMPIRE.

It is a delight to learn of the intelligent attention given this important subject here, although trained American foresters are so rare that some of the offices provided for by Congress are still unfilled, owing to the lack of men competent to fill them. Many of the assistants under Mr. McCabe, now Chief of the Bureau, are Filipinos, and in Mindoro a Moro chief, the Raja Mujdi Mandi, is doing excellent work in looking after all the trees in his province. He is greatly interested in the subject, and sees that the rules are enforced, as no American could do. The Moro method of dealing with infringements is summary and necessarily successful. Heads fall easily under Moro rule. Concessions, however, are withdrawn by the bureau in every case if conditions are not complied with.

Four islands are especially well wooded, Mindoro, Paragua, Mindanao, and Basilon, 5,000,000 acres in the first alone being public forest land. Already 884 kinds of trees have been classified, and frequently squared logs from 90 to 120 feet in length are obtained. If Congress but ratifies permanently the fine provisional regulations now in force, we shall be spared the humiliating and disgraceful spectacle so frequent at home of miles of forest cut down indiscriminately, even to saplings, and then burned over, to "clean up" the *débris;* and our islands will yield a rich revenue from their wealth of timber, scarcely diminished as future generations come upon the scene. In the matter of gutta trees especially the wasteful native method of felling the tree to obtain an inferior and impure quality of gutta is being replaced by the far more remunerative and merciful way now prevalent in Java, of gathering the precious sap from the leaves and bark. A purer article results, and the tree is uninjured, while producing even more in quantity.

THE FOREST QUESTION.

The coal scare is followed by the timber scare. Increasing demands from Great Britain and Germany (the *Westminster Gazette* says) are faced by decreasing supplies from Norway, Russia, and Hungary. During the last few years the average annual value of wood imported by Great Britain has been about £22,000,000, while Germany has backed a similar bill to the amount of £14,000,000. Europe for the first time is unable to meet the whole demand;

and for the balance we must look to Canada, Australia, and elsewhere. The outlook is not inspiriting. Our colonies are already importing timber to the amount of £18,000,000 per annum. That is bad enough in itself. But inextricably interwoven with the question of timber supply is another matter which might at first sight seem to be quite unconnected with it. What effect will the stripping of a country of its forests have upon its climate? It is not quite a foregone conclusion to the expert that extension of forests increases the rainfall. But it is certain that districts well clothed with plants and trees have a climate which is thereby rendered more temperate and uniform. The reason is not far to seek. In the daytime a large amount of the sun's rays, which would otherwise reach the earth's surface and heat it, is expended on the vegetation. At night the radiation of the heat from the ground is checked, and thus the rate of fall of temperature is decreased. The constant evaporation which is always going on from leaves, &c., plays its part in the general phenomena, for by it the atmosphere is made cooler. In this way the forests affect the humidity of the air. With moist air there can be neither excessive cold nor excessive heat. Nor must it be forgotten that in tropical regions trees have an influence on the spread of malaria, and will often afford considerable protection to a district from the assault of destructive storms.

Can we, therefore, conclude that by afforestation or by disforestation we are able to influence appreciably the climate of a district? The answer is that not only can we do this, but *ipso facto* we can affect the adjacent districts. Let us take an illustration. Bosnia is a country enjoying the possession of vast forests, and is separated from the sea by great mountain ranges rising in the Dinaric Alps to some 6,000 feet. Herzegovina, to the south of Bosnia, has hardly any forests at all. To the west of Herzegovina, towards the middle of the Adriatic, is the island of Lissa, name of ill-omen in the records of the Italian Navy. The summer temperature of Bosnia is from 4 to 8 degrees Fahr. cooler than in the more southerly Herzegovina, and nearly 2 degrees below that of the sea-girt Lissa. Or, again, take the shores of the Caspian. On the western coast we have a great forest region. On the east extend countless acres of desert sand and stone. The result is a summer cool and dry at Lenkoran, but intolerable on the opposite coast of the great inland sea. Thus, results of the most unexpected and far-reaching nature may be the outcome of the ill-considered disforestation of a country. In the course of the last thirty years the hard-worked members of the Indian Forest Service have done work that can only be characterised as invaluable. It is possible that in the comparatively near future the forests of the Indian Peninsula may be among the most valuable assets of the Indian Government. It is to be hoped that Australia, the home of the karri and jarrah, is alive to the consequences of uncontrolled denudation. Forestrial meteorology may some day be as pressing a question as any that a Government may have to face. From the purely sentimental point of view, the destruction of recent years is enough to make Dante turn in his grave.

THE SPRUCE FORESTS OF CANADA.

Canadian spruce forests, says Mr. J. C. Langelier, Superintendent of Forest Rangers of Quebec, will supply the world's demand for pulpwood alone for 840 years, on the basis of 1,500,000 tons annually of manufactured pulp. The latter amount is equal to about the present total annual production of the United States. The extent of the spruce forest remaining untouched in the four provinces is given as follows:—Ontario, 52,818,420 acres; Quebec, 144,363,454; New Brunswick, 11,224,540; and Nova Scotia, 10,853,544 acres. Out of over five billion feet board measure of spruce timber consumed for all purposes in 1900, 130,400,000 feet B.M. represented pulpwood; and of this 30 per cent. was exported to the United States.—*Engineering News.*

Science.

NOTES ON OVARIOTOMY AS APPLIED TO MARES.

By G. R. GAGGIN, Student of the Melbourne Veterinary College.

Several years ago I visited France, and during my stay in that country received special instruction in the art of speying dairy cows. And during my attendance at the Alfort College the operation of ovariotomy was performed on a number of mares. I took particular notice of two of these "cases," an account of which may be of interest to readers of the journal.

The subject of the first case was a very valuable racing mare, aged six years, and was the property of a wealthy French count. The mare was very fast, and had won every race in which she ran, except during "the season," at which period she would very often disappoint her backers—for, if started in a race while "in season," and in which stallions or even geldings were running, she could not be induced to go to the front or pass her male competitors, and had never run into *first* place in any race during the four months of the year known as "the season," though, as before stated, she invariably won during any other time of the year. Her owner endeavoured to overcome the trouble by various "home-made" remedies, but without success. He then consulted a member of the veterinary profession, with the result that he decided to have the mare "speyed." With this object in view she was removed to the College Hospital, and there kept on a low diet for several days previous to being operated upon. Professor Cadiot undertook the operation, which was performed with complete success, the mare recovering from its immediate effects within a few days. She was, however, kept in a loose box in the infirmary for three weeks after the operation, being fed on a suitable diet and carefully watched during that time, and was then returned to her owner in good health and spirits.

Eight weeks after being operated on the mare was put to work, and, as I subsequently learned, her owner and others interested had good reason to be pleased with the results of the operation—the mare winning many big races, several of which were won during "the season."

I may add that the mare's trainer complained that after "alteration" she was inclined to put on too much flesh, and required "more whip," though he admitted she was "all there" when called upon by her rider.

CASE No. 2.

Subject.—A highly-bred saddle mare, aged eight years. This animal had for years been suffering from "general cussedness" She was possessed of a most vicious temper, continually showed signs of being "in season," and behaved in many ways like the nymphomaniac cow. Very often when approached she would kick, bite, or strike most treacherously with her fore limbs; had caused the death of one man and crippled several others, besides blemishing several animals of her own species. As she became almost unmanageable, and could never be trusted, her owner had decided to destroy her, when, someone suggesting speying as a remedy, he agreed as a last resource to give it a trial. The mare was admitted to the College Hospital, and treated in a like manner to No. 1, ovariotomy being performed successfully, and with no bad after-effects.

The removal of the ovaries in this case had a most marked effect upon the character and disposition of the animal—this vicious, uncontrollable, and hitherto useless mare became after the operation in a double sense an "altered" creature, never exhibiting any of her former wicked and unnatural habits, but on the contrary becoming gentle and submissive. Thus, by a skilfully performed scientific operation, the life of this animal was saved, and she became an obedient and useful servant to her human master.

In the cases which I have recorded ovariotomy was performed by the vaginal method, and the strictest antiseptic precautions were taken. The only instruments used were a bistoury caché and an écraseur, specially designed for use in the vaginal operation, and properly called the "ovarian extirpator."

Should readers of this journal care to be made acquainted with the mode of using this new instrument, I shall be pleased to give full particulars in a future issue.

The advantages of ovariotomy in relation to troublesome and vicious mares are very apparent, and in my opinion should not be overlooked.—*Australasian Veterinary Journal.*

DRIED BLOOD.

A cheap and rapid method for concentrating the quantities of blood collecting in abattoirs is described by its inventor in the *Technische Rundschau.* The blood is injected in a finely pulverised state into an oven-shaped chamber open at the top and brought into contact with a current of hot air ascending from below. All the water is evaporated in this manner, and the blood is carried to the receiving chamber. According to the inventor, the powder thus obtained is tasteless and contains 74·8 per cent. of digestive albumen.

A BRANDING MIXTURE.

The *Breeders' Gazette* says:—We have had several complaints that druggists are in doubt as to compounding the formula for the New Zealand chemical branding mixture as published some months ago. The directions, as we printed them, are as follow:—

Barium sulphite and coal tar, thinned by equal parts of American potash and water and spirits of turpentine, each equal in measure to the original composition.

We found no difficulty in understanding these directions, but for the benefit of those who are puzzled we put them in the form of a prescription, with full directions, as follows:—

	Oz.
Barium sulphite	16
Coal tar	16
Mix thin with	
American potash	32
Turpentine	32
Water	32

Mix the barium sulphite and coal tar thoroughly as is required by the nature of the two substances. Mix the three last named—potash, turpentine, and water—also as required by their nature so as to secure perfect fluidity and amalgamation. Gradually then incorporate the two masses.

A correspondent reports that he has had good success by clipping the hair from the point at which he wishes to apply the brand, but from the experience of others this is not necessary. The same correspondent states that a wooden brand will answer quite as well as one of iron.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1900.	1901.											
	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
North.													
Bowen	2·30	17·25	6·23	8·26	4·75	0·94	0·19	0·10	6·36	0·18	0·93	0·92	0·71
Cairns	4·19	11·53	22·09	14·93	8·87	13·18	0·57	0·89	2·53	1·82	2·34	5·23	2·78
Geraldton	18·68	23·32	32·93	37·64	26·10	26·72	1·21	2·58	11·77	3·37	3·85	6·45	1·60
Herberton	4·01	8·25	4·16	10·95	2·87	3·80	0·18	0·64	2·53	1·04	4·92	1·13	1·30
Hughenden	0·61	1·62	1·41	2·82	1·74	3·48	0·03	Nil.	0·33	Nil.	0·31	0·29	1·43
Kamerunga	2·38	15·91	22·36	13·09	9·57	13·18	2·09	2·60	1·94	1·72	1·19	5·74	2·16
Longreach	0·11	0·41	0·22	3·09	2·56	5·95	0·09	Nil.	0·37	0·58	Nil.	Nil.	1·71
Lucinda	2·48	31·80	24·76	15·78	9·16	8·63	2·89	2·17	5·89	0·30	2·59	Nil.	0·32
Mackay	7·00	24·85	8·99	10·13	6·80	1·32	0·25	1·07	5·14	2·29	1·35	1·85	0·71
Rockhampton	0·68	0·49	8·26	5·53	2·84	0·79	0·24	2·29	3·04	1·78	0·51	0·41	0·19
Townsville	0·76	14·91	12·94	4·95	3·13	0·74	0·32	0·19	1·87	0·14	0·90	0·16	0·61
South.													
Barcaldine	1·20	0·15	1·17	3·70	1·90	2·21	0·82	0·63	0·25	0·51	0·54	0·55	0·09
Beenleigh	1·49	5·99	4·30	11·44	4·17	4·55	4·15	1·34	4·49	0·70	3·35	1·35	0·14
Biggenden	0·06	1·11	2·55	6·19	6·35	1·47	1·56	0·74	2·81	2·11	1·35	0·47	0·92
Blackall	0·17	0·29	0·90	2·28	3·96	3·80	0·90	0·55	0·44	0·88	0·60	0·97	0·32
Brisbane	0·55	3·43	2·96	11·70	3·10	2·29	3·29	1·31	3·71	1·30	3·25	1·41	0·75
Bundaberg	1·28	2·34	2·61	3·17	10·27	1·14	0·74	2·01	5·59	1·80	2·18	1·28	Nil.
Caboolture	2·11	1·11	5·51	11·53	4·64	3·34	2·27	3·70	3·18	1·55	5·01	3·17	3·45
Charleville	1·13	0·19	0·22	1·10	2·61	3·28	0·93	1·27	0·92	0·32	0·04	0·65	0·96
Dalby	3·37	2·89	0·44	4·77	3·12	1·12	3·59	2·83	1·66	1·11	4·09	0·15	0·42
Emerald	1·08	3·65	4·43	3·25	0·88	1·31	0·63	0·90	1·74	1·11	Nil.	0·09	0·63
Esk	1·80	3·99	3·15	8·36	4·11	1·78	2·45	3·01	3·03	1·72	4·87	1·08	2·20
Gatton College ...	0·47	6·27	1·54	6·73	3·86	1·55	2·93	1·53	3·23	1·06	3·02	0·86	0·26
Gayndah	0·08	1·22	2·10	4·22	3·97	0·97	2·32	2·29	Nil.	1·91	2·39	0·04	0·38
Gindie	1·32	1·57	1·62	2·07	0·44	1·21	0·84	1·34	1·77	1·81	0·53	0·02	0·57
Goondiwindi	0·94	0·59	0·25	3·53	1·82	1·90	1·73	2·30	1·55	0·67	2·83	0·21	0·20
Gympie	0·47	2·57	3·10	18·56	3·89	3·38	2·82	3·40	3·39	1·34	1·91	1·34	1·25
Ipswich	0·47	2·09	2·88	7·01	3·38	1·43	3·16	0·97	2·47	3·54	3·98	1·17	0·35
Laidley	0·63	4·01	1·58	6·94	3·81	1·47	2·54	2·00	5·32	1·22	3·37	1·10	1·65
Maryborough	1·18	5·03	5·51	11·76	5·58	4·09	2·22	3·07	5·02	1·05	1·54	1·84	1·54
Nambour	2·19	4·25	9·13	18·01	3·33	7·25	3·33	6·80	4·42	0·98	3·89	2·85	3·89
Nerang	2·92	4·26	4·22	14·91	5·12	5·42	5·34	0·79	5·41	0·88	4·57	2·70	0·16
Roma	3·28	1·13	0·11	1·77	1·11	1·11	2·66	2·26	0·98	0·43	0·71	0·54	0·83
Stanthorpe	2·16	1·94	0·80	3·95	2·13	0·77	2·74	1·52	4·22	1·42	2·93	2·22	1·67
Taroom	0·29	1·40	0·10	3·15	1·88	1·70	2·19	2·74	2·34	2·11	0·92	0·42	0·31
Tambo	1·52	0·52	0·51	1·66	2·75	2·85	1·47	0·73	0·74	1·47	0·51	Nil.	0·16
Tewantin	0·95	7·04	14·18	20·33	11·70	12·20	5·45	8·34	4·61	2·71	3·26	1·66	2·70
Texas	3·33	1·29	1·35	4·58	1·46	1·10	1·87	1·00	3·06	1·47	1·47	0·26	0·43
Toowoomba	2·40	3·60	1·76	6·84	6·59	1·04	3·57	2·22	5·57	1·85	4·45	1·10	0·87
Warwick	2·50	2·90	0·26	5·56	2·91	0·82	3·47	1·57	5·74	2·05	3·12	1·19	0·71
Westbrook	1·35	1·88	0·73	4·37	3·38	0·74	3·48	1·64	6·50	1·75	2·27	0·59	0·31

CLEMENT L. WRAGGE,
Government Meteorologist.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER (duty free).—Market for colonial, steadily improving. Australian, choicest, 108s. to 110s.; Danish, 118s. to 120s.; Canadian, 108s. to 110s.

CHEESE (duty free).—American, 45s. to 46s.; Canadian, 47s. to 48s.; New Zealand, 46s. to 48s.; Australian, 46s. to 48s. per cwt.

SUGAR (duties, raw, 2s. to 3s. 10d.; refined, 4s. 2d. and ¼ per cent.).—Refined, £14 6s. to £18 3s. per ton; German beet, 88 per cent., 7s. 3d. per cwt.

SYRUPS (duty, 2s. per cwt. and ¼ per cent.).—Finest, 14s. to 17s. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—6s. 6d. to 8s. 6d. per cwt.

Rice (duty free).—Rangoon, £10 to £15; Japan, £13 to £18; Java, £20 to £25; Patna, £18 to £21 per ton; Queensland (Pimpama Island), valued at £18 10s. in the London market.

Coffee (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, small to good middling, 44s. to 125s.; peaberry, 75s. to 130s.; Santos, 31s. to 44s.; Mocha, 78s. to 102s.; Jamaica, finest, 100s. to 120s. per cwt.

Arrowroot.—St. Vincent, 1½d. to 4½d.; Natal, 5d. to 8d.; Bermuda, 1s. 5d. to 1s. 8d. per lb.

Wheat.—Australian, white, 30s. to 30s. 6d.; New Zealand, white, 29s. 9d. to 30s.; Duluth, red, 30s. 6d.; Manitoba, red, 31s. per 480 lb. Eleven thousand quarters of Victorian wheat, January-February shipment, have been sold at 30s. 3d.

Flour.—Australian, 20s. to 20s. 3d. per 280 lb.

Malting Barley.—English, 25s. 6d. to 28s.

Oats.—New Zealand, 24s. to 26s. 6d. per 384 lb.; Canadian, 16s. to 28s. per 320 lb.

Split Peas.—47s. per 504 lb.

Ginger (duty free).—Calicut, good medium, 80s. to 100s.; medium, cut rough, 39s.; small, cut rough, 30s. to 34s.; Japan, rough, 42s. to 42s. 6d.; Jamaica, good bright, 60s. to 70s.; middling to fair, 40s. to 56s. per cwt.

Pepper.—Capsicums, 16s. to 80s.; chillies, 35s. to 40s. per cwt.

Tobacco.—American: Thomas H. Edwards and Co., Liverpool, report the following prices:—

STRIPS.	1901.	LEAF.	1901.
Western—		Western—	
Fillers	4½ @ —	Common export	— @ —
Rather short	5¼ „ 6	African export	— @ 5 @ 6½
Very middling to middling	6¼ „ 7	Short trade	3½ @ 4
Good to fine	7¼ „ 8½	Medium to good trade ...	4½ „ 6
Burley	6 @ 8 @ 11	Burley	7 @ 7½ @ 8
Virginia Dark—		Virginia Dark—	
Fillers	4¾ @ —	Common export	— @ —
Rather short	5 „ 6	Short trade	— „ —
Very middling to middling	6½ „ 7½	Medium trade	4 „ 5
Good to fine	8 @ 9 @ —	Good to fine trade	5½ „ 6
Virginina afd Carolina Bright—		Virginia and Carolina Bright—	
Semi-dark	— @ 6½	Common or semi-bright ...	— @ 6
Semi-bright	7 @ 7½ @ —	Medium or mixed	6½ @ 8½ @ —
Medium or mixed	8¼ @ 9½	Good to fine	10 @ 11 @ 15
Good to fine	10 @ 11½ @ 13		

Wine.—Prices remain as quoted last month.

Green Fruit.—Oranges, Valencia, from 8s. to 9s. for common sorts to 20s. to 40s. for finest selected, per 420; lemons, finest selected, 20s. to 30s. per case of 420; bananas, 8s. to 12s. per bunch.

Cotton.—Clean upland, 5½d. per lb. In America, seed cotton, 2½d.; lint, 9d. per lb.

Cotton Seed.—£6 5s. per ton.

Cotton-seed Oil Cake (decorticated).—£6 17s. 6d. per ton.

Cotton-seed Oil.—Crude, £19 15s. per ton.

Linseed.—56s. per 416 lb.

Linseed Oil.—£31 10s. per ton.

Linseed Oil Cake.—£7 17s. 6d. to £8 5s. per ton.

Manila Hemp.—£25 to £30 per ton.

NEW ZEALAND HEMP.—£33 10s. per ton.

WOOL.—At the last London sales prices remained firm.

FROZEN MEAT.—The following are the latest quotations for the various descriptions of frozen meat mentioned (last week's prices being also given for comparison) :—

	Jan. 4.	Jan. 11.
New Zealand Mutton. (Crossbred Wethers and Merino Ewes.)		
Canterbury	$3\frac{3}{8}$d.	$3\frac{11}{16}$d.
Dunedin and Southland	$3\frac{1}{8}$d.	$3\frac{7}{16}$d.
North Island	3d.	$3\frac{1}{4}$d.
Australian Mutton. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$2\frac{7}{8}$d.	3d.
Light (under 50 lb.)	3d.	$3\frac{1}{8}$d.
River Plate Mutton. (Crossbred and Merino Wethers.)		
Heavy	3d.	3d.
Light	3d.	$3\frac{1}{8}$d.
New Zealand Lambs.		
Prime Canterbury (32 lb. to 42 lb.)	$4\frac{3}{4}$d.	$4\frac{7}{8}$d.
Fair average	$4\frac{1}{2}$d.	$4\frac{5}{8}$d.
Australian Lambs.		
Prime (32 lb. to 40 lb.)	$4\frac{1}{2}$d.	$4\frac{5}{8}$d.
Fair average	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
New Zealand Frozen Beef. (Fair Average Quality.)		
Ox, fores (100 lb. to 200 lb.) ...	$2\frac{5}{8}$d.	None offering.
Ox, hinds (180 lb. to 200 lb.) ...	$4\frac{1}{8}$d.	None offering.
Australian Frozen Beef. (Fair Average Quality.)		
Ox, fores (100 lb. to 200 lb.) ...	$2\frac{1}{8}$d.	$2\frac{1}{4}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$2\frac{7}{8}$d.	$2\frac{7}{8}$d.

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations for New Zealand and Australian lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 12s. to 13s.; Danish, 13s. to 18s. per 120.

BACON.—Irish, 59s. to 63s.; American, 50s. to 54s.; Canadian, 50s. to 56s. per cwt.

HAMS.—Irish, 100s. to 112s.; American, 52s. to 60s. per cwt.

HIDES.—Queensland heavy ox, $5\frac{1}{2}$d. per lb.; light ox, $4\frac{3}{4}$d.; cow, $4\frac{5}{8}$d. New South Wales heavy ox, $4\frac{3}{4}$d.: light ox, $4\frac{3}{8}$d.; cow, $4\frac{1}{4}$d.

TALLOW.—Beef, fine, £32 5s.; medium, £29 10s.; mutton, fine, £32 5s.; medium, £29 10s. per ton.

Entomology.

A PARASITE OF SUGAR-CANE BEETLE GRUBS
(*Dielis formosus*, Guérin).

By HENRY TRYON, Entomologist and V. Pathologist.

(Plate IX.)

Introductory.

In connection with some of the incidents relating to the occurrence of the larvæ of more than one of the scarabæid beetles that live in such pronounced injurious relation with the sugar-cane in one district or another throughout the coastal agricultural lands of Queensland, the belief has been engendered that these pernicious insects have been at certain times and in special localities decimated or partially subdued by some natural agency that has spontaneously arisen, and that has consisted in the counteracting presence of disease or of parasitic fungus- or parasitic animal- organism.

As bearing on this experience, may be mentioned the almost complete disappearance, until a recent date, of the "grubs," after great destruction had been experienced from their depredations, throughout considerable areas of both the Hambledon Plantation, Cairns, and the Goondi Plantation, Johnstone River—not to allude to other apparently illustrative examples of it also.

In some cases, it is true, this has followed—as at Hambledon—the active and vigorous prosecution of methods of repression, exercised with great skill and judgment; but, even where this has happened, the subsequent absence of the cane-destroying scarabæid larvæ was an event of greater importance than would be the one that might have been expected to follow as a result of their application.

That the "cane grubs" are victimised in Queensland by disease and also by fungus and insect parasites has long since been announced by the writer (*vid.* "Grub Pest of Sugar-cane in the Mackay District," pp. 35-37, *Brisbane*, 1896). The purpose, however, of this note is not to dwell generally upon this fact, but to call attention to a special natural enemy, whose existence and service in this capacity have both been hitherto overlooked, notwithstanding it may have proved highly efficacious in some instances in accomplishing the result to which allusion is made.

This victimiser of the cane grub is an insect, belonging to the class *Hymenoptera* and to the family *Scoliadæ*, and named *Dielis formosus*, Guérin.

Historical.*

The male insect was described by Fabricius as long since as 1793 (*vid.* "Entomologia Systematica," p. 356) under the title *Scolia septemcincta*, Fabr. Forty-four years subsequent to this the French naturalist Guérin made known to the scientific world (*vid.* Voyage de la Coquille, II. p. 252, 1838) the opposite sex, bestowing upon it the name *Scolia formosa*, Guérin, but without the suggestion, that he was dealing with the identical species to that to which Fabricius' account related, being given expression to.

The type of *S. septemcincta*, Fabr., was derived from New Holland, and was probably obtained during Captain Cook's expedition, and Guérin's insect was derived from New Caledonia.

The specific distinctness between the two insects was maintained by F. Smith (*vid.* Catalogue of the Hymenopterous Insects of the British Museum, III. p. 105, 1855). Henri de Sanssure and J. Sichel (*vid.* Catalogus Specierum Generis Scolia,

* Information of a more or less technical character such as is the subjoined is printed in smaller type than is the memoir in general.—*Ed.*

p. 209, 1864) redescribed the male insect, but, whilst maintaining Fabricius' name, suggested that the insect before him and that characterised by Guérin in 1838 were sexual forms of a single species; a suggestion expressed in the words "an ne E. formosæmus" that he ventured to make use of. In Appendix No. 1 to the "Catalogus" cited, issued with it under the sole authorship of J. Sichel, there is an account of an insect derived from Balade and New Caledonia given that is regarded without question, as *Elis* (*Dielis*) *formosus*, Guérin, male. This has characters assigned to it that correspond to those ascribed to *Scolia septemcincta*, and that clearly establish their identity with the Queensland insect.

The association of two such distinct insects as sexual forms of a single species is in keeping with what is found to obtain with other Hymenoptera embraced in the families related to Scoliadæ, and hence their common title *Heterogyna*. In the instance under notice it has been justified in the course of breeding experiments and observations having reference to the manifestation of a special habit.

In agreement with the procedure followed by systematic writers in their accounts of the members of other families of insects, Guérin's name should be allowed to lapse in favour of that bestowed by Fabricius—*i.e.*, *septemcincta*.

The Queensland examples of the female insect appear, however, to constantly differ from the New Caledonian ones of this sex in having—amongst other special features—the fringed hairs that form bands on the under surface of the hind-body white instead of fulvous, and may accordingly ultimately be found to be specifically distinct from them. In the event of this variation being constant, the name *E. formosus* might be retained for the insect endemic in the French colony.

DISTRIBUTION.

Dielis formosus, Guérin, is an insect indigenous to Australia. It has a wide range of occurrence therein. This range extends from Tasmania to perhaps the northernmost limit of the continent. The parasite is, moreover, especially prevalent throughout the eastern seaboard. It does not, however, appear that its interesting life-history has been hitherto elucidated previous to the observations relating to its nature made on Mr. R. Blackwell's Mulgrave River cane farm, in the Cairns district, by the writer as recently as the 4th August of the present year (1901).*

SCOLIADÆ OF RELATED HABITS.

In other countries, however, members of the same hymenopterous family to which *Dielis formosus* belongs have been shown to be parasites of the larvæ of scarabæid beetles.

Passerini† during the years 1840-1 graphically described and depicted the mode in which *Scolia flavifrons* attacks in Southern Europe the larva of *Oryctes nasicornis*, an insect allied to our Rhinoceros Beetle (*O. barbarossa*), entering deeply into the spent tan used in conservatories whereon the grub feeds for the purpose of doing so.

C. Coquerel‡ subsequently gave an account of the services rendered by two Scoliadæ—viz., *Scolia oryctophaga* and *S. carnifex*—in destroying the large grubs of three different species of the same genus Oryctes that in Madagascar prove so harmful in coco-nut plantations.

Again, D. Sharp§ has informed us that the author of the interesting *Souvenirs Entomologiques* (1879), J. H. Fabre, has recently communicated to him the fact not only that the insect the object of Passerini's observations attacks the larvæ of various species of *Cetonia* beetles, that occur in rotten wood; but also that *Scolia interrupta* chooses as hosts for the nourishment of its young the grubs of two species of European chafers—*Anoxia villosa* and *A. matutinalis*—*i.e.*, beetles that are systematically allied to the principal depredator of sugar-cane in the Isis Scrub district, the larva of a species of *Rhopæa*.

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* The discovery was widely announced at the time at which and in the district in which it was made, as may be inferred from a report of an interview with the writer, held by the Cairns Chamber of Commerce, and described in *Cairns Daily Argus* of 14th August. Subsequent to the preparation of this paper intimation has been received of the interesting fact that the parasite was met with also by an officer of the Colonial Sugar Refining Company (to whom the fact of the existence of an hymenopterous parasite of new cane grub had been early communicated) at its Hambledon plantation (Cairns) during the month of September.

† Osservazione sulle larve, nimfe, abitudini della Scolia flavifrons, *Pisa*, 1840, and Continuazione delle osserv. nell'anno 1841 sulle larve di Scolia flavifrons, *Firenze*, 1841.

‡ Surles, mœurs des, Oryctes et sur deux espèces de Scolia. *Ann. de la Societé Entomologique de France*, 3 ser. 1854.

§ Cambridge Natural History, vol. vi. Insects II., p. 99.

Description.

The insect now under notice may be thus described:—

The Female.—The female *Dielis formosus*, that greatly exceeds the opposite sex in size, has the general appearance of a large honey bee, with elongated hind-body. In size it is very variable, ranging from 24 mm.* to 28 mm. in length, and having a wing expansion of from 32 mm. to 36 mm. Its ground colour is black, but this is almost concealed by special markings. Coarse punctures occur upon the upper surface of the mid-body. On the head behind each eye is a narrow yellow bar, and occupying widely the hinder portions of the first, second, and third segments of the hind-body are conspicuous broad orange-yellow bands, of which the second has its fore margin waved. The bands are not continued on the under surface, and the first three are suddenly narrowed before terminating abruptly at the sides. Each band is fringed behind by two lines of decumbent straight orange-coloured hairs; those constituting the hinder of the two being especially numerous. The hairs fringing the fourth segment, as well as those densely clothing the succeeding ones, are of a dark-brown colour. On the under surface of the abdomen there are corresponding fringes, but these are white. They occur upon the hind borders of the second, third, and fourth segments. The remainder of the body is clothed with conspicuous long curved gray pubescence, and this is especially well developed upon the face and legs; that in the former situation having a yellowish hue of colour. Long stiff reddish-brown hairs also occur on the under surface of the jaws and upon the upper lip (labrum). The wings are pale smoke coloured, and are suffused with yellow behind the fore borders and towards their bases, this being especially noticeable in the front pair. They have, moreover, faint violet reflections. The wing-veins that do not extend to the outer border of the wing are stout and of a yellowish brown colour. The legs are both strong and long, and are endowed with stout spines that are especially noticeable towards the termination of the tibia and on the tarsal joints of the front pair. The broad tibiæ of the hind legs has a series of broken ridges with deep intervening grooves crossing its upper surface, and has stout spines along each side and two exceptionally long terminal spur-like ones. The 12-jointed feelers (antennæ) are stout curved and hairless, and of a dull black colour. The jaws (or mandibles) are both large and stout; they are curved also, and when at rest form a bow in front of the head. The eyes are large, pale-coloured, and deeply excavated along their fore-borders.

The Male.—This is a smaller and much narrower bodied insect than its consort, and varies greatly in size: measuring from 13 mm. to 20 mm. in length, and having a wing expansion of 21 mm. to 31 mm. Its ground colour is also black. It is marked with lemon-yellow (instead of orange-yellow as in the female), and the markings themselves have the following disposition:—The hind-body has a conspicuous broad band above, crossing the hinder portion of each of the first, second, and third segments. These gradate hindwards into creamy-white bands, that occupy a similar position on the fourth, fifth, and sixth segments. There is also a band on the seventh that is ill-defined. These bands, except the first, are continued on the under surface of the hind-body, that on the second segment having adjoining it on its fore-border a yellow spot also. There are, further, a large yellow spot enclosing a dark point on the clypeus or front portion of the head, two small spots of this colour on the top of the head; a band occupying the prothorax, or collar, of the mid-body; one at the base above of each wing and two short broad bars in the centre of the mid-body, above, behind the origin of the wings. The legs have also a yellow stripe along the under surface of each femur, and the upper and fore side of each tibia. The first tarsal joint of the first and second leg is also of this colour. The body is clothed with fine whitish pubescence, and the hindmost extremity terminates in three backwardly-directed sharp spines. The

* A millimetre (mm.) is approximately $\frac{1}{24}$ inch.

legs are spined, but in a much less pronounced degree than occurs in the female insect. The feelers (antennæ) are also almost straight, 13-jointed, and longer and narrower than are those in its case. The eyes are black. The mandibles, or jaws, are less conspicuous than in the opposite sex.

The contrast in habit and in colouration between the male and female insects, as is indicated by the foregoing descriptions, is very pronounced and is such as to readily suggest—as happened in the case of their first describers—that we have in them types of distinct species of insects.

Habits.

At what period in the growth of the cane-grub the parasite first attacks it has not been definitely ascertained. But there are grounds for concluding that this generally takes place when the latter has arrived at nearly its full size, but has not yet fabricated its subterranean cell perparatory to pupating. It is certain, however, that when assailed it is in many cases several inches beneath the surface. Whether the *Dielis* makes tentative explorations in the soil in quest of its prey or not has, moreover, not been discovered; but it is believed that nothing of the kind takes place. Having once decided where operations are to commence, after sailing with a swinging flight in a serpentine course amongst the cane plants at a short distance from the ground, and alighting now and again on or close above it, it quickly commences to dig, using its formidable scoop-like jaws as the principal agents in accomplishing this purpose, although bringing into operation as auxiliary instruments its spine-bearing front legs also. The particles of soil freed by these from their surroundings are quickly transferred to the curious ridged plates that (as mentioned in the account given above of the female insect) occur upon the expanded tibial joints of the hind legs, and are then rapidly and forcibly ejected backwards. During this work the insect constantly crawls upwards towards the mouth of its burrow, again and again rejecting in doing so soil-fragments. This process of excavation is rapidly executed, with the result that if the soil be friable the industrious insect is soon hidden from view. It is, however, by no means essential for its work that the earth through which it tunnels its way be of a loose texture. It must be admitted, however, that where the writer found beetle-grubs to be parasitised by it, in greatest amount, the soil frequented was of an alluvial open nature. Having at length found a grub, it deposits a single egg and this it fastens with some sticky substance generally just behind the origin of the third pair of legs. Whether this act on its part is preceded by an administration of poison by means of its sting has not been observed. The comparative inactivity that the grub henceforth exhibits may be attributable, however, to the fact that this event transpires.*

As more than one egg has been found within the body of a single female *Dielis*, it is probable that the laborious work of hunting for beetle grubs in the soil whereon to oviposit is at least once repeated.

The egg, once placed in the situation named, evidently soon hatches, and gives rise to a footless maggot-like larva, but one in which the individual body segments are discernible, and that is rounded at the hind extremity, but tapers gradually towards the head; this part of the body being bent and directed backwards both when the insect is attached to its host as well as when ultimately it has become free.

Immediately on hatching this larva gnaws a hole or rent at the exact spot where it is born, through the skin of the beetle-grub, and inserting its head as

* Passerini states that the European *Scolia flavifrons* attacks its victim—the *Oryctes nascicornis* grub—at a time in the development of the latter when this has arrived at that period of inactivity when internal changes are being undergone that convert it from a larva to a nymph, and that it is accordingly possible that the mother Scolia does not require to sting the beetle-grub in order to stupify it. Fabre, on the other hand, according to D. Sharp, has found that a congeneric species, the *Scolia bifasciata*, of Europe also, prior to attaching its egg to the grub of Cetonia beetles, stings the latter in a definite position "the line of demarcation between the pro- and mesothorax on the middle line of the ventral surface," and so destroys the sensibility of the grub, without meanwhile determining its continued existence until the food requirements of the young parasite—in the matter of living grub-tissue—are fully satisfied. [*Sharp l.c.* p. 98-99.]

it does so deeply into the living tissues of the latter, remains stationary, fixed in this position, until fully developed and ready to undergo metamorphosis. The position, with respect to the grub in which it is fixed, as well as the fact that the head and body are not in a single straight line, aid it, moreover, in retaining its hold, notwithstanding the movements of its victim. The larval *Dielis* meanwhile feeds on the soft tissue as well as on the liquid contents of the grub's body, and so increases in size as it does so. This increase takes place so rapidly that it may attain its maximum development within a fortnight or less. Its appetite, moreover, is voracious; for, notwithstanding the fact that the beetle-grub continues for a while to feed, its body gradually becomes more or less flaccid and collapses. That the existence of its victim may persist for a sufficient length of time, the *Dielis* larva is careful, whilst indulging its carnivorous appetite, to avoid injuring any organ on the intactness of which this persistence of vitality is dependent. Death, however, ensues before the grub can transform to its pupal stage. Ultimately the host-insect is reduced to an empty skin, in which all the hard parts can be recognised as remaining uninjured.

The *Dielis* larva has meanwhile freed its fat and sleek body, and soon commences to fabricate a silk-covered elongate oval cocoon that occupies in the soil the space previously filled by the beetle-grub. These cocoons vary in size from 30 mm. ($1\frac{1}{4}$ inches) long by 15 mm. ($\frac{5}{8}$ inch) broad, to 24 mm. by 12 mm. These are the dimensions of those that are to give rise to female "wasps." Those from which male insects will emerge also vary in size, but are usually 21 mm ($\frac{7}{8}$ inches) by 9 mm. ($\frac{3}{8}$ inch). The silky investment, that is at first of a pale greyish-yellow colour, becomes ultimately a rich glossy tan-brown. It is in two readily separable layers, one of which is in contact with the soil, and the other with the dense black elongate-oval chrysalis proper that has been formed from the altered epidermis of the larva. The cocoon itself manifests considerable strength and toughness, and so cannot readily be torn open.

On opening one of the above-mentioned cocoons, the parasite will be discovered in various stages of growth, according to the time that may have elapsed since it has been fabricated; but when this has been of sufficient duration the perfect insect will be recognised in the nymphal condition, with its legs folded up, and these and its wings and antennæ and other organs enveloped in separate sheaths, that in the case of the last-mentioned organs present a pad-like appearance. The mouth organs also are very prominent features in the somnolent inactive nymph, especially so in the case of the female insect, in which, during the next stage arrived at in the course of insect transformation, they will perform as digging instruments so important a *rôle*.

For a time the cocoons lie side by side with the remains of the grub that has been destroyed, that now become brown and fragmentary.

The mature *Dielis*, either male or female, however, in due course emerges, having first freed itself from its nymphal investments, and then cut the cocoon open by a clean circular incision that separates one extremity.

The parasite now tunnels its way to the surface, availing itself, it may be, in doing so, of the partly-filled channel formed by the beetle grub in descending downwards in the soil—a movement that is effected by the latter when full fed.

A living female *Dielis*, with its wings frayed and broken, was on one occasion dug up in the field whilst still several inches beneath the surface. In its case it was evidently returning to the daylight and free air after having in darkness performed the laborious work involved in attaining its victim, and after having attached its egg thereto.

The cocoon of the *Dielis* has been encountered at a depth of 3 feet from the surface. The larva that fabricated it may, however, have been borne downwards by the beetle-grub whilst still attached to the latter; for at certain periods in its early life it can only be separated therefrom with the exercise of considerable force. But although the parent parasite may not have been compelled to tunnel downwards to this extent in order to seek food for its progeny, still the winged insect, that in course of time would arise as development of the latter proceeded, would be obliged to delve its way upwards through this depth of soil in order to enjoy its free life.

Once emerged the perfect insects exhibit considerably activity on the wing, although they may be captured without the exercise of much adroitness. The males are usually to be encountered flying over patches of grub-injured cane-land or where scarabæid beetle-larvæ may have damaged the roots of grasses or other plants in pasture or cultivated fields. In these situations the individual of this sex remains for days after it has emerged flying in circuitous course amongst the herbage at a short distance from the ground, but frequently alighting on some low plant, and thereon, resting, with its wings directed over its yellow-banded hind-body as if to conceal so conspicuous a presence.

The female insects that are exceeding handsome—a fact that has won for the species the title *formosus* (*Lat.* most beautiful), do not, however, long frequent their birthplaces; but speedily repair to haunts abounding in flowers, upon whose nectar they subsist. Plants of various kinds are affected by them, as in the case of our honey bee. Miss Margarey Wells, a youthful observer residing in the Childers district, has mentioned to the writer the Summer Chrysanthemum (*Chrysanthemum annuum*) as one especially addicted to being visited by the beautiful insect. The blossoms of arboreal plants are, however, by no means overlooked by it.

The female "wasp" does not apparently seek out a beetle grub as food for its young until some days have elapsed since the first appearance of itself.

With regard to the proportion between the sexes that issue from the cocoons this varies, according to the time of the year at which the observation is made, in a curious manner.

In the first place, however, it may be mentioned that there are grounds for concluding that two broods of the winged insects hatch out during the course of the summer in some parts of Queensland. For instance, in the Isis Scrub district the females have been found on the wing in September (M. Wells), and in March (H.T.), and nymphs of this sex and spun-up larvæ during the early part of December (H.T.) The males have been found flying there early in September and throughout December, in the latter case without attendant females. In the Cairns district females have been found on the wing in July, and only rarely early in August, and both sexes, but principally males, raised from pupæ during September and October. No opportunity of observing the second brood there has been forthcoming. The differences between the latitude of the Cairns and Isis Scrub districts render the periods of appearance in the respective localities fairly correspondent.

In the case of both the spring and autumn broods, wherever examples of both sexes are found issuing from the pupæ or chrysalis cocoons, it is found that the male individuals appear first. This is, doubtless, a provision for ensuring the mating of the sexes; for, as already remarked, the male frequents for days the spot where it has emerged, although this may provide it with no food, in order that the female on emerging may not fail to receive the attentions of a suitable partner. Whilst thus engaged, three or four male *Dielis* may not infrequently be observed in the field of vision at one time flying restlessly over the surface.

In the case of the spring brood the females largely preponderate, although this fact may not strike one since individuals of this sex on emerging soon take their departure for flower-yielding haunts, where accordingly they are to be sought. With the early autumn brood, however, the opposite condition prevails, the perfect insects that appear then being almost exclusively males.

This is comparable with what happens in the case of other hymenopterous parasites, and especially with such as belong to the section *Pimplinæ* of the family *Ichneumonidæ*, the members of which are for the most part destroyers of grass-consuming caterpillars.

With regard to the insect under notice, this peculiar incident is not difficult to account for. The female *Dielis* can only perpetuate its kind when the beetle grubs are nearly full fed; this is in August, in the Cairns district, and in September in that of the Isis Scrub. It is accordingly in keeping with this circumstance that it occurs in preponderating numbers then. By the time, however, that its immediate progeny appears, the scarabæid larvæ have become either pupæ or perfect beetles, and the grubs that are necessary to receive the eggs of ovipositing females are comparatively scarce. Accordingly this brood consists to a very large extent exclusively of males; and such few female examples of the perfect *Dielis* that do emerge put in a belated appearance.

The few insects resulting from the latter in February and March possibly pass, in most cases, the winter months in the imago condition; although unhatched chrysales of the insect are commonly found in the soil during this month. How long the insect remains beneath the earth has not been ascertained, but it would appear that its existence as a pupa may be considerably protracted when cold weather supervenes.*

This hymenopterous scarabæid grub parasite is in some instances quite prevalent. In the case of a single exploration made in the farm of Mr. R. Blackwell, Mulgrave River, Cairns, on the 4th August, it was observed that no less than 25 per cent. of the large cane-destroying grubs of the large cane-destroying scarabæid beetle—*Lepidiota albohirta*—were victimised. In the Childers district (South Isis) a smaller proportion—viz., 10 per cent.—of the grubs of the most prevalent cane grub of that locality, a species of *Rhopæa*, was found to be similarly victimised in the course of investigations conducted by the writer during December, 1901. In neither locality, however, has the laborious work of exploring the soil to a depth of 2 feet 6 inches, or even beyond this, as is necessary in such an inquiry, been prosecuted to an extent adequate to bring to light the fullest degree to which the species of parasitism under notice may sometimes attain.

The method of dealing with the sugar-cane "evil" to which reference is made, consisting as it does principally in the capture of the mature form or beetle as originally advocated by the writer, is not attended with the undesirable result of destroying simultaneously this useful insect, as oftentimes happens when plant depredators subject to being victimised by parasites are secured with a view to their subsequent destruction. The cane grubs, however, being reduced in numbers by this means; the destructive parasitism due to the *Dielis* may be exerted to a larger proportionate extent than, failing the prosecution of this method of repression, would be experienced.

The parasite, as may be inferred from a foregoing statement, does not restrict its attention to the larva of a single scarabæid beetle. In the Cairns district it has been found commonly attacking the grub of *Lepidiota*, and in the Isis Scrub district that of *Rhopæa*. There are grounds also for concluding that it also victimises the larvæ of *Anoplognathus* and *Dasygnathus;* both genera that also include species of so-called sugar-cane beetles.

A single dead cocoon has been found in the soil already riddled with perforations. Whether these arose previous to death or not cannot be pronounced. It may be, however, that we have evidence here of the existence of some hyper-parasite that attends the primary one—the *Dielis*—as this pursues its quest in the soil, and that in turn lays its eggs adjacent to that of the parasite, that its young may feed upon this grub-destroyer.

This useful insect is not likely to lend itself to artificial propagation to an extent to admit of its numbers being augmented, with the result of greater benefit being derived from its presence in Queensland than would otherwise be experienced. Impregnated females might, however, be transported to foreign

* J. Sichel, writing concerning the Abyssinian insect *Discolia castanea*, Percheron, of which he had received a collection comprising forty-one males and not a single female, makes some interesting remarks on the relative frequency of occurrence of the two sexes amongst Hymenoptera, and states amongst other facts in this connection that in the case of some species the males appear several days, or even several weeks, before the females emerge from the soil. He does not, however, include, in his explanation of the exclusive appearance at a time of individuals representing one sex only, a seasonal preponderance of this sex as constituting the brood of which it forms part. (*Cf. Catalogue.* Appendix I., p. 279.)

countries, in which also scarabæid larvæ other than those occurring in Australia, although related insects, injure field crops. For example, it might prove serviceable in the United States of America in assisting to subjugate the different species of *Hoplosternus*, whose larvæ provide the root-destroying "grub pest" of that region.

EXPLANATION OF PLATE IX.

[*Dielis formosa*, Guérin.]

Fig. 1.—Male insect.
Fig. 2.—Female insect.
Fig. 3.—Larva fully developed and detached from victim.
Fig. 4.—Chrysalis cocoon (female), the silken covering intact.
Fig. 5.—Chrysalis cocoon (female), the silken covering in two layers partially detached and discovering the chrysalis proper.
Fig. 6.—Chrysalis (male), the silken covering removed.
Fig. 7.—Nymph (female) removed from chrysalis.
Fig. 8.—Cocoon (female), natural circumcision of one extremity by perfect insect on emergence.
Fig. 9.—Chrysalis (male), the silken cocoon detached, illustrating phenomenon shown in Fig. 8.
Fig. 10.—A cane grub (Larva of *Lepidiota albohirta* attacked by Larva (Fig. 3) of Parasite (Fig. 2).
Fig. 11.—A cane grub (Larva of *Lepidiota albohirta*) that has succumbed to attack of larva of parasite, after having its body contents partially removed by it.

NOTE.—All the figures are of natural size. Figures Nos. 3, 4, 10, 11, after photographs placed at disposal of the writer by the Colonial Sugar Refining Company, Limited, and reproduced with the permission of its general manager. Figures 1, 2, 7, from negatives prepared by Mr. McMillan, chief chemist, Childers Mill (C.S.R. Co.'s, Ltd.) Figures 5, 6, 8, 9, from photographs by H. W. Mobsby (Dep. Agr. Qd.)

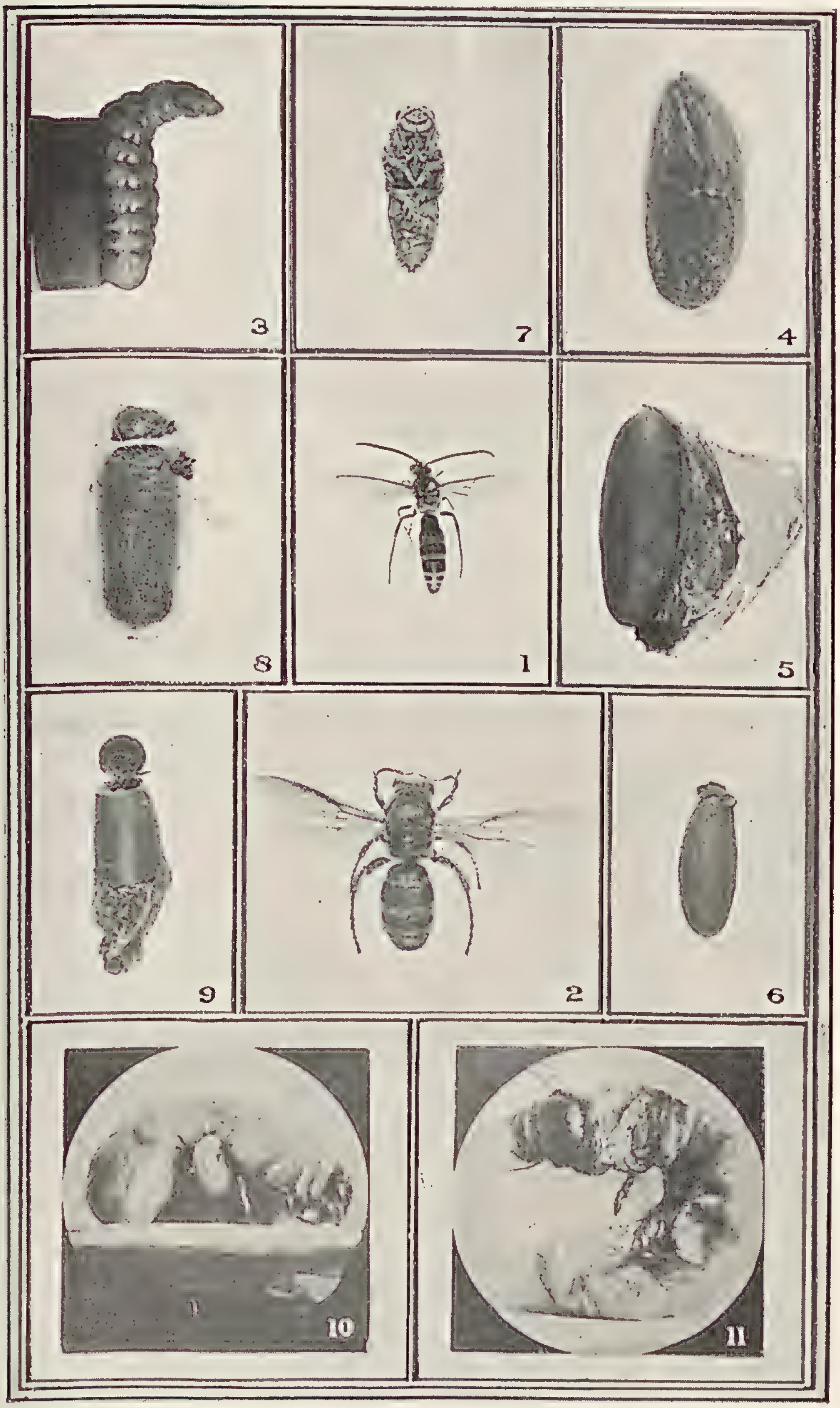
Agricultural Patents.

PATENTS ACCEPTED.

WEED-POISON INJECTOR.—Classes 28, 81 (2 Figures)—6091: George Partridge, of Ruthven street, Toowoomba, plumber. "An Appliance for Inoculating Prickly Pear and other Noxious Weeds with Destructive Fluid." Dated 3rd July, 1901. (Drawings, 7s. 6d.; specification, 2s. 6d.) To economise the application of liquid poison to prickly pear and like weeds, the liquid is carried in a valved vessel (resembling an enlarged machine oil-can) provided with an elongated bayonet-like probe on the spout, whereby the liquid is conducted directly into the tissue of the plant. (1 claim.)

TRACK-BURNER FOR GRASS PADDOCKS.—Classes 36, 83 (7 Figures)—5909: Frederick Longley, of No. 337 Little Lonsdale street, Melbourne, Victoria, engineer, and Arthur Brundrett, of No. 23 Nicholson street, Essendon, Victoria, gardener. "A Machine for Burning-off Lines or Strips of Grass." Dated 25th February, 1901. (Drawings, 12s. 6d.; specification, 8s. 6d.) A rectangular metal firebox with open bottom and openings around the roof is dragged along the track to be burned; through openings in the lower point, a row of vaporising burners of the "Primus" type ignite the grass; to prevent lateral extension of the fire, the firebox is surrounded by a flexible pavement of articulated drag-plates, which are of special form for conveniently varying their extent by adding or detaching rows of plates; the plates are attached by longitudinal drag-chains to a draught-bar, and by lateral rings to each other; extra plates and loose chains are added in the rear of the free box to ensure complete extinction; a land-wheel may be added to operate the air-pump of the lamps by a crank and connecting rod. (5 claims.)

Plate IX.

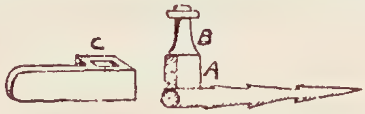


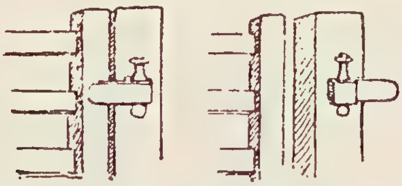
SUGAR-CANE GRUB PARASITE.—*DIELIS FORMOSUS*, Guérin.

General Notes.

A SIMPLE GATE LATCH.

A simple but effective latch for a gate or door is shown in the accompanying diagrams. It is cheap, and easily made—any country blacksmith could forge out the parts from the sketches. The latch is in two parts. One has a spike 8 inches long for driving into the door or gate post. The upright part of this





section is about 2 inches long, and has a nut screwed on to the top to prevent the latch from slipping off. At A this upright is squared 1 inch by 1½ inches, and at B it is rounded. The latch C is made to fit the squared upright portion of the bolt. When slipped down, it forms a firm catch as shown. To open the gate the latch has to be lifted to the rounded portion and swung back.

A NEW METHOD OF ADULTERATING WINE.

The *English Mechanic and World of Science* takes the following from an American paper:—It has recently been ascertained that a peculiar method of wine adulteration has come extensively into vogue in European wine-growing countries, and which involves the conversion by chemical means of red into white wines. A French chemist, in the course of certain investigations upon the constituents of the ashes of certain wines, found present therein about one-half of 1 per cent. of manganese protoxide per litre of wine. Further investigation of the subject seems to have confirmed the suspicion that the investigator had to deal with a red wine which had been treated with animal charcoal (boneblack) and potassium permanganate, for the purpose of effecting its decolorisation It was also shown that this artifice had assumed large proportions among the wine-producers since the public had begun to show a preference for white wines, which, consequently, had increased in price. The following method of detecting this method of adulteration has been proposed:—Ten cubic centimètres of white wine should be treated with 1 to 2 cubic centimètres of caustic soda solution, followed by 1 cubic centimètre of hydrogen dioxide. When these constituents are thoroughly mixed, the liquid will instantaneously take on a mahogany-red colour. In the case that hydrogen dioxide is not available, the same reaction will occur, though more slowly, by using in excess of caustic soda.

GROWING TOBACCO UNDER SHADE.

An enthusiast on the subject of growing tobacco under shade estimates that within the next five years there will be no less than 6,000 acres producing wrappers under cheese-cloth in this country. At, say, 1,500 lb to the acre, the yield would be 9,000,000 lb—enough to wrap the cigar product of the country, and something left for export. The samples of the tobacco grown under shade in Connecticut which have been shown in the market are absolutely without a defect.

ROTARY LAND MEASURE.

Moved by the sight of a land measure which you illustrated some time ago (writes a correspondent of the *Australian Field*), I append a description of one which I use, and which I think is easier to use. Take a strip of wagon box iron, and make a hoop 8 feet 3 inches in circumference. A wooden hoop will answer the purpose if one large and strong enough can be secured. Put in

spokes enough to make the wheel rigid; I used two 1-inch strips, four spokes, bored a ¼-inch hole where they cross. Then by making an "A" frame for handles I have a machine which looks something like an overgrown wheelbarrow minus the box. It measures land at the rate of a rod at two revolutions. I tie a white cloth on the wheel to count by. If you find it necessary to put in more spokes, bevel them to fit against the first four, and nail to first ones.

A SOIL MAP.

The United States Department of Agriculture is making a "soil map." The map is to cover the whole of the United States, and the scale (10 acres) to be represented by one-eighth of an inch square. Each farmer, however, will be able to procure a chart of his own neighbourhood on a larger scale, so that he can arrange his planting in accordance with the suggestions which it conveys. In the first place, the soil map will show what kind of agricultural industry any given locality is best adapted for. It will make clear to the farmer in one locality, for instance, that he has the same soil that is used advantageously for certain purposes in other localities, assuming similar climatic conditions. The map will call attention to certain troubles of soils which have been investigated through chemical analysis.—*Pastoralists' Review.*

SIMPLE CURE FOR GAPES IN CHICKENS.

Punch some holes in the bottom of an old tin bucket. Get a piece of glass large enough to cover the top. Put a hot coal in a saucer, and pour a drop or two of carbolic acid on it. Place the chickens in the bucket, and set the latter over the saucer. The fumes of the acid will rise through the holes. Do not put the bucket on till the first fumes have passed away. Watch the chickens through the glass so that you may not smother them. If they seem overcome take the bucket off the saucer and remove the glass. One operation is usually sufficient. By doing this, you will lose no chickens from gapes.

KEEPING BIRDS OUT OF FRUIT TREES.

Here is a simple, inexpensive, and practical contrivance for keeping birds out of fruit trees, which might answer for scaring away sparrows from paddy, parakeets from Indian corn, squirrels from cacao, custard apples, &c. It consists in hanging a small mirror on the top limb of the tree. There should be at least 6 inches of string to the mirror, so that it can swing about when moved by the wind. It is said that the flash of the mirror creates a scare. One or more cheap mirrors used thus on each tree are said to have answered well in the Philippines, and the birds do not grow familiar with the contrivance as in the case of scare crows. The experiment suggested is well worth trying.—*Tropical Agriculturist*, Ceylon.

A CLOCK DEVICE.

Mr. H. R. Stephens, Toowoomba, sends the subjoined illustration and description of a very ingenious and useful device for opening or closing a gate, thus saving the trouble of attending to the wants of stock of any kind enclosed in a yard. A patent has been applied for this novelty in the way of labour-saving appliances. It is a device in which, by means of an ordinary alarm clock, which may be set to any hour or minute the user pleases, a gate or door will open at a corresponding time, so that stock could be admitted to feed or water by a previous preparation of same without requiring the attendance of anyone to their requirements. Other applications are for releasing poultry from their houses at an early hour of the morning or shutting up at night. For opening gates, &c.,

A. Clock case.
B. Lever releasing weight.
C. Cord attached to hasp of gate.
D. Weight.
E. Ordinary hinge.
F. Crank hinge.

the gate should be made with a crank hinge, so that it closes or opens of its own accord, the device pulling out a bolt or hasp to admit of this action. If a stronger pull is required, give the weight a greater fall The size of case enclosing clock from weather is about 14 inches by 9 inches, and is fastened to one post of gate or door. Other applications are obvious.

[Mr. Stephens's device comes rather close to an ingenious invention of Mr. Edison to enable him to avoid tedious and monotonous work. When the great inventor was fourteen years old he was engaged as a night telegraph clerk, and it was part of his duty to report himself every half-hour to the head office by telegraphing the word "six," to show that he was not asleep. Now, although Edison had little desire to sleep, yet he liked taking open-air exercise at night, so he constructed a wheel in which he cut notches This he attached to the works of a common five-shilling clock, and so arranged it that the contrivance transmitted the signal regularly every half-hour for six hours. After this, one cannot doubt Mr. Stephens's statement that by his device he can light the kitchen fire at any unearthly hour without waking from his sleep.—Ed. *Q.A.J.*]

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

SEED WHEAT.

DOWNS FARMER.—

Question.—I have a farm of 100 acres, nearly all in wheat and oats. Can I grow my own seed wheat? I am not satisfied with what I have bought.

Answer.—Certainly you can, but it will take time to produce seed sufficient for 100 acres. The Canadian farmers have lately been paying great attention to this matter, and last year 1,000 plots were entered for the seed-grain competition. They sow seed-grain in plots of $\frac{1}{4}$-acre each, and every year select the largest and best-filled heads. These are threshed, screened, and hand-picked, and sown on other plots the following year. Two acres of land are sufficient to provide seed wheat and oats for a 100-acre farm, provided the land is specially prepared to ensure vigorous growth.

CLEARING LAND WITH DYNAMITE.

DYNAMITE, Caboolture.—

Question.—I have 6 acres timbered with red oak. I want to plant vines and pineapples on the land, but I have no time to grub the trees, some of which are 3 feet in girth. Can I destroy them with dynamite? If so, please tell me how.

Answer.— Clear away some of the soil near the tap root. Then with a $1\frac{1}{2}$-inch auger bore a hole slanting from the stump at about 6 inches from the ground into the centre of the tap root. Press the detonator, with fuse attached, into the dynamite cartridge. Then insert the latter into the hole. Do not tamp it; only fill up the hole with some dry earth. Light your fuse, which, for safety, you should leave rather long, and retire to a safe distance. The dynamite will remove the stump or so shatter it that it can easily be taken out. Giant powder is useful for shattering a stump or tree, if it is intended to complete the operation by burning, as it operates more strongly in a downward direction than dynamite.

LIQUID MANURE.

Answer.—Liquid manure is mainly the drainings or washings from manure, or urine of domestic cattle more or less diluted. A good proportion for diluting the drainings is half-and-half. If animals have been fed on food of fair average digestibility and quality, the urine will contain 75 per cent. of the nitrogen in the manure and 95 per cent. of the potash, whilst the solid excrement contains 80 per cent. of the phosphoric acid, 90 per cent. of the lime, and 70 per cent. of the magnesia. Remember that urea decomposes rapidly when exposed to the air; therefore the urine must be applied to the soil as quickly as possible. If you cannot use it at once, then add to it some green vitriol or gypsum, to prevent the evaporation of the ammonia. Sulphate of ammonia which is not volatile will be formed. Fresh urine is a forcing manure very valuable as a nitrogenous fertiliser.

In some European countries oil-cake is stirred into a tank containing a mixture of dung and water. The mixture is left to ferment for three or four weeks before using it. For garden purposes, to which liquid manure is more applicable than for field use, $\frac{1}{2}$ oz. of sulphate of ammonia to 1 gallon of water is useful, but this should not be mixed with lime nor applied to land recently limed.

HOME-BREWED BEER.

T. JENKYN, South Brisbane.—

Question.—Can you tell me how to brew beer for home use? I do not like the recipe given in the December *Journal*.

Answer.—In December last year we gave a recipe for brewing cottage beer from bran, hops, treacle, and honey. Here is another which may perhaps suit you better. Try it next June, as that is the best time for home-brewing:—

If the liquor is intended for immediate use, and the weather is mild, ½ lb. of hops to a bushel of malt will be sufficient. Put a quantity of water, equal at least in bulk to the malt, into the copper, and allow it to get heated up to 108 degrees. Then pour this water into a mashing-tub, and when clear enough to show your reflection add the malt at once. Mix all carefully and gradually, and stir with your mashing-stick. Take care to mash every lump. When all is thoroughly blended, cover the tub with sacks. In about three hours' time let the wort run out from beneath; at the same time take off the covers. Pour on more fresh water of the same temperature as before.

No specific directions can be given respecting the quantity; this matter rests with the brewer. As fast as the wort flows from the mash-tub it should be strained; to be perfect it should be transparent, and of an amber colour. A peculiar smell will be noticed, and it should have delicious taste. If it be cloudy, the water has been at too high a temperature.

The next process is to boil the wort. Put it into the copper to boil for several hours until it has acquired the proper strength; while the wort is in the copper or boiler, add the hops. Quick boiling is best, but great caution is needed to watch the motions of the liquor, and to keep it down when it begins to swell. When the hops sink the liquor has boiled sufficiently, taking about thirty-five to forty minutes. Long and slow boiling is both injurious and wasteful. Let the liquor into coolers (shallow tubs) to the height of 4 inches in winter and 2 inches in summer. When filling the permeating tubs—"Gyle tubs"—do not fill them too full, or the liquor will flow over.

Quantity of yeast or brewers' barm, about ½ pint to 10 gallons. Stir every day for a week.

Draw off the liquor into small casks, and leave them with the bungs out. The ale will continue to ferment after it is put into the casks, but they must be kept full, then the yeast will flow out at the bung; if not, the beer would be cloudy.

When the working is finished fill the cask full, skim off the head that rises. In a few days you will understand about the drawing off the ale; each day add fresh-boiled hops made as dry as possible.

The casks can then be bunged down tightly, and a hole bored for the vent-peg.

SUNDIAL.

STUDENT, Rosewood—

Answer.—Yes. It should have been stated that the gnomon must be 6 inches long—no allowance for thickness. It must be in the vertical plane, and make an angle of 51 degrees 18 minutes with the horizontal plane.

DOES SUGAR-CANE EXHAUST THE SOIL?

CANE-PLANTER, Nerang.—

Question.—For some years my land (scrub) has produced good crops of cane, but of late the crops have been almost too light to pay for cutting and loading. Yet I can get very good crops of corn or potatoes off the same land. Has the cane exhausted the soil?

Answer.—There is practically no such thing as an exhausted soil, but the available plant food near the surface may have been exhausted. In your scrub soil there is plenty more of the plant food which sugar-cane requires, but it is out of reach of the roots, and requires to be brought up either by subsoiling or by growing nitrogen-producing plants Again, the soil cannot be exhausted, as you say you can get good crops of corn and potatoes from the land. It is the plant food needful for cane which has been carried off year by year till little is left. A glance at the following table will at once show you the reason for the failure of cane-crops.

Crops remove from the soil plant food in the following proportion:—

	Nitrogen.	Phosphoric Acid.	Potash.	Lime.
Sugar-cane	127	44	298	71
Wheat	43	23	36	16
Barley	47	23	54	11
Maize	61	31	66	14
Rice	41	26	68	10
Potatoes	26	13	48	2
Cotton	54	19	40	25

From this, you can at once see that sugar-cane extracts from the soil about five times as much nitrogen, three times as much phosphoric acid, and six times as much potash as do potatoes.

CURING BACON.

PIG-BREEDER, Murwillumba, N.S.W.—

Question.—Will you kindly give me a good recipe for curing bacon?

Answer.—We have already given half-a-dozen recipes in the *Journal*, and in the December issue of 1901 we described the process of bacon-curing in Yorkshire. As you have only taken the *Journal* since the New Year, we once more furnish what should be a good recipe:—Cover the pork with salt and lay it on stone flags. For each stone of pork allow 1 oz. of saltpetre, ½ oz. of coarse sugar, and 1 lb. of salt. Rub both sides of the flitch with the sugar and saltpetre, then warm the salt and rub part of that in; lay it on a flagged floor or stone sconce, and turn and rub every few days, adding more salt each time till it is all used. In two or three weeks the bacon will have absorbed as much salt as it can, and is ready to be hung in a dry, cool room, through which there is a good draught. Leave there till the salt dries and crystallises. The bacon is now cured, and may be hung where most convenient in a dry place; or, if not be used at once, may be packed in a thick layer of dry straw. "Good old recipes" usually include smoking, which is not always possible in modern houses.

DISEASE IN YOUNG PIGS.

P. F. EVANS, Warwick.—The matter you write about has been investigated by an officer of the Stock Department. As the last death occurred about a month before the inspector's arrival on the scene, and no other pigs are affected, it is too late to do anything in the matter. Report at once to the inspector should any further mortality occur.

DOES SUGAR CAUSE TOOTHACHE?

A correspondent asks the above question.

The old saying, that one must go far afield to get news of what is happening in one's own country, is exemplified in an article taken from *Science Siftings* by the *British Journal of Dental Science.* The writer of the article states that some years ago, when a guest on one of the large sugar plantations at Mackay, in North Queensland, he visited the owner's stables. Noting the fat, sleek-coated horses, one of the grooms told him that these horses spent sleepless nights owing to the agonies of toothache. He further stated that he had examined the mouths of three of them, and found their teeth in a dreadful state of decay. The groom informed him that, in addition to the ordinary food, the horses were given chopped sugar-cane and chaff sweetened with molasses, and to this he ascribed the decay. He had no means of ascertaining whether the river water could have produced such an effect.

As an old sugar-planter employing some twenty-five horses and a number of kanakas and white people on the plantation, I am inclined to doubt the writer's statement as to the cause of the trouble. That the horses in question may have had bad teeth is possible; but that the caries arose from eating sugar-cane and molasses, I do not consider likely. In the first place, sugar-cane is too valuable to feed to horses. In less than a fortnight they would eat cane enough to produce 2 tons of sugar, in addition to other feed and molasses. My horses were regularly fed on the chaffed tops of the cane damped with molasses and water. There is very little crystallisable sugar in the tops; in fact, they are merely equal to sweet chaff. None of my horses ever suffered from toothache, and as for the sleepless nights, no doubt, during the summer, their rest was often disturbed, not by toothache, but by the attacks of mosquitoes. Then, again, as to the kanakas, they constantly chewed sugar-cane, not the tops, but the cane itself—and that to such an extent that it was necessary to forbid the practice. Both white men and white children were everlastingly chewing cane; and the latter, when they got the chance, were fond of dipping their fingers into the coolers, and eating the crystallising contents. No kanakas ever came to me complaining of toothache. Their teeth were beautifully white and sound. On the other hand, I have seen native blacks, whom I used to employ sometimes to cut firewood, and who rarely touched a cane, suffering very badly with toothache.

If horses suffered in that way, surely it would have long ago been made known, for all planters fed the tops to the horses; and had it or molasses the effect described, the practice would speedily have been dropped.

At the Queensland Agricultural College, molasses is regularly given to the dairy cattle, yet the veterinary surgeon has not drawn attention to any cases of toothache arising from this cause.

PASSION FRUIT.

S., Logan Road—

Question.—What is the best method of collecting and preserving passion-fruit seeds; when is the best time for planting them?

Answer.—In Southern Queensland on the coast, plant in September; in North Queensland, in March. To save the seed, take out the pulp of several fruits, press it lightly so as not to injure the seed. This will remove a large amount of the moisture. Put the pressed pulp and seeds into a tin and let it dry. It will keep for a very long time. When you intend to sow the seeds, soak the cake for a time in water.

PLANTING A VINEYARD.

NOBBY, Broadsound—

Question 1.—I have 30 acres felled and burnt off of softwood scrub. I only want 10 acres for present cultivation. What grass would you advise to sow broadcast amongst the stumps? The soil is red volcanic.

Answer 1.—Try *Paspalum dilatatum.* Your climate is too dry for prairie-grass. Roots are obtainable at the Queensland Agricultural College, Gatton, and most seedsmen supply seed at a cheap rate.

Question 2.—Can you give me the names of the most suitable and earliest table grape for this district? Also—

(1) Let me know at what distance apart to plant vines on a trellis.
(2) How should vines be pruned?
(3) Will rooted plants carry successfully from Brisbane?
(4) Which is the best month to get them sent here?

Mr. E. H. Rainford, Instructor in Viticulture, furnishes the following replies:—

Answer 2.—Early grapes to plant—Sweetwater, Black Hamburg, Alvey, and other American varieties.

(1) Distance, 6 feet apart—10 feet between rows.
(2) How to prune—Read articles in *Journal* and elsewhere.
(3) Rooted vines will carry very well.
(4) July or August.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY. Top Prices.
Peaches, per half gin case	5s. 6d.
Plums, per half gin case	5s.
Australian Lemons, per case	3s. 6d.
Italian Lemons, per 150	8s.
Apples, per case	9s 4d.
Oranges, Italian, per 150	11s.
Oranges, Australian, per case	5s.
Mangoes, per case	2s. 6d. to 4s.
Nectarines, per quarter-case	4s. 6d.
Apricots, per quarter-case...	2s. 6d.
Grapes, per lb.	$2\frac{1}{2}$d. to $2\frac{3}{4}$d.

AVERAGE TOP PRICES FOR DECEMBER.

Article.		December. Top Prices. £ s. d.
Bacon	lb.	0 0 7
Bran	ton	3 9 0
Butter, First	lb.	0 0 $9\frac{1}{2}$
Butter, Second	"	0 0 8
Chaff, Mixed	ton	3 6 0
Chaff, Oaten	"	4 1 0
Chaff, Lucerne	"	3 4 0
Chaff, Wheaten	"	3 10 0
Cheese	lb.	0 0 $6\frac{3}{10}$
Flour	ton	7 5 6
Hay, Oaten	"	3 17 0
Hay, Lucerne	"	2 4 0
Honey	lb.	0 0 2
Rice, Japan (Bond)	ton	14 18 0
Maize	bush.	0 2 6
Oats	"	0 3 1
Pollard	ton	3 19 6
Potatoes	"	4 17 0
Potatoes, Sweet	"	2 5 0
Pumpkins	"	1 11 0
Sugar, White	"	21 13 0
Sugar, Yellow	"	18 10 0
Sugar, Ration	"	15 10 0
Wheat	bush.	0 2 11
Onions	cwt.	0 4 $3\frac{3}{5}$
Hams	lb.	0 0 $9\frac{2}{5}$
Eggs	doz.	0 0 $9\frac{3}{10}$
Fowls	pair	0 3 $10\frac{1}{5}$
Geese	"	0 5 $10\frac{1}{5}$
Ducks, English	"	0 3 $6\frac{3}{5}$
Ducks, Muscovy	"	0 5 $0\frac{3}{5}$
Turkeys, Hens	"	0 9 $9\frac{3}{5}$
Turkeys, Gobblers	"	0 19 $3\frac{3}{5}$

ENOGGERA SALES.

Article.	December. Top Prices. £ s. d.
Bullocks	8 11 $10\frac{1}{2}$
Cows	7 6 3
Wethers, Merino	0 12 3
Ewes, Merino	0 10 $5\frac{1}{4}$
Wethers, C.B.	0 14 $9\frac{3}{4}$
Ewes, C.B.	0 11 $11\frac{1}{4}$
Lambs	0 11 $7\frac{1}{2}$
Baconers	2 2 6
Porkers	1 10 0
Slips	0 13 11

Orchard Notes for February.

BY ALBERT H. BENSON.

As this month is usually a more or less wet one, especially in coastal Queensland, the cultivation of the orchard is apt to become somewhat neglected, owing to the inability of working the land; and a heavy crop of weeds of all kinds is the result. If possible, the weeds should be kept down when young by means of one or two horse cultivators fitted with surface-working knives; but if the weather prevents this from being done, no great harm will take place if the weeds are mown down before they go to seed. The trash so obtained should be ploughed in, and will tend to maintain the supply of organic matter in the soil, and this, as has been stated frequently in this *Journal*, is of the greatest importance, as, besides rendering the soil more friable and easier to work, it increases the power of the soil to retain moisture, a most important consideration in a climate as changeable as this. In drier districts the orchard should receive good cultivation after every rain, as by this means the growth of weeds will be prevented and the greatest amount of moisture will be retained in the soil. In dry districts where irrigation is available, all citrus trees should receive a thorough soaking during the month, unless there has been a fall of several inches of rain, as a soaking now will carry the fruit on to maturity, provided that it is followed by cultivation. In irrigating fruit trees, always give a watering, say equal to 4 inches of rain all over the orchard; as this is infinitely better than giving a number of surface waterings. One soaking irrigation saturates every part of the soil, and will last for two or three months if followed up by proper cultivation; but surface waterings dry out in a few days, and unless kept up do more harm than good. In any case, surface waterings induce the growth of surface roots, and unless these surface roots are kept well supplied with moisture they will die off, and more harm than good will be done to the tree. On the other hand, when the land is well saturated, the roots strike down, and are therefore less likely to dry out or be affected by sudden changes. The marketing of fruit still continues an important branch of orchard work. The main crop of rough-leafed pines, besides mangoes and bananas, in the Southern coastal districts, as well as the later varieties of plums and apples in the Stanthorpe district, have to be disposed of. As stated in last month's notes, every care should be taken to place the fruit on the market in as neat and attractive a manner as possible, and to see when packing it that it is free from fruit fly, San José scale, or other disease. I am sorry to say that few growers realise the importance of proper packing, as a large proportion of the locally grown fruit that comes to market is put up in anything but an attractive form. Clean cases, even grading, and neat packing always take the eye of the buyer; and fruit so got up will pay the grower handsomely for the extra trouble he has been put to, and not only that, should the market be glutted, fruit so got up will always find a sale when other fruit marketed in a slovenly manner is unsaleable.

February is a good month for transplanting mangoes and other tropical and subtropical fruit. The ground should be in thorough order, and dull or showery days should be chosen for the work; if this care is taken, there will be little risk of failure. Plant mango seeds either in nursery row for working over next year, or, if seedlings are wanted, then in the position they are to occupy permanently. In selecting mango seeds for trees to stand permanently, choose none but those obtained from the very best fruit—fruit that is of fine flavour, large size, handsome appearance, as free as possible from fibre, as well as being a prolific variety and strong grower.

Any vigorous-growing mangoes will do for seedling stocks to be worked over, as the process of plate budding, lately described and illustrated by Mr. Horace Knight in this *Journal*, gets over the difficulty of mango propagation true to kind, and we will be able to increase our good sorts and decrease the bad. This method of working the mango can be carried out during the month, either on young seedlings or older trees of inferior varieties that it is deemed desirable to work over into more profitable lands.

Budding of both citrus and deciduous trees can be continued during the month, and the nursery will require constant care to keep it free from weeds, to see that all ties are cut, and all buds properly started and tied up; as, unless the young tree is properly started and trained to a single stem in the nursery, the grower has considerable difficulty in getting it to grow into a decent tree when it is permanently planted out in the orchard.

Strawberry planting should commence during the month. The land, which should be a rich loam of moderately heavy texture, if possible, should be well prepared by thorough working to a depth of at least 12 inches. If the land is virgin scrub, no manure will be necessary; but if it has been under crop for some time it should receive either a good dressing of well-rotted farm manure or of a commercial fertiliser rich in phosphoric acid, potash, and nitrogen, such as that recommended in this *Journal* in the articles on manuring which appeared under the heading of "Fruit Culture in Queensland" some months since.

Choose moist, showery weather for planting strawberries, and take care to set out nothing but strong, healthy runners. If the land is dry at time of planting it will require irrigating, and this is best done by opening up a furrow in which the plants are to be set, and filling it with water. As soon as the ground has soaked up the water, set the plants in the furrow and cover them with the dry soil. This method of watering will be found far better than setting the plants in dry ground and watering afterwards; as the moisture is all at the root of the plants, and the dry soil that is placed on the top acts as a mulch and prevents the soil from drying out. Where leaf blight is troublesome—viz., wherever the Marguerite is grown—all plants should have all old diseased leaves removed, and the crowns and young growth should be dipped in Bordeaux mixture, taking care that the Bordeaux mixture is made from the best bluestone and not from an inferior article, as the cheap bluestones contain more or less sulphate of iron, and this will destroy the bulk of the plants dipped into a solution of which it forms part.

The best strawberries to grow are—

1st, for early box berries—Aurie and Marguerite.

2nd, for mid-season box berries—Aurie, Marguerite, Federator, Pink's Prolific, and Trollope's Victoria.

3rd, for jam—Pink's Prolific, Trollope's Victoria, and Marguerite, though the latter has not the colour of the former.

There are, in addition to those named, several seedlings that are showing considerable merit, but are not yet fully tested.

Farm and Garden Notes for March.

FIELD.—Continue to plough up the land and get it ready for lucerne sowing. The whole of the potato crop should be finished planting by the middle of this month. As the growth of weeds will now be slackening off, lucerne may be safely sown in good, rich, deep soil. The land for this crop should have been previously thoroughly prepared and reduced to a fine tilth. Lucerne may be sown either broadcast or in drills. If weeds make their appearance before the plants have sent down their roots, mow the field. Before the weeds again raise their heads, the young lucerne plants will be strong enough to make head against them. Then harrow and roll the field. In warm, late districts, maize may be sown, but in localities where early frosts occur it is not advisable to sow this crop. Gather maize as it ripens. Watch for the ripening of tobacco; gather the leaves or cut down the plants as they arrive at maturity, and leave them to wilt on the field. Rye-grass, prairie-grass, oats, barley, wheat, sorghum, vetches, carrots, mangolds, and Swede turnips may be sown.

First sugar-cane trashing this month in Northern Queensland.

KITCHEN GARDEN.—This is a busy month for the market gardener, seeing that most of the winter crops of vegetables may be sown, the autumn beginning on the 20th of the month. Have all the beds ready dug during the dry weather. Dig deep and manure well, so that every available opportunity for planting out may be seized at once. When transplanting, try to leave a ball of earth attached to the roots of the plant, or make a thick batter of earth and water and put the plants into this as you raise them from the seed bed. In planting out cabbages, make the rows 2 feet apart, and, if on a slope, make the rows across the hill. Give asparagus beds a dressing of salt. Make a general sowing of broad beans. peas, French beans, beet-root, carrot, turnip, radish, kohl rabi, cabbage, cauliflower. onions, leeks, lettuce, mustard and cress, celery, parsley, endive, spinach, &c. Transplant eschalots. In showery weather, plant out cabbage, cauliflower, &c. Beet-root requires a very deep, rich soil. If the young plants are attacked by grubs, spray with Paris green. This is about the best time to plant strawberries. Select strong, healthy runners. Note Mr. Pink's remarks on the disease which attacks the Marguerite strawberry.

FLOWER GARDEN.—The season is now getting much cooler, so that all screens may be removed to allow the plants to get the full benefit of the sun and air. Autumn flowering plants will present a very gay appearance. Dig or fork in the mulching and keep the hoe going. Continue to stake and tie up plants. Look over rows that have been budded, and loosen the ties if necessary. Plant out bulbs of freesias, ranunculus, narcissus, iris, ixias, anemones, &c. Dianthus, phlox, sunflowers, and various annuals may be planted out during showery weather. Make sowings of antirrhinums, asters, cornflowers, daisies, dianthus, larkspur, cosmia, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas, &c. Give chrysanthemums plenty of liquid manure, and especially attend to such as are likely to come into flower soon. Many of the semi-tropical shrubs may now be safely planted out. They will be well established and have a good hold of the ground before the cold weather sets in.

Agriculture.

FIRST STEPS IN AGRICULTURE.

14th Lesson.

SECOND STAGE.

By A.J.B.

We will, in this lesson, take the artificial manures as I classified them in Lesson 13, that is to say as Nitrogenous, Phosphatic, and Potash manures.

A Nitrogenous manure is one which contains more or less nitrogen. Farmyard manure is one of these. Amongst the artificial manures I mentioned Peruvian Guano as being nitrogenous, and I told you how rich it was in ammonia many years ago, but all the best deposits have been worked out since I was at the Guano Islands, and the guano is now more of a phosphatic character, being very poor in nitrogen, the latter constituting only about 4 per cent. and the phosphates about 50 per cent. of the manure. There is also a small percentage of potash in it.

The offal from fish-curing establishments is called Fish guano, and this also supplies about 10 per cent. each of ammonia and phosphate of lime.

Nitrate of Soda is a most valuable artificial fertiliser. It contains nitrogen, the most important of plant foods, in its most readily available form. The effect it has upon a soil poor in nitrogen is little short of marvellous, especially in the case of wheat and grass. It acts almost immediately it is applied, and is particularly useful in a dry season. It is a compound of nitric acid and soda, and is found in large deposits in some of the rainless regions of the west coast of South America, mixed with earthy matter which is removed from it, leaving a substance containing 95 per cent. of the fertiliser, the remainder being chloride of sodium or common salt.

Unfortunately, it is the most expensive of manures, and scientific men are hoping to devise a means whereby the nitrogen of the air may be united to the sodium of common salt, and so produce nitrate of soda artificially and cheaply.

It is a suitable manure for all crops except legumes, especially for cereals, used at the rate of from 1 to 2 cwt. per acre. You will see how very valuable a fertiliser it is when I tell you that on two trial plots, one with nitrogen, the other without, that with nitrogen yielded 64 bushels of barley and the other only 36 bushels.

For mangolds it is also good. A mixture of 1½ to 2 cwt. of nitrate and 2 to 4 cwt. of common salt, applied in two dressings, is a fair proportion.

The first dressing should be applied when the young plants are old enough to use some of the nitrogen, and the other some time afterwards as a liberal top-dressing.

Never mix superphosphate with nitrate of soda, because the free sulphuric acid in the superphosphate sets free the nitric acid in the soda.

Now, you want to know why plants treated with nitrate of soda suffer less from drought than others not so treated. The reason is, that it rapidly permeates the soil, so the roots have not to go down in search of it, nor even to seek it immediately below the surface, which would result in the evil of shallow rooting. The growth of the young plants is so stimulated that the roots are able to strike far down into the soil without any delay, so that dry weather coming on afterwards will not affect them injuriously.

Sulphate of Ammonia is a compound of ammonia and sulphuric acid, derived from the refuse of gasworks. It is quite soluble in water, contains more nitrogen than the nitrate just spoken of, but is not so quick in its action on plants. It may be used for all purposes to which the nitrate is applied, but should be put on the land earlier than the latter, because it has to undergo NITRIFICATION (the process by which the material containing the nitrogen is decomposed, to set the nitrogen free) before the nitrogen is available as plant food.

Other slow-acting nitrogenous manures are those I told you of in Lesson 4, so I need not describe them here. Indeed, this whole lesson is really only an extension of the 4th. Of POTASH MANURES, the best known is that called KAINIT, a mineral obtained in Germany consisting mainly of Chloride of Potassium or Muriate of Potash, Sulphate of Magnesia, Common Salt, &c. MURIATE OF POTASH is a very useful fertiliser for potatoes and root crops. It is of not much value in heavy soils, as they generally contain potash, but light soils are benefited by it.

COMMON SALT is often applied in small quantities to the soil. As a manure proper, salt is not required by plants, as Sodium has been proved by numerous experiments not to be essential to plant life; there must then be some other reason for its use. This reason we find in the INDIRECT ACTION of salt in decomposing some substances in the soil, and so setting free something needed by the plants. This was only lately discovered, and pages used to be written and extraordinary statements made about the use of salt, some declaring it a valuable manure, others a rank poison, and the chemists themselves did not know what use it was if applied to the soil. It is sometimes used to prevent too rank a growth, but how it acts in this case is not properly understood. It is quite possible that the checking of the growth is due to the plants being poisoned by the salt. At any event, such a suggestion is made by Professor Storer in his valuable work, "Agriculture in some of its Relations with Chemistry," Vol. II. He says also that Nessler discovered that tobacco grown on land manured with salt had tougher and more flexible leaves than that grown on unmanured adjacent land. Now, there is a cheap, simple experiment you can and ought to make in your garden. You might make a discovery which might be of very great value to tobacco-growers in Queensland.

LIME.—The use of lime in agriculture is of such importance that I could write many pages on the subject, but here I shall just briefly tell you what it is used for and how to use it. Hereafter you will find all about it in various books on agriculture, which no farmer should be without.

If there is no lime in a soil, no crop can grow on it. All plants require more or less of it. In an acre of average soil taken to the depth of 1 foot there are, at an exceedingly low estimate, 3,250 lb. of lime. There is a certain quantity of lime in farmyard manure and in all the artificial manures. Now, how does lime act on the soil? Is it a direct fertiliser? These are the only two questions you need replies to.

CARBONATE OF CALCIUM—that is, LIMESTONE—is, as I have stated, found in all soils. When this is burnt, it becomes QUICKLIME; and when the latter is mixed with water, it is then SLAKED LIME. It acts with acids in making clay soils more friable and pervious to water, and it promotes the decomposition of vegetable matter and organic manures and the formation of nitrates in the soil. Thus the clay soil is rendered warmer and easier to work; material containing potash is broken up, and the potash is, by the action of the lime, presented in an available form as plant food, but which prevents it from leaching out of the soil. It also acts in rendering available all three of the plant foods which lie dormant in the soil. That is its *chemical* action.

Its *physical* action is to render stiff clays easier to cultivate and better able to supply moisture, heat, and air to the plants.

It improves the texture of sandy soils, making them more compact and better able to retain moisture and fertilisers. But lime must not be used heavily on a sandy soil, or the latter will soon be exhausted by the above chemical action of the lime.

This answers the second question. Lime is *not* a direct fertiliser.

Lime should be applied a little time before planting a crop. It should not be ploughed in. It is of great value in destroying insects, worms, and fungi, and enables a farmer to grow root crops where formerly, for want of lime, such crops became diseased.

After screening the slaked lime, you scatter it with a grain drill or a special lime spreader, then harrow it and incorporate it with the soil. As to how much to use, some people put on from 2 to 5 tons per acre at intervals of from five to ten years. Others put on half-a-ton annually. Lastly, this is worth remembering: Water-melons, peas and some other legumes, corn, and potatoes are *injured* by lime; but sugar-cane, beetroot, onions, celery, lettuce, parsnips, cabbage, maize, rockmelons, tobacco, and fruits are *benefited* by it.

The Phosphatic Manures are—Phosphate of Lime, and also several varieties of fertiliser included under this name, such as Superphosphate of Lime, Basic Slag or Thomas' Phosphate, Bone-meal, Bone-ash, Bone-black, and some Phosphatic Guanos. Superphosphate, when put on the land, acts in this way: The first shower of rain, or the moisture of the soil, dissolves the phosphoric acid, and it soaks into the earth. There it meets our old friends Carbonate of Lime, Iron, and Alumina. These seize hold of it, and with them the phosphoric acid forms phosphate of lime, which is finer than the finest bonedust, and is distributed everywhere throughout the soil. Thus the root crops get an abundant supply of phosphoric acid.

Questions on Lesson 14.

1. Name the classes of Artificial Manures.
2. What are Nitrogenous Manures? Which is the most important of these?
3. How does this fertiliser act?
4. Is Salt really a direct-acting Manure?
5. Does Sulphate of Ammonia differ from Nitrate of Soda in its action?
6. What is Kainit? Whence is it obtained?
7. Explain the action of lime on soils—(*a*) chemically, (*b*) physically?
8. Name some plants benefited or injured by the use of lime.
9. How and in what quantities should lime be applied to the soil?
10. State what you know about Phosphatic Manures and their action.

15th Lesson.

SECOND STAGE.

In our last lesson we considered the three principal artificial fertilisers. It is necessary that you should know the effect they have on plants and soils. If you are acquainted with the "functions"—that is, the duties and action of any substances applied to the soil as plant food—you will be better able to make use of them in proper proportions. For instance, I made a little experiment last September with a small plot of potatoes in my garden to show the effect of nitrate of soda on the plants. I applied the nitrate to three rows as soon as the plants were 6 inches high. The other three rows had been manured with well-rotted stable dung. I must tell you that I used more than twice as much nitrate as was necessary. The plants so treated showed the effect almost immediately. They grew rapidly, and the leaves were of a beautiful, healthy dark-green colour. As the season went on, the haulms increased in height until they fell over and lay on the ground. In November some of them were over 4 feet long. In due course I dug up the crop, and, although there were a large number of potatoes at each root, there was only one of marketable size; the rest were all about the size of a big marble. On the other hand, the plants which had received no top-dressing yielded a good ordinary crop of large tubers. Now, what had happened? The roots had seized upon the soluble nitrate, and they had conveyed it to the haulms, which in consequence had grown to an immense size at the expense of the tubers. Thus you see that, if you have no knowledge of the effect produced by fertilisers, you may not only waste money but injure your crops. What are the functions of potash in the soil? What does it do for plants? There is a large quantity of potash contained in most soils when the original rocks have been decomposed, and in their remains the potash is present in an insoluble form, but much of it is in such a form that it is dissolved by water, and so reaches the plant, and some is acted upon by acids which come from the plant roots. It is mainly in the case of land which gets little manure, and when the rocks only supply a very small quantity of potash, that its application to the soil is advantageous. The potash assists in making the nitrogen of the soil available as plant food. Have you ever noticed how well corn grows on the spots on newly-cleared land where heaps of timber have been burned? The reason is that the potash contained in the wood ashes has assisted the action of the nitrogen, which has thus been made available for the corn plants in super-abundant quantity. The soil on such spots is always moister than the surrounding soil.

The plants most benefited by an application of potash are beets, potatoes, clover, cabbages—all leafy plants, you notice. Professor Storer writes: "It appears, indeed, that we may say, Use phosphates for turnips and such like roots, POTASH FOR LEGUMINOUS PLANTS, and active nitrogen for grain.

Many of our scrub soils are deficient in potash, so are light sandy soils, but as clay increases in a soil so does the potash. It is not good to add potash to a very heavy clay soil, therefore. It does more harm than good by making the soil more impervious. But, as I told you before, one of the functions of lime added to a soil is to render it more friable and easier to work, so that, if potash is in excess in a clay soil, a plentiful addition of lime will overcome its unfavourable effects. But wherever potash is used there must be effective drainage, or all its good effects are destroyed.

What is the effect of applying a phosphatic manure? First, consider bone-ash. This is dissolved (probably) by carbonic-acid water in the soil, and then is conveyed directly to the plant. It is also probable that the solution is first decomposed by compounds of iron or of alumina in the soil, and that the phosphates of these minerals are dissolved either by carbonic-acid water or by the acids of the roots, and so are conveyed to the plant.

Next take superphosphate. When it is applied to the soil, the moisture dissolves the soluble phosphoric acid which soaks into the earth. The earth holds carbonate of lime, and this substance with iron and alumina arrest it. Now, this phosphoric acid rendered soluble is far finer than the finest bone-dust, and is distributed evenly throughout the soil, consequently the root crops get a continuous supply, and superphosphate is then infinitely superior to bone-meal or bone-ash.

When you intend to use superphosphate, first pause and consider whether there is a sufficiency of lime in the soil. If there is not, you will do harm instead of good by its use, in consequence of the soluble phosphoric acid not being precipitated quickly enough. There should be enough lime to precipitate the acid fairly quickly, and time must be allowed for that precipitation.

I will close this lesson with a few remarks on how and when to fertilise. In the next book you will be shown how to start a farm; how to deal with it in the matter of drainage; what crops to grow; when, where, and how to grow them; what implements, farm buildings, and stock are required on the farm, and many other matters which need to be known to make you a successful farmer.

The farmer should bear in mind the particular purpose to which an artificial fertiliser is to be applied, since neither all trees nor all crops take kindly to the same kind of food. There is as much difference, comparatively, in the food of the different members of the vegetable kingdom as there is in that of the animal. A horse will not eat flesh, nor a dog hay; neither will all trees flourish on the same nutriment.

Every intelligent horticulturist is aware of this fact, and acts accordingly, being guided in the application of fertiliser by the analysis of the ash of such plants and trees as he cultivates.

It is on this principle and on this basis that the special fertilisers are manufactured, each containing the particular ingredients needed by the particular plants to which it is intended to be applied. One may need a larger amount of ammonia than the soil naturally furnished, another more potash, another more nitrogen and phosphates. When these special fertilisers are made by honest manufacturers they are very valuable aids to the farmers and fruitgrowers.

Analysis shows that the ash of the orange tree and fruit contains a large percentage of potash, lime, and phosphoric acid, besides smaller quantities of other mineral ingredients. Hence, these are substances, conjoined with sufficient vegetable matter to retain moisture, that the orange-grower must feed to his trees.

And now how are these to be obtained? Easily, and by every man who chooses, for they are all about him in profusion, needing only to be utilised by a provident and thrifty hand.

The analysis of a soil may show lime to be needed, and lime is forthwith applied, and without effect, because powerless to work alone. Combine it with humus, which, as everyone knows, is simply decayed vegetable matter, and then its effect will be quickly visible.

Here is one of the many proofs that there are two distinct classes of manures, one serving as the actual food of plants, the other assisting in preparing that food by combining with the substance in the soil and bringing it into a form that the plants can assimilate, or by changing such as would be inimical to vegetable life. Thus, for instance, when we apply lime to a newly broken piece of land which is mucky, we say that the lime has sweetened it, because its action on the carbonic acid contained in the muck is such as to change, by combination, that which would otherwise be hurtful to vegetation and helps to transform it to valuable manure.

In applying fertilisers to trees, the latter should be treated rationally. A surfeit of rich food will derange the animal system, and so it will the vegetable. Too large quantities of manures, rich in nitrogen, for instance, will cause dieback and fungoid diseases.

While the trees are young and in rapid growth they will bear heavy fertilising, just as a growing child will eat more in proportion than an adult; but if the system of high fertilising is continued after they have arrived at the bearing age, eight or ten years, it will almost invariably retard their fruiting, as too rich a soil has a tendency to make wood rather than fruit. Therefore, after the seventh year the quantity of fertiliser should be gradually lessened, and only enough used to keep the tree in a healthy slow-growing condition.

In fertilising for young trees nitrogen should be present in larger quantities than for bearing trees, the latter requiring more potash, phosphoric acid, and other kindred ingredients. Yellowish leaves indicate deficiency of nitrogen in the soil; dark-green leaves show that there is plenty of it.

Finally, do not lose sight of this fact: Of the three ingredients mentioned either one or two are deficient; so, also, is lime often on a soil requiring fertilising. Now, you cannot make up for the want of potash by increasing the quantity of nitrogen, neither will an excess of potash make up for a deficiency in phosphoric acid. If any one or two of these substances is wanting, the soil will not produce abundant crops, and you must see that the necessary ingredient is supplied.

Suppose that Phosphoric Acid is wanting, how are you to supply it? You have seen that you can do so by using bone-ash, bone-meal, phosphatic guano, Thomas' phosphate, or superphosphate.

Is NITROGEN required? Then use sulphate of ammonia, nitrate of soda, dried blood, or guano.

For supplying POTASH, use kainit or wood ashes.

I will now close Part 2 of this series with the usual questions.

Questions on Lesson 15.

1. What is meant by the "Functions" of a fertiliser?
2. Describe an experiment illustrating the bad effect of too much nitrate of soda applied to a growing crop.
3. What are the effects of Potash as a fertiliser?
4. For what plants would you employ—(*a*) phosphatic manures; (*b*) potash manures; (*c*) nitrogenous manures?
5. What function does lime perform in connection with the soil?
6. What is the effect of applying a phosphatic manure? How is the phosphate rendered soluble?
7. What should be considered before applying superphosphate to the soil?
8. What fertilisers are needed for orange-trees?
9. What is the result of applying manures in too large quantities?
10. What do yellow leaves of a plant indicate? What do dark-green leaves show?

THIRD STAGE.

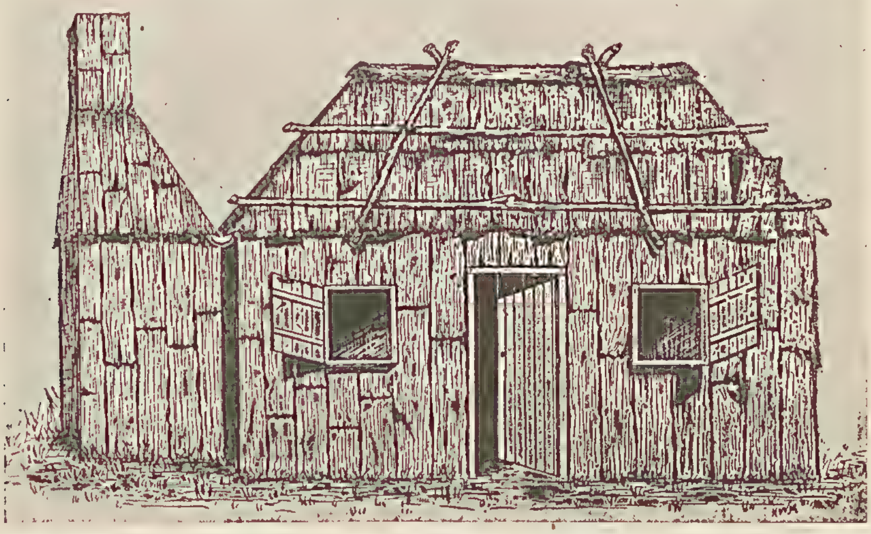
1ST LESSON.

What I have explained to you in the first two primers of this series will have served to give you a general insight into the FIRST PRINCIPLES OF FARMING, and these lessons have taught you that successful farming cannot be carried on by rule of thumb. In these modern days you must farm on scientific principles or you will not succeed. I grant that many of our best farmers here in Queensland began in the days when the only farm implements required were the hoe, the axe, the firestick, and a cornsheller. Very little capital was needed. I myself began scrub-farming many years ago, when all the scrub was still standing on the banks of the great Southern rivers and creeks, and even from Brisbane to the Seventeen-mile Rocks and further the scrub was barely touched. My farm of 25 acres was all dense vine scrub on the banks of Oxley Creek, with the exception of about half-an-acre of forest on a hill, and 3 or 4 acres of ti-tree swamp. Wallabies, bandicoots, snakes, and iguanas were in possession of the land. My whole capital consisted of a boat, some splitting tools, a few hoes, a tent, and a month's ration of salt beef, flour, tea, and sugar; £20 represented all my available cash. There were no wheeled vehicles of any description in the district. All labour was done by hand, and all produce carried on our backs from field to barn and from barn to the boat, which carried it to Brisbane or Ipswich.

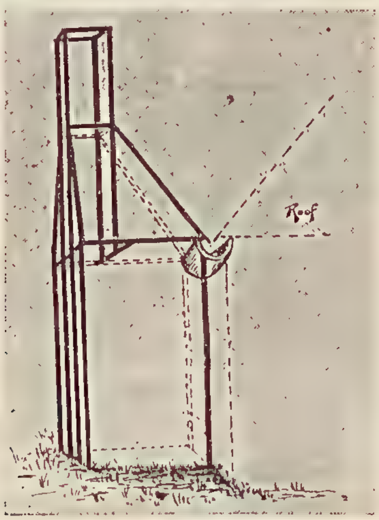
How this land was changed from a heavy scrub to a beautiful farm is what I shall now explain, for the reason that there are many thousands of acres of rich scrub land in the State which many of you will no doubt some day take up and settle down on.

SCRUB-FARMING.

When you decide on taking up a scrub farm, bear in mind that you will have to do more than grow corn and potatoes in these days. Every farmer should keep dairy cows and pigs. So that, in addition to your scrub land, be careful to obtain a good area of forest or plain, on which to depasture a few head of good dairy cows and whatever horses you may require. I should advise that a portion of this land be at once fenced in with wire fencing. A three or four wire fence is cheaper, and can be more quickly erected than a two-rail split fence. Whilst you are fencing you can be also running out some slabs for your first "house," and, if stringy-bark or box is handy, get off sufficient sheets for the roof not only of the house, but also of a cowshed. The house will, of course, be a very primitive affair at first: 20 feet long by 10 feet or 12 feet wide will give you two rooms quite large enough for two people or even three. This will take about sixty slabs, which, with free-running timber, you can easily run out in a day. Twenty sheets of bark will roof it, and with plenty of good timber, twenty sheets of bark only take half-a-day to strip. Flatten out the bark, after scorching the inside to keep it from splitting, and weight the pile with a few logs. It will have seasoned sufficiently by the time you are ready for it. When stripping bark, if you find it clings to the tree, set up a fire all around it for ten minutes. It will then come off freely. Put in four stout corner posts and two intermediate ones. Put on wallplates dressed on two sides with the adze, and to these nail the slabs, which may be sunk 6 inches into the ground. A ridge pole and a few rafters complete the frame. Nail on some saplings longitudinally for battens, to which fasten the bark with greenhide and toggles. *Never nail bark on*, for as the bark shrinks the nails will draw through. For windows, do as I did—make shutters. They are quite good enough for a beginner, and remember that you will want all



your money for the farm and dairy work ; so don't go to the expense of a boarded floor. An earthen floor soon tramps down hard, and the house can be swept out and kept clean as well as if boards were laid down. If you like to build a bush chimney you can do so, as it will not cost much, being built of bark and saplings. Make it at least 6 feet wide and from 4 to 6 feet deep. The accompanying figure will show you how to build it. The eave of the



house and the eave of the chimney lead into a wooden trough to prevent the rain entering the house. Two handy young fellows will build such a hut in less than a week, and they will not be long in running up a rough stockyard and building a shed for the cowbail.

Now you are ready for a start, and may set to work at scrub felling. In doing this, be careful as much as possible to fell the trees so that they lie in the same direction, not piled up higgedly-piggedly anyhow. To effect this you must first go through the scrub and cut all the vines close to the ground, and also overhead; then cut down all undergrowth and saplings up to 3 inches in diameter. Now you have a clear space to swing your axe at the big timber. Some people half-cut through a dozen trees and then drop a bigger tree on them, which brings them all down. Do not do that. It appears to be a saving of labour; but your half-cut trees are not clear of the stumps. They continue to draw nourishment from them, and hence will not dry quickly. Besides that, they do not lie flat on the ground, and this prevents a good burn off. Lop every tree, laying the branches as flat as possible. When you have about 5 acres felled in this manner, leave it to dry and tackle another portion, leaving a good width of standing timber between the old and the new fall. In about six or eight weeks, the first lot will be ready to burn. Do not wait till the leaves have dropped off, or there is sure to be a bad burn. Choose a night when a fair breeze—not a gale—is blowing, and fire the scrub at different points, because this causes a series of draughts which help to make a good burn-off. By good management and attention to all the details here given, the fire will make a clean sweep of everything but some of the biggest logs, which will, however, present no obstacle to planting operations, and which may be got rid of by and by.

Now, suppose you have burnt off in August, you can at once set to work and get in a crop of maize. The soil is, of course, a solid mass of roots, but they are soft, and a No. 3 hoe will easily cut through them. Plant the maize, three seeds in a hole, at a distance of 5 feet or, better, 6 feet between the rows, and 3 feet between the plants. Drop in a few pumpkin seeds at intervals of about 30 feet. You have now two crops underway, and in the rich, deep, vegetable soil they will grow with marvellous rapidity, even in a dry season. You will have no weeds to trouble you with the first crop, so your whole time can now be devoted to getting ready for your dairy stock and to fencing in the planted land. By the way, never fence scrub till you have cleared it, or the falling trees and fire will destroy the fence. The maize, as it grows, will throw out a number of suckers, which must be removed and used for fodder for the cows, which you may now buy according to your means, as you have a certain amount of feed for them as well as the grass in the paddock.

Do not make the mistake of buying a lot of poor stock. Start with a few really good Jerseys or Ayrshires, and a good boar and a couple of sows—Berkshires for preference.

The arable land is, of course, a mass of stumps; so you cannot profitably grow lucerne, but you may scatter seeds of the *Paspalum dilatatum*, which will soon furnish you with abundance of excellent feed. If you have time, you should get in at least an acre of potatoes. To do this break up the land with the hoe in rows 2 feet wide and 2 feet apart, cutting through all the roots and clearing them out. In less than four months you will have an additional supply of food for the pigs.

That is about all you need in the way of instructions for starting a scrub farm. In about three years the stumps may be taken out, for they will nearly all have rotted. Once this is done, you are ready to give up hard work and take to horses and implements. There is no doubt that commencing such a farm means a great deal of hard work from daylight to dark. But, if you mean to succeed, stick to it. Don't run off to town at every opportunity; and although cricket and football are manly and useful games, don't indulge too much in them, for every day off the farm is a dead loss to you. Young men starting farm life on their own account should be careful to avoid the public-house. Vigorous, healthy youth requires no stimulant beyond its own natural vital forces. For years on the farm I touched nothing but tea, water, and home-made hop-beer, and I was always able to do a heavy day's work either at felling scrub, splitting, or, what was harder than all, pulling a heavy boat laden with 5 tons of potatoes to Ipswich.

If your farm is near a railway station, you will require a spring cart to fetch and carry. Such carts were very dear in my time, so I bought a pair of wheels and an axle and built a cart myself. It was a rough affair, but it served its turn for the time being. Once the stumps are out, you can lay down a few acres of lucerne. You should also at the earliest opportunity lay out a small orchard, planting such fruit trees as are suitable to your district. Fruit trees take time before they bear, but they keep on growing whilst you are working at other things or resting. If your farm is on the Downs, plant apples, pears, quinces, plums, peaches, nectarines, apricots, and even walnuts. If below the Range, plant citrus fruits, guavas, peaches, wild goose plums, mangoes, custard apples, persimmons; grow also pineapples and passion fruit. In the Central and Northern districts your orchard, in addition to citrus fruits, should contain some purely tropical ones, such as jack fruit, mangoes, papaw apples, Duriens, &c.

By and by you might plant a few suitable vines.

A vegetable garden I have not mentioned, as you will naturally think of growing vegetables, if only for home use. There is a great deal of money, however, in growing cabbages for the market where you have a suitable soil, a cool climate, and cheap carriage by water or rail.

Questions on Lesson 1.

1. How would you proceed to clear a vine scrub?
2. When cleared, what is the first crop you would plant?
3. What fruit trees would you plant—(*a*) on the Downs; (*b*) below the Range; (*c*) in the Central and Northern districts?
4. When would you stump scrub land?
5. What grass may be grown amongst the stumps?

AGRICULTURAL CO-OPERATION: SUGGESTIONS FOR THE CONSIDERATION OF THE FARMERS AND FARMERS' ASSOCIATIONS OF QUEENSLAND.

By FRED. WM. PEEK, Loganholme.

In addressing a few ideas of a practical nature to our farmers and producers, I do so because of my long association with those of our community who have struggled from the early days of this State's history, and who, by their perseverance and toil, have been the chief factors in the progress of the State. It is to the man on the land, who faces the virgin scrubs and forests, axe in hand to clear the land and bring it under his control by careful toil and perseverance notwithstanding recurring adverse climatic conditions, that credit must be given. Queensland has many districts that can be pointed out with pride to the seeker for information, or to the intending settler, as landmarks of our State's progress, where a few short years ago all was in its primeval state, and where are now well-kept farms—thriving townships—with ever-increasing businesses and manufactories, swelling the State's importance and wealth, and building up such institutions of lasting value, that speaks well for the wealth of soil and energy of our farmers and producers. One of the first things necessary in every small settled community of farmers, who desire to assist each other for the benefit of the whole, is to meet together at certain intervals for discussion, and by taking counsel together, comparing notes and experiences, to try to alleviate the hundred-and-one little troubles with which they are surrounded. In nearly every district in this State, so-called agricultural societies and associations have been formed to assist those whose occupation is primary production, and I am pleased to be enabled to write that such institutions have done a vast amount of good, especially so where the objects for which they were intended have been strictly adhered to. The maxim that "Union is strength" can never be better exemplified than by our farmers, if they follow on the lines of the progressive societies of England and of the Continent of Europe. This spirit of unionism or co-operation is the secret spring that has revolutionised the agricultural industry of the world. The farmers first, by meeting together and discussing matters of mutual interest, which included not only cultivation of the soil but the disposal of their products, by finding and creating markets, introducing better systems of manufacture, and the constant demand for the latest information and scientific knowledge, compelled the attention of their respective Governments, manufacturers, scientists, and others to their urgent needs; and their requests have been responded to most heartily by the erection of schools, colleges, training homes, experimental farms, and gardens under the care of skilled teachers, professors, and practical scientists, who have succeeded in placing the farmer's produce on the markets of the world in the best possible manner with the smallest amount of physical labour and cost. This, then, should be an incentive to the farmers in this State to meet together in unison to make their wants known, to form societies, or, if such are already established, to form branches working under the same rules, but independently as regards their own requirements. Thus a better feeling will be engendered, and, by co-operating, the many little difficulties will be overcome, and socialism of the right kind will be established. It has often been shown that by uniting for the purchase of your seeds, implements, and even your clothing and everyday requirements, a great saving will be effected in the cost to each individual by the larger or wholesale purchasing power. The same system applies also with beneficial results in marketing your crops. The great lesson learned from co-operation, is that it teaches you and your neighbour to help yourselves. It not only enables you to obtain a better price for what you grow and have to sell, but it creates a very considerable saving in what you have to purchase. In other words, co-operation not only assists you in "making a profit," but, better still, it helps you "to save one."

OUR SOCIETIES AND ASSOCIATIONS.

In addressing a few notes to our societies and associations on the question of co-operation or, as some prefer to call it, affiliation (it all tends to the same conclusion), I may be permitted to state that at the present time there is certainly a movement amongst the various bodies in this State to increase their usefulness. The conferences inaugurated by the Department of Agriculture have brought out the fact that common sympathies and interests permeate the whole of this State's societies, but for the want of proper organisation they have allowed their interests to lie dormant. No greater factor for the welfare of the agriculturists of this State could be found than the work which could be undertaken by the various societies and associations, if properly organised and modelled on up-to-date lines. It was this thought that enabled the writer to take into consideration the organising of a central body uniting the various societies into a corporate body, and which was enthusiastically taken up at the Bundaberg Conference, where a strong and energetic committee was appointed to carry out the object in view—namely, the establishment of a Queensland Chamber of Agriculture. This has been done successfully, and I may therefore be pardoned for saying to our farmers, producers, and the members of our various societies and associations, whether large or small, that this Chamber has been formed to benefit you. You may be of the opinion that this does not interest you—that local organisations meet your needs and requirements; but this is not so. Those of your members who are moving with the times will gladly welcome and avail themselves of this institution which seeks to co-operate with each and all in furthering in a practical manner the interests you, as local bodies, are representing, and by its close touch with the various Government departments endeavouring to obtain the relief desired, or to carry into effect the suggestions and desires of the agriculturists of this State. Already good work has been accomplished. The question of exorbitant freights on Northern-grown fruits has been settled satisfactorily; communications have been opened up with the various Societies and Chambers of Agriculture in the southern States on interstate matters affecting the joint interests of our farmers. Freights on Queensland railways have been discussed, and an urgent endeavour is being made to secure permanently the temporary reduction and assimilation of freights with those of New South Wales; also, the periodical inspection of weigh-bridges, with certificates of true weight for freight, on railways, is advocated; the establishment of cyaniding chambers, &c., &c. The question of the tariff was also fully discussed, and the suggestions received by the Chamber from the various affiliated societies were promptly forwarded to each State representative and Senator of the Federal Parliament with good results, as the answers received proved satisfactory to the members of the Chamber of Agriculture. All this goes to prove the benefit of affiliating or co-operating, as by our societies uniting under one central organisation they may still maintain their individuality for local requirements whilst assisting the general producer by advocating such interests as conduce to the progress of our industries. It surely cannot be said of us Queenslanders that we do not know how to combine. We have only to look at the union of workers in this State to prove the falsity of that notion. But they are not farmers, you say! Farmers will not combine like that! To these I would point out that there are now registered in this *Journal* upwards of 140 societies, and surely there must be a certain amount of *camaraderie*—a reciprocal feeling that what "troubles one concerns all." This is the true spirit we must have if we are to combine successfully to place our industries in their proper position. The good work that has been begun by our societies must be still further developed. The Chamber of Agriculture was the outcome of the influential conference held by the Department of Agriculture at Bundaberg, at which 120 societies were represented, and its success for good remains entirely in the hands of our agriculturists and their associations, who should rally round it and give every support until the institution comprises all the societies and individuals who have the future welfare of our great industry at heart. This is what is aimed at. The farmers and producers have the numbers here in this State to make them the dominant power in the community. All they want is complete organisation to co-operate with the one great object in view of advancing their interests and the State's prosperity which must follow. The nucleus is established, and the institution is now practically commencing its career. Its constitution is still open to amendments, which may be suggested by those joining its ranks year by year. It will grow yearly in importance; and when it embraces all societies and representatives of the producers, it will be of great assistance to the Department of Agriculture and a paramount influence in the State. Let our local societies then be stirring. Roll up your members. Our farmers and producers must be organised; our interests must be consolidated, and on all matters of importance we must combine and speak with one voice. Our members must be thoroughly instructed in the principles of co-operation, and impressed with the vital necessity of their being true to those principles, and accord the Chamber loyal support. Our farmers know too little of the systems that are ruling the world of production; but let our societies unite together to elevate and educate them as far as lies in their power, inducing friendly rivalry in productive competition and showing their district's progress at annual shows. At the same time all should bear in mind that better systems of marketing and display are as much needed as better production. I trust that, with the new year and with a new committee, new life and vigour may be imported to our societies and associations, that they may be induced to improve the systems and conditions of local productions and industries, and that they will unite under the organisation now established for the purpose of voicing their wants and requirements, and prove by their co-operating with each other that the farmers of Queensland are prepared and are fully alive to the necessity of keeping pace with any State of the Commonwealth of Australia.

MANURE FOR LUCERNE.

Where lucerne has been sown on poor land, or where it fails to yield satisfactory crops, give the land a good dressing of farmyard manure, and sow about 4 cwt. of superphosphate of lime and 2 cwt. of sulphate of potash per acre.

HILLED LAND FOR OATS.

Mr. A. Becker, of Eagle Hill, Nanango, writes :—It was by chance that I learned a little in the art of cultivating land for oats, wheat, barley, or any other crop for hay. It was only on a small scale. I had broken up some new forest land with a plough. After giving it two weeks' rest, I hilled up part of it for sweet potatoes with the plough. On account of a scarcity of sweet potato vines I could not plant all the hills. Two months after the hilling I harrowed it level again, ploughed it once more, and also the unhilled portion, and put oats into it. Judge my surprise, when the oats came up, on seeing those on the part which had been hilled growing quicker than the rest and as evenly as if they had been clipped with a mowing machine. The other portion came up very patchy, and only attained a height of from 4 feet to 5 feet, whilst the even lot reached a height of 5 feet 6 inches. Thus the yield of straw was far heavier on the latter. The average yield of grain per acre was 64 bushels, and the ears were so heavy that they bent the stalk to within 1 foot of the ground. This was last May. When planting this year, I shall try the experiment again on a different piece of land, and will let you know the result.

[If the land is of the same quality as that on which you got the heavy yield of grain, the result will most probably be the same. It is simply the natural effect of good cultivation. The hilled land would be in better tilth than the unhilled, which was most likely harder and more lumpy than the other. The soil being rendered finer in one case, the capillarity was increased, the roots could travel with ease in search of plant food, and there was less evaporation. The more you cultivate the land and the finer the tilth to which you reduce it, the better the crop will be. Your success with the hilled land proves this.—Editor Q.A.J.]

EXPERIMENTS WITH FERTILISERS.

Carried out by W. G. WINNETT, Slack's Creek, Loganlea.

In the early part of the year 1901, Messr. Webster and Co. offered to supply any members of the Logan Farmers' Association with fertilisers for experimental purposes, in order to test their qualities in connection with various crops. One of the members of the association, Mr. W. G. Winnett, accepted the offer, and also the conditions which were to be fulfilled in making the experiments. The results have been tabulated and placed before the association, as an object lesson to any other farmers who were interested in the subject. Mr. Winnett says he does not put it too strongly when he declares that the question of the value of fertilisers is one of vital importance to every farmer who wishes to make a success of his calling. We quite agree with him also, that associations would be more popular if they would give more time to the discussion of questions of educational and practical value to the farmer.

RESULTS OF EXPERIMENTS.

CABBAGE.

Soil.	Area of Plot.	Distance between Rows.	Distance between Plants.	Manure.	Cost of Manure.	Yield.	Value per Plot (less Cost of Manure).	Value per Acre.	Gain per Acre.	Loss per Acre.
	Acre.	Inches.	Inches.		s. d.		£ s. d.	£ s. d.	£ s. d.	£ s. d.
				Plot 1.						
Hill land; surface, brown loam, dry, with red subsoil	1/40	30	18	None	...	4 dozen fine 12 ,, inferior	0 7 0	14 0 0		
				Plot 2.						
Ditto	1/40	30	18	Superphosphate, 14 lb. Sulphate of potash, $6\frac{1}{2}$ lb. Sulphate of ammonia, $8\frac{1}{4}$ lb.	0 $7\frac{1}{2}$ 0 $10\frac{1}{2}$ 1 4	25 fine 140 inferior	0 9 6	19 0 0	5 0 0	
				Plot 3.						
Ditto	1/40	30	18	Superphosphate, 14 lb. Sulphate of potash, $6\frac{1}{2}$ lb.	0 $7\frac{1}{2}$ 0 $10\frac{1}{2}$	15 fine 90 medium 130 inferior	0 11 0	22 0 0	8 0 0	
				Plot 4.						
Ditto	1/40	30	18	Superphosphate, 14 lb.	0 $7\frac{1}{2}$	13 fine 65 medium 140 inferior	0 9 $8\frac{1}{2}$	19 18 4	5 8 4	
				Plot 5.						
Ditto	1/40	30	18	Sulphate of potash, $6\frac{1}{2}$ lb.	0 $10\frac{1}{2}$	160 inferior	0 2 $3\frac{1}{2}$	4 11 8	...	9 8 4

Remarks.—The best results were obtained by using Superphosphate and Potash together, as in Plot 3. Fifteen cabbages in this plot averaged 10 lb. each in weight. The worst results were in Plot 5, in which potash alone was used. In Plot 4, fertilised with superphosphate alone, 13 cabbages averaged 8 lb. each.

RESULTS OF EXPERIMENTS—*continued.*

CARROTS.

Soil.	Area of Plot.	Distance between Rows.	Distance between Plants.	Manure.	Cost of Manure.	Yield.	Value per Plot (less Cost of Manure).	Value per Acre.	Gain per Acre.	Loss per Acre.
	Acre.	Inches.	Inches.		s. d.		£ s. d.	£ s. d.	£ s. d.	£ s. d.
				PLOT 1.						
Hill land; surface, brown loam, dry, with red subsoil	1/40	20	..	None	...	50 lb. stunted, unsaleable				
				PLOT 2.						
Ditto	1/40	20	...	Superphosphate, $5\frac{1}{2}$ lb. Sulphate of potash, $2\frac{1}{2}$ lb. Sulphate of ammonia, $2\frac{1}{4}$ lb.	0 3 0 4 0 $4\frac{1}{2}$	129 lb.	0 7 $4\frac{1}{2}$	14 15 0		
				PLOT 3.						
Ditto	1/40	20	...	Superphosphate, $5\frac{1}{2}$ lb. Sulphate of potash, $2\frac{1}{2}$ lb.	0 3 0 4	184 lb.	0 10 11	21 16 8		
				PLOT 4.						
Ditto	1/40	20	...	Superphosphate, $5\frac{1}{2}$ lb.	0 3	168 lb.	0 11	22 3 4		
				PLOT 5.						
Ditto	1/40	20	...	Sulphate of potash, $2\frac{1}{2}$ lb.	0 4	50 lb. stunted, unsaleable				

REMARKS.—In this case the use of Superphosphate alone gave the best results, whilst Potash alone yielded the same bad return as Plot 1, in which no manure was employed.

RESULTS OF EXPERIMENTS—*continued.*

PEAS.

Soil.	Area of Plot.	Distance between Rows.	Distance between Plants.	Manure.	Cost of Manure.	Yield.	Value per Plot (less Cost of Manure).	Value per Acre.	Gain per Acre.	Loss per Acre.
	Acre.	Inches.	Inches.		s. d.		£ s. d.	£ s. d.	£ s. d.	£ s. d.
				PLOT 1.						
Hill land; surface, brown loam, dry, with red subsoil	1/40	20	...	None	...	15 lb.	0 2 0	4 0 0		
				PLOT 2.						
Ditto	1/40	20	...	Thomas' phosphate, 10 lb. Sulphate of soda, 5 lb. Sulphate of ammonia, 2¼ lb.	0 6 0 8 0 4½	42 lb.	..	8 13 4	4 14 4	
				PLOT 3.						
Ditto	1/40	20	...	Thomas' phosphate, 10 lb. Sulphate of potash, 8 lb.	0 6 0 8	45 lb.	..	10 13 8	6 13 4	
				PLOT 4.						
Ditto	1/40	20	...	Sulphate of potash, 10 lb.	1 4	11 lb.	..	0 6 8	...	3 13 4
				PLOT 5.						
Ditto	...	...	...	Sulphate of potash, 5 lb.	0 8	11 lb.	..	*1 13 4	...	2 6 8

REMARKS.—Plot 3 shows that the best results are gained by the use of Thomas' Phosphate and Sulphate of Potash, and the worst by using Potash alone, as in Plots 3 and 4.

* Some error here.—Ed. *Q.A.J.*

It affords us great pleasure to print Mr. Winnett's experiments. It must be patent to every farmer how valuable these are. Many have the idea that only a scientific man or an agricultural chemist can carry out useful experiments. Here is a proof that an intelligent farmer can, at very small expense, conduct a work which results in showing the farmer exactly what he has to do to ensure the highest yield. For instance, Mr. Winnett shows that at a cost of 1s. 6d. for fertilisers he can produce at the rate of £22 worth of cabbage per acre, and that without that trivial expenditure he only realises £14 per acre. That is as far as cabbage is concerned. In his experiment on carrots, unmanured land gave practically no return, whilst the sum of 7d. expended in fertilisers on 4 perches of land gave a return of £21 16s. 8d. per acre.

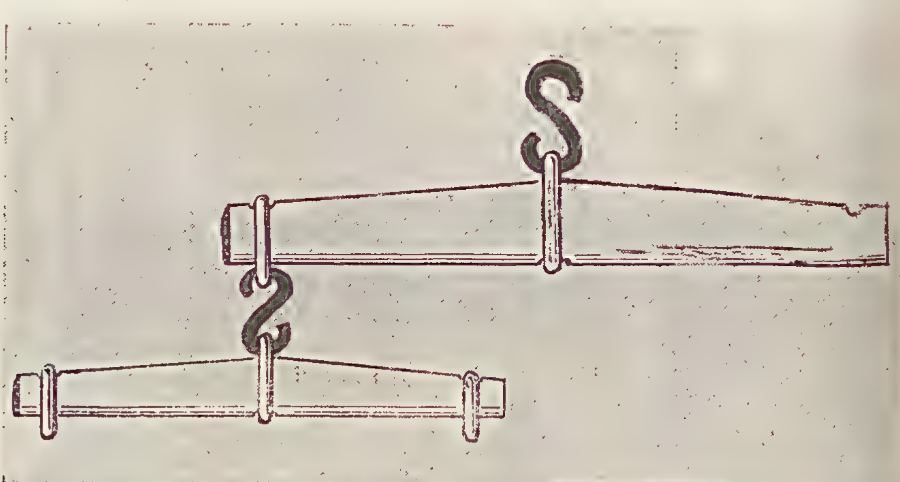
Turning to the experiment with peas, when no manure was used the yield was merely nominal, and estimated at £4 per acre, whilst 1s. 2d. expended in fertilisers on the same area resulted in a return at the rate of £10 13s. 8d. per acre. These are the lessons which the farmer can teach his brother farmer, and we wish it to be clearly understood that the pages of this *Journal* are open to the farmers to ventilate their ideas. This beginning by Mr. Winnett will, we trust, prove an incentive to others to try and increase the yield of their land, always remembering that artificial manures are not used like farm-yard manure, viz., to enrich the soil, but to furnish direct plant-food to the growing crop.

We would suggest that, when making experiments such as the above, the rainfall be given.

MOUNTING FOR WHIPPLE-TREES.

Mr. R. Jarrott, manager of the Gindie State Farm, finding that in the very dry climate of the Central district, about Emerald and Springsure, it is almost impossible to keep the ordinary style of mountings of whipple-trees tight, owing to the constant shrinking of the timber, has adopted a link, of which he writes :—

There are several advantages in using these links. The first is they cost next to nothing. The second that, no matter how much the timber shrinks, they won't come off, and if any of the bars are broken and a man can raise a tomahawk and a piece of good tough sapling, he can make a new one in about five minutes.



The size of the iron for the hooks will depend on the number of horses used. For our six-horse team the links and the S hooks are made of three-quarter inch round iron ; for lighter work we use half-inch.

It is the best plan to make the links first, and cut the timber to fit them fairly tight without having to force them on. Then when the link drops into the nick in the bar it leaves just sufficient room for the S hooks and tracehook. The nick for the link should be at least 2 inches back from the point of the bar.

A NEW AID TO AGRICULTURE.

A series of lectures is being delivered in many agricultural counties by Mr. D. Finlayson, F.L.S., on a matter of much interest to agriculturists. It illustrates the means of helping the farmer to produce more food for his stock by improving the food-producing power of the roots, mangels, swedes, turnips, &c., with which he feeds them. Mr. Finlayson is engaged in expounding the principles of the "Carter method of root selection" for seed purposes, which embodies the following tests:—The specific gravity of the entire root—this is a guide to its keeping quality; the specific gravity of the juice of the flesh—this is a guide to its feeding quality. The percentage of water is ascertained and diminished by selection. The quantity of saccharine matter and other digestible solids are ascertained and increased; the quantity of indigestible dry matter ascertained and diminished. Roots selected under this method combine highest density in the juice and in the whole root, the least amount of water, the least amount of indigestible dry matter, and the greatest quantity of digestible solids. When planted for seed purposes each root is analysed, and all those which do not reveal a strong combination of the above qualities are rejected. This has been introduced by Messrs. Carter and Co., the King's seedsmen, High Holborn, W.C., and is attracting a great deal of attention in the agricultural world.—*Farmer and Stockbreeder.*

WOOD INSTEAD OF CANVAS FOR REAPERS.

The trouble experienced by agriculturists, particularly in wet weather, in regard to the canvases of the harvesters and binders in common use, has been of such a serious character that anything that can be devised to obviate this inconvenience cannot fail to receive the most cordial welcome. Mr. W. Brown, Drumgley, Forfar, whose mechanical genius has already been profitably applied in various directions connected with the practice of husbandry, has been experimenting for some time with the object of effecting an improvement in the particular matter referred to, and the result has recently been made known.

Mr. Brown's idea has been to substitute for the present method of lifting the grain a series of octagonal wooden rollers, the position at present taken by the upper and lower elevating canvases, and the result of the trial was to demonstrate to those present that the idea is a thoroughly practical one. The rollers, which are about 5½ inches in diameter, and are placed about 1½ inches apart, readily catch the grain and carry it to the binding-tabler, where it is manipulated by the knotter in the ordinary way. The wooden rollers experimented with certainly add to the weights of the binder, but it is obvious that the idea can readily be applied in material of a lighter character. The motion is brought on by an ordinary pitch chain running over a series of pinions attached to the end of each of the wooden rollers. Mr. Brown has tested the invention on all classes of crops and under different weather conditions. On one occasion he used it when the crop was wet without any of that inconvenience attaching to machines fitted with the ordinary canvases.

In cutting and binding rye grass, on which it has been tested, the result has been equally satisfactory. Altogether the idea, which is protected by patent rights, is sure to lead to a new departure with regard to the reaper and binder of the future, and Mr. Brown may well be congratulated on the success which has attended the application of a practical mind over a period of years to the removal of a fault which has been a source of expense and annoyance to all agriculturists.—*Scottish Farmer.*

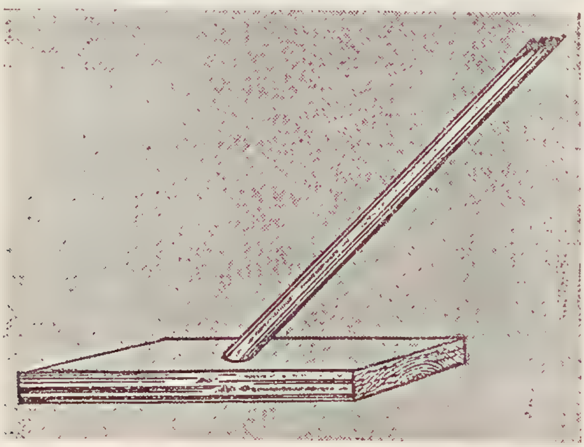
FLAX CULTURE.

By I. HAYWARD, Homebush.

Having been brought up to the cultivation and preparation of flax from sowing of the seed to preparing it for market in the old country, I have taken great interest in your notes on flax-growing by Messrs. Woolfe Brothers, of Traralgon. I sowed some seed here three years ago, but as it did not germinate I put it down to bad seed. Since then I have not tried any, as I thought there would be a difficulty in getting good seed in this country. I think that flax would grow well here in the Mackay district—that is, if properly put in. If I can get good seed I intend to have another try, and will let you know the result. The latter end of March will be a good time to sow the seed here, as most of the heavy rains are over by then, and the seed should be ripe before the frost could do it any damage. If sown later than March, the dry weather would prevent the seed from filling out.

Flax straw is very useful for thatching buildings, as it lasts much longer than straw. A farmer I knew in the old country could not get men who understood the retting, so he put in 20 acres for seed, and mowed it afterwards to thatch his buildings with. When I left, it had been on for five years, and looked as well as when first put on. It is possible that the oily nature of the fibre keeps the wet off as the oil on a duck's feathers keep the water off its back. This farmer heard of the fibre and the price it was fetching, so he made inquiries, but could not get any men who understood the manufacture. This was near Pewsey, in Wiltshire, an out-of-the-way place where the farmers always grew the same crops—barley, oats, and wheat—year after year; but this farmer had heard of the profit to be made by flax culture, so he determined to try some, and a friend of his recommended him to write to my father in Somersetshire. This he did, and we engaged to do all the cultivation and manufacture of the crop by contract. The seed was sown broadcast with a machine for the purpose. I am not aware whether there are any of these machines in Australia. It has a long narrow box about 9 or 10 feet long, with a long iron rod running through the centre, to which are attached little brushes at intervals of 6 or 8 inches to brush the seed through the small holes made for the purpose. It has handles like those of a wheelbarrow and the same kind of wheel. The spindle is driven by cogwheels.

When the seed was ripe my father and I took the pulling by contract at 15s. an acre. It was then carted to the barn till the wheat harvest was over, and then we commenced to get the seed out, an operation which, in those days, was all done by hand, as no machine was yet invented for the purpose. We had a block of tough wood about 9 inches by 12, and about 3 inches thick, with a handle 4 or 5 inches distant from one end, as shown in the rough sketch I have made. It will be observed that the handle must be so fixed



that a man can stand and lift up the block of wood and strike down again so that the wood will fall flat on the floor without jarring the hands. This we call a stamper. It breaks the balls and the seed falls out, the flax, of course, being laid on the floor where the seed could not get away. In fine weather we preferred to do the work out of doors, as the sun opens the balls containing the seed, and it was easier to break them. At night we covered it up with a sheet or tarpaulin. As fast as we got the seed out the stalks were carted out into the grass paddocks to "retten" or ripen, as we used to call it. We had 1s. per bushel for stamping the seed out. The most difficult operation was the retting of the flax (as Messrs. Woolfe Brothers point out), because it does not all retten together. Sometimes we had to look it over every day and turn it to prevent the worms drawing it into the ground in very wet weather, especially when all was retted. We had a humpy built in which to prepare the fibre for market. In those days, in very damp weather, we used to drive the dampness out of the fibre by means of two long poles about 20 feet long stuck up on forks with a bank thrown up round in the form of a pit. The flax was spread on top of the poles to a depth of about 6 inches thick, and a steady fire was then kept up underneath made of the scales from the flax. This was done every night in damp weather, and the flax was then put away for the next day. I do not think this would be required in this country, as the sun alone would be hot enough to dry it.

(*To be continued.*)

NEWSPAPER COPYRIGHT.

The editors of certain Australasian newspapers [and also of some outside of Australasia—Ed. *Q.A.J.*] are afflicted with a mental obliquity which prevents their recognising the dishonesty of appropriating articles without leave from the owners. This is particularly noticeable in respect to articles written by officers of the various departments of agriculture for the monthly journals published by those departments—so much so that in several of the States the departments have been driven to copyright their properties. The officers are paid by the States to do certain work, amongst the duties being the education of the public by writings in the departmental journals. The newspapers copying those writings are in the habit of publishing the same as having been written by the authors for their own newspaper, carefully omitting the fact that the articles were written expressly for the departmental journal, and thus the readers are deluded into the belief that the newspaper proprietor has engaged the whole of the State specialists—professors, horticultural, agricultural, and other instructors—to write for his columns. The imputation of deceitfulness and dishonesty could easily be exploded if the proprietors of those papers would notify—in the usual way—that the borrowed article was written by such and such a person for the *Agricultural Journal* of Queensland, or New South Wales, or South Australia, or otherwise, and neither the officers in question nor the departments would feel aggrieved. Under present conditions, where no copyright is enforced, there are several officials who neglect to contribute to their departmental journals, because their writings and their names are piratically used by unscrupulous editors.—*Journal of Agriculture*, South Australia.

Dairying.

THE DAIRY HERD.—QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST DECEMBER, 1901.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire	25 April, 1901	234	3·9	10·22	Dry, 29-12-01
Annie ...	„	19 Nov. „	631	3·5	24·73	
Blink ...	„	2 Feb. „	203	4·0	9·09	Dry, 29-12-01
Bonny ...	„	12 April „	55	3·9	2·4	Dry, 6-12-01
Isabelle ...	„	7 Sept. „	588	3·6	23·7	
Laura ...	„	28 Aug., 1900	315	3·6	12·7	With first calf
Linnet ...	„	7 May, 1901	522	3·8	22·21	
Lavina ...	„	11 Sept. „	886	3·8	37·7	
Lass ...	„	24 Aug. „	638	3·7	26·43	With first calf
Renown ...	„	29 Nov., 1900	45	4·1	2·08	Dry, 6-12-01
Rosebud ...	„	13 Nov., 1901	912	3·8	38·81	
Ruby ...	„	9 April „	211	4·0	9·45	Dry, 29-12-01
Ream ...	„	9 Nov. „	625	3·6	25·2	
Lena ...	„	3 Dec. „	784	3·8	33·36	
Lowla ...	„	3 Dec. „	686	3·6	27·65	With first calf
Alsie ...	„	7 Dec. „	424	3·5	16·62	
Ruth ...	„	12 Dec. „	365	3·7	15·12	With first calf
Ream Routhie	„	13 Dec. „	454	3·6	18·3	
Bell ...	Jersey	15 Sept. „	301	4·5	15·17	With first calf
Connie ...	„	8 Sept., 1900	312	4·2	14·67	
Content ...	„	6 June, 1901	42	5·2	2·44	Dry, 6-12-01
Carrie ...	„	31 Aug. „	470	4·0	20·95	
Effie ...	„	18 Nov. „	716	4·1	32·87	
Eileen ...	„	2 Sept., 1900	446	5·0	24·97	
Ivy ...	„	24 Oct., 1901	645	4·0	28·89	
Tiny ...	„	5 Oct. „	502	4·2	23·4	With first calf
Playful ...	„	14 July „	206	4·5	10·38	Dry, 26-12-01
Spec ...	„	27 Aug. „	325	4·3	15·65	
Blaze ...	Grade Jersey ...	27 Sept. „	372	4·2	17·49	With first calf
Pansy ...	„ „ ...	28 Oct. „	565	4·0	25·31	
Bluey ...	„ „ ...	9 Oct. „	389	3·6	15·46	With first calf
Countess ...	Shorthorn ...	18 June „	517	3·8	22·03	
Dott ...	„	31 May „	324	3·6	13·06	With first calf
Gladdy ...	„	29 April „	211	3·9	9·21	Dry, 29-12-01
Guinea ...	„	18 July „	218	3·8	9·27	
Lady Vixen	„	13 July „	320	3·6	12·9	With first calf
Maggie ...	„	20 May „	212	3·9	9·26	
May ...	„	16 July „	555	3·6	22·37	
Nestor ...	„	3 July „	607	3·7	25·15	
Olga ...	„	19 June „	41	4·0	1·83	Dry, 6-12-01
Queenie ..	„	19 May „	320	4·1	14·69	
Rose ...	„	10 April „	35	4·2	1·64	Dry, 6-12-01
Louisa ...	„	23 Dec. „	106	3·6	4·27	
Clara ...	Grade Shorthorn	14 June „	224	3·9	9·78	With first calf
Eva ...	„ „ ...	26 Oct. „	635	3·5	24·89	
Laurel ...	„ „ ...	22 Aug. „	527	3·7	21·83	
Lucy ...	„ „ ...	9 Sept. „	661	3·7	27·39	
Leopard ...	„ „ ...	6 Oct. „	568	3·7	23·53	
Princess May	„ „ ...	25 May „	214	4·0	9·58	Dry, 26-12-01
Peggie ...	„ „ ...	29 May „	355	3·8	15·10	
Redmond ...	„ „ ...	22 Aug. „	502	3·8	21·35	
Horney ...	„ „ ...	22 Sept. „	215	3·7	8·90	Dry, 26-12-01
Stranger ...	„ „ ...	6 Nov. „	688	3·6	27·74	
Curly ...	„ „ ...	12 Nov. „	781	3·5	30·61	
Empress ...	„	27 Dec. „	74	3·6	2·96	
Rusty ...	„	7 Dec. „	351	3·5	13·75	
Ada ...	South Coast ...	16 July „	545	4·2	25·63	With first calf
Dora ...	„ „ ...	2 June „	145	3·8	6·17	Dry, 29-12-01
Grace ...	„ „ ...	15 June „	467	3·8	19·86	With first calf
Trixey ...	„ „ ...	4 July „	401	3·7	16·60	With first calf
Topsy ...	„ „ ...	4 Oct. „	687	3·7	28·46	With first calf
Molly ...	Grade Ayrshire	5 Oct. „	466	3·6	18·78	With first calf
Devon ...	Devon	2 Nov. „	445	3·9	19·43	With first calf

The cows were allowed to graze on lucerne plot for one hour daily, and were then turned on to natural pasture. During the last week of the period they were fed a quantity of green maize.

CURE FOR RICKETS IN CATTLE.

By W. H. HITCHCOCK.

Mr. W. H. Hitchcock, of Tungamull, in the Central district, sends us the following interesting account of cures effected by him of the disease known as "rickets." The cure is so simple that anyone can try it, and even should it fail there is not much trouble and no expense in applying it.

There are cattle, as Mr. Hitchcock says, which are known to eat the Zamia plant without any ill effects. Such cattle, it would appear, have easy access to water, and this may be, as the writer suggests, the cause of their immunity.

Next to tick fever, the disease known as "rickets" in cattle has been the worst scourge of the cattle farmer in this district, but up to the present no cure has been found for the disease.

Dr. Hunt, Government Pathologist, investigated the disease a few years ago, and the conclusions he came to were that rickets was caused by cattle eating the macrozamia plant, that the disease could not be produced by inoculation, and that there was no cure for it, the only remedy being to rid the country of zamia.

As I have cured two animals of rickets, I think the best way to reach and benefit those who are interested is to publish the facts in the *Agricultural Journal*.

Just twelve months ago, after the bush fires had been through the country, the cattle would get among the ridges and feed upon the Zamia as it began to grow after having been burnt. This is the surest and quickest way for cattle to get the rickets. When driving the cattle home one evening I noticed that a yearling heifer had suddenly taken the disease. I thought I could do nothing, but would drive her gently to the well and give her a drink, hoping it might counteract the poison to some extent. In going to the well, a distance of about 300 yards, she fell on her haunches three times. She had a good drink, and I left her. In the morning I was considerably surprised to find that the heifer was only a little bit shaky in the hind legs, and in a few days there was no sign of rickets on her, and since then she has been quite sound.

The second instance occurred just two weeks ago, and it was the marked success in this case that confirmed me in the opinion that a drink of water given in the nick of time will expel Zamia poison from the system of cattle, and induced me to lay the matter before the readers of the *Journal*.

The animal in this case was a three-year old Ayrshire bull. He had been biting at Zamia for some weeks past whenever he got the chance, but on the day that he took the rickets he had got further away, and had had a larger feed. When I went to drive the cattle home I found the bull on his feet, but almost helpless. His legs were all together, and his head erected high in the air, while he had a frightened look in his eyes. He could not make out what in the world had come over him. He was in a far worse condition than the heifer had been. I drove him home gently as he had great difficulty in walking; his hind legs gave outwards and inwards; he could not control them, and in going down slight inclines he fell on his haunches several times. Having got him inside the paddock I carried him three gallons of water, which he drank eagerly. In the morning he was greatly improved, could walk quite steadily. I saw that he had as much water as he required for a few days, and he is now as sound as ever.

I do not claim that a drink of water will cure rickets in every case It is only when the disease comes on the beast like a shock that a drink of water given at once will counteract the effect of the Zamia poison. This will explain how it is that some cattle can feed on Zamia with impunity. It is because they are able to reach water before the poison takes effect Others become helpless before they reach the water, and the disease stays on them. Although water does not cure rickets once the disease is thoroughly seated in the system, the above is sufficient to show that, if dealt with at once, valuable animals may be saved. Had I known of this remedy a few years ago I might have saved a number of dairy cattle. If any persons are sceptical on this matter, all that I can say to such is "try it." They will be surprised at the result. The great point is to give the water at once without any delay.

HOW TO MAKE SMALL CHEESE.

Here are a few principles and rules (says H. E. Cook, in the *Rural New Yorker*) that may be given, and, if good judgment is used, may prove satisfactory.

We will assume the quantity of milk to be 500 lb. of 4-per-cent. milk; and if more or less, the amount of rennet, salt, &c., may be changed accordingly. The night's mllk should be kept at a temperature of 65 degrees Fahr., after being exposed to the air after milking. In the morning, mix the two milkings together in a vat or tub not exceeding 20 inches deep—15 inches would be better; the curd would cook more thoroughly, with less danger of packing in the bottom A very simple and effective way of heating will be to use two small cans 7 inches in diameter, and high enough to come above the milk. Fill these cans with hot water, moving the cans and agitating the milk until warmed to 84 degrees. If one desires coloured cheese, then add ½ oz. of some standard cheese colour, mixed with ½ pint of water; mix thoroughly. Provide yourself also with 1½ oz. of rennet extract. Put the extract into a ½ pint of cold water; do not use warm water or keep it where it is warm, and add to the milk, stirring for 2 minutes. In about 25 minutes the coagulated mass will be ready to cut. Put the finger gently into the curd, and when it breaks clean over the finger it is ready. If no cheese knife is at hand, previously provide yourself with a piece of galvanised-iron woven wire with a ½-inch mesh—about 6 x 15 inches; draw it through the mass lengthwise, crosswise, and from top to bottom. Of course it is a crude way of cutting, but will serve the purpose of breaking the mass and starting the whey. Keep the mass stirred so each particle will remain independent of another. In 10 minutes the heating cans should be brought on again, filled with hot water. Keep them moving as well as the curd, to prevent overheating any portion of it. When the thermometer registers 98 degrees, rake out the cans and keep the mass stirred until the curd particles do not readily adhere; then stir occasionally until—well, let's see. This point is not so easily told.

The old, old way was to take off the whey when the curd squeezed between the teeth—that's not bad. I should, of course, rather depend upon the feeling and by smelling, but the beginners would better use the first rule mentioned, aided by the feeling. Take a handful of curd, squeeze it hard, let go. If it has an elastic feeling, showing it to be well dried out, then take off the whey. Keep the curd well stirred until it is free from moisture and cool, which will require about half-an-hour. It may be more convenient, after removing the whey, to take the curd into some other receptacle where the moisture will drain out more easily and quickly, either by a slanting bottom or a rack with a cloth over it, through which the moisture can drip. One pound of clean salt will be sufficient; add and thoroughly mix, and allow to remain before pressing for 15 minutes. Two hoops 11 inches in diameter and 14 inches deep, or one hoop 14 inches in diameter and 14 inches deep, will be needed, or, if small 12-lb. cheeses are wanted, get four 7-inch hoops 1 foot deep. The amount of cheese produced from the milk will depend upon its fat content. One can safely figure 2·65 lb. cured cheese to each 1 lb. fat in the milk, if the milk contains anywhere from 3½ to 4½ per cent. butter fat Take a cheese bandage to fit, and long enough to project past each end 1 inch or even 2 inches—it can be cut off. The bandage may be placed in before cutting in curd, and turned over the top edge of the hoop to hold in while filling; use a round piece of cotton cloth at each end of the cheese. I would not advise any cheap, uncertain method of pressing; a $1\frac{1}{2}$-inch screw set in a frame, with means of turning; or send to a dairy supply house and get a press. If sufficient pressure is not applied the rind will not form, and the whole job will be a failure. After pressing an hour, take out, adjust the bandage smooth and cover the edges nicely, put on cap cloths of same material, with the cotton press cloths on top, and at the bottom the same; put on a closely-fitting follower, put to press again, and keep it there until the following day. Then take it out and cure in a room from 60 to 65 degrees for three weeks. If you have not slipped a cog somewhere, the cheese will be presentable and eatable. From an economic standpoint, however, the job will be a failure. An equal amount of cheese can be purchased much cheaper of some reliable manufacturer or dealer—quality guaranteed.

REMEDY FOR A SELF-SUCKING COW.

Material required—a halter, a surcingle, and a piece of wood about 3 feet long. Put the cow in the bail. Fasten one end of the piece of wood to it by a piece of chain. Put on the halter and lash the other end of the wood to the surcingle. After adjusting the latter, pass the wood between the cow's front legs, then buckle up the surcingle. The cow can feed and lie down without difficulty. Put this arrangement on when the cow has a first calf; and when she is dry, take it off till she comes in with another one.

This suggestion comes from Mr. J. Howard, Beelbi Creek, Howard.

A BRIAR AND BLACKBERRY BUSH DESTROYER.

Mr. H. W. Potts, F.C.S., F.L.S., editor of the *Journal of Agriculture of Victoria*, in a short article under the above heading, mentions an experiment made some years ago by the manager of a South Gippsland butter factory. At the ordinary weekly testing of the suppliers' milk samples by the Babcock method, a quantity of sulphuric acid is employed, as much as half-a-gallon in many cases during the day. When the tests are completed, a quantity of partially-exhausted sulphuric acid is left in the flasks, and the usual practice is to throw it away. The practical mind of the manager in question suggested the utilisation of this waste product in the direction of killing briars and such like. The factory paddock of 4 acres was wholly occupied with this growth. He experimented on it by throwing half-a-pint of the waste sulphuric acid, so as to flow down the centre of the stem of the plant to the main root. In the course of a few days each bush withered, became dry, and formed a mass readily destroyed by fire. In six months the paddock was cleared with the greatest ease, and the manager now enjoys the privilege of grazing a horse in a paddock formerly taken up by this impenetrable, thorny, and useless shrub. Hundreds of gallons of sulphuric acid are allowed to go to waste yearly at our butter factories, and in numerous instances this might be collected in demijohns or Winchester quart stoppered-bottles and distributed to milk suppliers, with suitable directions and precautions, to act as a blackberry and briar destroyer.

The writer does not mention prickly pear, but it is probable that at least young prickly pear bushes might be destroyed in the same manner; and if so, quantities of sulphuric acid could be obtained from the Queensland butter factories and utilised in like manner. We are anxiously awaiting the advent of the man who can prove his claim to the reward of £5,000 offered by the Queensland Department of Agriculture to anyone who can devise a cheap, speedy, and effective means of destroying that pest, the prickly pear.

Poultry.

DRIED BLOOD FOR FOWLS.

Some hens are very obstinate in the matter of egg-laying. The production of eggs is, however, only a question of food. The most persistent non-layer will be induced to assist towards filling the egg basket, if she is fed with butter milk, wheat-porridge and a few chopped chillies. From the analysis of dried blood it is shown that this substance contains everything needed for the production of eggs. When feeding the fowls, it is a good plan to make them work for their food. Good scratchers will lay better than hens which squat down in front of a quantity of food and gorge themselves with no exertion. Therefore scatter the food amongst easily disturbed litter, and the hens will get plenty of exercise in searching for the grain.

THE POULTRY TICK.

As far as we know, that scourge of the poultry-yard, the tick, has not yet made its appearance in Queensland. But this immunity may not last for ever, and should the tick arrive, poultry-keepers will have a bad time. The tick has the same effect on poultry as the cattle-tick on horned stock. According to the *Melbourne Age*, the pest has appeared in Victoria, and from an article in that journal last December we learn that it was discovered for the first time in the Government refrigerating works in Flinders street, where several large consignments were being prepared for South Africa and Western Australia. Orders were at once given for a wholesale destruction by fire of the feathers and birds on hand; but, strange to say, the Chief Inspector of Stock, who traced up the source whence the birds had come, found himself powerless to act. *The Leader* had forewarned the Government some four years ago to prepare for this dreaded pest, and to use the most stringent measures to prevent its introduction. The Minister took steps to ensure careful inspection at the border towns, but no machinery was prepared by the stock department to go on to premises and destroy affected poultry, and now the pest is in the heart of the city.

At the refrigerating works specimens of the pest have been preserved, and it may be interesting to know that the ticks, after being frozen for thirty-six hours, turned up as lively as crickets, and to show how rapidly they get to work on poultry, it may be mentioned that one breeder at Mildura lost 200 birds in six days through the tick pest.

The serious character of this pest is not generally known, and its appearance in poultry bred in the suburbs and sold in the city auction-rooms will have a startling effect on poultry-keepers. Once it appears in a poultry-yard there is nothing left but to apply the firestick and burn off the sheds, houses, and all woodwork on the poultry-yard or farm. For many years the tick has been known in South Australia. It is supposed to have come in poultry crates from Texas, in America, and whole streets have been decimated in Adelaide, so that residents cannot keep fowls through the ravages of the pest. Its habits are nocturnal, coming out at night from the crevices of the poultry-house and attacking the birds. The tick attaches itself to the fowl with lengthy suckers, drawing away the blood in a wonderful manner. This is followed by fever, and death quickly ensues. The strongest carbolic disinfectants are quite harmless as far as the tick is concerned, and the only remedy is fire.

Mr. J. J. Fenton, the Government Statist, in recording the annual production of poultry in Victoria, says:—

"The principal miscellaneous product for which an estimate is given is poultry. The importance of this industry has, perhaps, never been fully realised, as its value, as estimated, is nearly two-thirds of that of the mining production of the State, according to the returns of the last census. The number of owners of poultry was 142,797, and the number of poultry 4,097,094, giving an average of 28 to each owner and an annual return of 2,257,300. The results, which have been arrived at after careful consideration, thus show a gross annual income of £2,257,300, and to each poultry owner of £15 16s. 2d., or 11s. $3\frac{1}{2}$d. per fowl, as compared with a capital outlay of, say 3s. 6d. This return from a single fowl is very striking, considering that the wool produced in the State in 1898 only gave a gross return per sheep of 3s. $6\frac{3}{4}$d., and it would thus appear that the yearly income from a single fowl is equal to the value of the wool from $\frac{1}{3}$-sheep. The poultry industry should, therefore, prove a most profitable one, as there is room for great expansion in the outlet for both eggs and poultry, and the cost of production probably does not exceed 5s. per head.

A FEW WORDS ANENT WYANDOTTES.

A Breed Increasing in Favour.

A breed that has nothing to recommend it but its feathers will not stay long in the estimation of poultry-breeders. But if we find a breed increasing year by year in the estimation of all classes of poultry-keepers we may be sure that it has many characteristics besides a handsome exterior which have won it this position.

It is clear Wyandottes have not yet reached high-water mark, nor is there any reason to suppose they will do so for a long time. Wide as their popularity is, there is plenty of room for their further extension; and thousands of non-productive mongrels, the sole feathered inhabitants of innumerable farmyards, might well be replaced by almost any variety of the prolific Wyandotte.

For the Wyandotte is one of the best paying of all breeds of poultry. It is exremely profitable to the fancier, as the demand for standard specimens is very great, and even second-rate specimens sell very well; while to the ordinary breeder for egg production it gives him a supply during the winter which hardly another breed can approach. Nor does it, like some some other winter laying breeds, go into rapidly successive fits of broodiness during the spring and summer months, much to the annoyance of owners, who want to hear something else than the never-ending cluck of broody hens; on the contrary, many Wyandotte hens never seek a nest oftener than once in a season, and twice a year satisfies most of them. So little are they controlled by the fit, however, that four days' confinement in a broody coop will effectually disperse it. On the other hand, if allowed to hatch and rear a family, they are eminently satisfactory in all respects. These remarks as to broodiness are applicable in particular to Silvers, Goldens, Whites, Buff Laces, and Violettes; the Buffs and Partridges, although excellent winter layers, are often a shade more broody in the warm weather, containing as they do a not inappreciable Cochin element in their composition.

The most popular variety is the Silver, due not only to its exquisite beauty in good specimens and to its consistently high utility qualities, but also to the fact that it got a good start in front of the others in point of time. But the Goldens are not far behind them now, many breeders keeping both varieties on their premises, and so well have both been bred to a good standard that it would be rather difficult to say which is the more useful at the present time. Which is the more beautiful is altogether a matter of taste, but there is probably very little, if any, difference now between their commercial qualities. Either will give a splendid account of itself in any breeder's yard if their ordinary requirements are attended to.

Are good specimens of Wyandottes easy to breed? Not particularly so, although the percentage of really good ones from a well-mated pen is now very much higher than it used to be, and every year sees a further improvement in this respect. This applies to the laced varieties; the Whites are comparatively easy to breed, a considerable proportion of excellent specimens coming with most hatches. But, then, they do not draw the same good prices as equally good specimens of their laced relations, nor have they found the same wide-spread popularity, although they are quite their equal in all economic qualities. Buffs, being a comparatively recent creation, are difficult to breed, a good level rich colour being somewhat hard so find. Some of the latter introductions of necessity throw a good many usless sports also, but some of them are picking up standard points wonderfully.

THE SHAPE.—All Wyandottes are, or should be, characterised by a pleasing, well-balanced shape, somewhat cobby in outline. The head is very neat and intelligent-looking, surmounted by a low-set rosecomb studded with minute corrugations, and terminated by a spike which curves downwards to the contour of the neck. The neck is medium short, well arched, and well clad, with flowing hackle. The back is broad across the shoulders, and takes a short sweep to the tail, which is well furnished but compact. The breast is broad and deep, and well rounded in outline. Legs and thighs are fairly short, and well set on at a nice angle. The hen follows its lord and master in body shape, allowing for the difference in sex. In all varieties the earlobes are bright red, the beak yellow or yellow and horn mixed, and the legs bright yellow.

In the Silvers there are two colours, black and white. In the body feathers the white is the centre, and the black is the rich lacing round the margin of the feathers. The whole of the hen's body is of this colour; her neck, hackle, and tail being the only exception. The latter is black, while the former is black, striped with white. The cock's breast and wingbar are laced same as the body of the hen, while his top colour shows a silvery white.

In breeding Silvers there are many faults to guard against. Pullets sometimes come with clear, well-laced breasts, but too dark and mossy on top. Others have clear good tops, but are weak in breast lacing. The fluff is too white in some, which makes them unreliable breeders. Cockerels are sometimes too brassy on top, instead of a good silvery white; while the lacing at base of breast is often little better than spangling, deepening to almost solid black at top. There are thus plenty of channels to strive to avoid in breeding Silver Wyandottes.

The stock birds should be carefully selected. If possible their breeding should be known for two or three generations; but in the case of purchased birds this is seldom ascertained. The longer they are bred in line, the better will be the stock produced, avoiding anything like too close breeding, though a little related blood on both sides, if from an excellent source, will be an immense help to the breeder. One thing a beginner must watch nowadays is to avoid putting a cockerel-bred cock to pullet-bred hens. By that I mean that many breeders employ a special mating to produce their cockerels and another their pullets. A very fine, well-laced cock, with silvery top, can, and frequently is, bred from hens with clear, densely-laced breast and wings, but as mossy on the top as a potato. Now, if you mate a cock bred this way to hens which are near standard points, clear laced and free from moss all over, you will never breed a pullet worth looking at, and very few cocks. So if you want a cock from a noted breeder, find out if he breeds mainly for show cocks or pullets, or if he is equally successful in both. Then you can negotiate for a bird for cockerel or pullet breeding as may be desired.

This system of double mating is not, however, an ideal one. With a little care and a little time strains could be formed which would breed good cockerels and pullets from the same pen. A cockerel which would breed good pullets will also frequently breed good cockerels, if one or two of the females are rather more lightly laced than their neighbours, but this lacing, though narrow, should also be very dense, and free from a white fringe on the outside.

Any bird showing white in the earlobes should be debarred from the breeding pen. This is a fault in some strains which should be bred out.

Golden Wyandottes are, or should be, the fac-similes of the Silvers in all but colour. Where the latter are white and black, the former are brown and black. Goldens are at present a little more difficult to breed than the Silvers. For a long time they did not make much headway in this country, and specimens got too much inbred to not very desirable mates, and they languished; but the boom came. America sent some splendid specimens to recruit our strains, while some breeders on this side most certainly filtered in a little Indian Game blood. Now the Goldens are full of life and vigour, and stand out as worthy members of the great Wyandotte race. But their combs are sometimes a bit of a bother to get good, and their colour often tends to a very dark brown, instead of the rich golden hue so much desired. I hope to have something to say about their breeding, as well as that of some of the other varieties, in an early issue.—*Farmer and Stockbreeder.*

INTERESTING TO TURKEY RAISERS.

An Indiana (U.S.A.) turkey raiser gives the following twenty-six pointers on turkey raising which have been printed by the *Florida Agriculturist*:—

1. Never let the young turkeys get wet. The slightest dampness is fatal.

2. Feed nothing the first twenty-four hours after they are hatched.

3. Before putting them in the coop see that it is perfectly clean and free from lice, and dust them three times a week with Persian insect powder.

4. Be sure the hen is free from lice. Dust her, too.

5. Look out for mites and the large lice on the heads, neck, and vents. Grease heads, necks, and vents with lard, but avoid kerosene.

6. Nine-tenths of the young turkeys die from lice. Remember that.

7. Filth will soon make short work of them. Feed on clean surfaces. Give water in a manner so they can only wet their beaks.

8. The first week feed a mixture of one egg beaten, and sifted ground oats or rolled oats, mixed with salt to taste, and cooked as bread, then crumbled for them; with milk or curds so they can drink all they want. Feed every two hours early and late.

9. Give a little raw meat every day; also finely chopped onions or other tender green food.

10. After the first week keep wheat and ground bone in boxes before them all the time, but feed three times a day on a mixture of cornmeal, wheat middlings, ground oats, all cooked, and to which chopped green food is added.

11. Mashed potatoes, cooked turnips, cold rice, and such will always be in order.

12. Two much of hard-boiled egg will cause bowel disease.

13. Remove coop to fresh ground often in order to avoid filth.

14. Ground bone, fine gravel, ground shells and a dust bath must be provided.

15. Give them liberty on dry, warm days.

16. They must be carefully attended to until well feathered.

17. Finely cut fresh bones, from the butcher's with adhering meat, are excellent.

18. A high roost in an open shed, which faces the south, is better than a closed house, for grown turkeys.

19. A single union of a male and female fertilizes all the eggs the hen will lay for the season, hence one gobbler will suffice for twenty or more hens.

20. Two-year-old gobblers with pullets or a yearling gobbler with two-year-old hens is good mating.

21. Turkeys can be hatched in an incubator and raised to the age of three months in a brooder, but only in lots of twenty-five, as they require constant care.

22. Capons make excellent nurses for turkeys and chicks.

23. It is not advisable to mate a forty-pound gobbler with common hens, as the result will be an injury. A medium-sized gobbler is better.

24. Young gobblers may be distinguished from the females by being heavier, more masculine in appearance, more carcunculated on the head, and a development of the "tassels" on the breast. A little experience may be required at first.

25. Adult turkeys cannot be kept in confinement, as they will pine away. By feeding them in a barnyard a little night and morning, they will not stray off very far, but they cannot be entirely prevented from roaming, and the hen prefers to make her own nest.

26. Gobblers and hens of the same age may be mated, but it is better to have a difference in the age.

RECIPE FOR CURING AND SAVING MEAT.

Kill when the weather is cool and dry. Cut up the hogs in the afternoon of the same day they are killed. As fast as cut, salt the meat and spread out each piece separately. Next morning re-salt and rub thoroughly with ground salt and pack tightly together in a square pile on a table or in such a way that all brine will drip off completely as fast as formed. Cover meat with salt, and in packing place the hams in the bottom layer, shoulders next, and sides on top. When all have been salted and carefully packed, take thin cloth and securely cover it to prevent flies from getting to it. Do not disturb it now until it has taken salt sufficiently to save it, which will be from eighteen to twenty-five days, depending on the weather and size of meat.

When it has taken salt, take up and wash perfectly clean in warm water; after washing, hang up and place a smoke under it at once and thoroughly smoke until a nut-brown colour. I use to smoke pine sap gathered from dead pine-trees standing. Dampen to prevent blazing. If the meat is properly hung up and attended to, the smoking process need take no more than three or four days

At any time within thirty days after completing the smoking, take the meat down and dip each piece separately in a pot of boiling water and let it remain in the water for a half minute. Take it out and lay on a table, and while wet and warm cover completely all of the pieces where there is no skin with a mixture of cornmeal and ground black pepper; this mixture of meal and pepper is two-sevenths pepper and five-sevenths meal, or, say, 4 parts pepper to 10 parts meal. When properly applied, the meal and pepper form a paste of about ¼-inch in thickness. As fast as prepared with this, carefully place each piece on a shelf made with slats, do not allow the pieces to touch each other, and do not disturb them until wanted for use.—*Florida Agriculturist.*

The Orchard.

NOTES ON LEMON-CURING.

BY DANIEL JONES, Department of Agriculture.

As the result of a recent holiday trip to Victoria, I am in a position to redeem a promise made to some fruitgrowers at the recent Bundaberg Agricultural Conference, with regard to the process of lemon curing as carried out by my friend, Mr. W. S. Williams, of Doncaster, Victoria. Mr. Williams is the most successful grower of lemons in that State, and those interested in the culture of citrus fruits generally, or who wish for useful lessons in the practice of water conservation and irrigation, would do well to pay his orchard a visit, and judge for themselves to what perfection citrus culture can attain when in the hands of a practical man. As this article is to be a brief one, and will deal only with what I have seen, I shall forbear touching on the very excellent system adopted for the storage of water, and the distribution of the same as necessity demands. Sufficient to say that here is demonstration of the value of the application of water in its best financial aspect. It may also be noted in connection with the curing of lemons, and the keeping of all irrigated fruits, that a very general impression obtains among traders that irrigated fruit is defective in keeping qualities. Be this as it may, there is evidently no difficulty in the methods here employed in curing citrus fruits, even if adversely affected by irrigation. As Mr. Williams handles about 6,000 cases of lemons annually, and has now for some years been profitably engaged in this pursuit, it will be conceded that a method that has thus far proved so great a success needs nothing else to demonstrate its efficiency. If the few hints I now place on record as ascertained from personal observation and from Mr. Williams' remarks will in anyway meet the inquiries of my friends, my holiday will, I trust, be of such service to others as it was a pleasure to myself. The importance of fostering this industry is exemplified by reason of the volume of trade the Commonwealth and New Zealand carry on in the importation of Italian and Syrian citrus fruits, which if captured by our own producers would favourably enhance the position of our orchardists.

To carry out the process of lemon-curing as here outlined does not require the expenditure of much capital; an intelligent orchardist by use of a little native ingenuity can very easily devise for himself a cheap if rude construction as well adapted for the storage of citrus fruit equally as well as may be possible in the more pretentious and costly constructions. The chief thing to keep in view is that thorough ventilation, by means of as constant a current of cool air as it is possible to obtain, is the prime desideratum. Probably more depends on this item in the process than on any other, while it is very necessary that in cutting your fruit from the trees all possible precautions must be observed to handle without bruising: be the care ever so great in the field, in the event of imperfect ventilation taking place in the storage cellar the presence of the carbonic acid gas which generates, as is usual when fresh fruit is stored, will inevitably destroy the product, by reason of defective arrangement for the ventilation of the cellar. An extract from the *Melbourne Leader* will convey more tersely than I can describe them, the points I wish to emphasise and which I fully endorse.

A good deal of attention is being paid this year to experience in lemon-preserving. All sorts of theories about dipping in all sorts of solutions are being promulgated, and some of them may contain the germ of successful methods It ought to be borne in mind, however, that the most successful lemons, as regards quality and distant trade, are those of Sicily, and these are not dipped or "preserved" at all. The method consists of cutting the fruit while yet green and allowing it to ripen in darkness, with an equal temperature and perfect ventilation. The Sicilian lemons carry round the world, and preserve their delicate appearance without any dipping or other external application of chemicals. That ours will do the same has been abundantly proved even in Parramatta, where, writes a Sydney exchange, the greatest lemon-preserving failure of last year took place. But in that case the untoward result was occasioned by neglect of the simplest principles of ventilation. The lower portion of the storeroom was airtight, and there were gratings, &c., overhead. The gas generated by the fruit, being much heavier than atmosphere air, persisted obstinately in lying on the floor, and gradually rising as it increased in quantity, so that presently the lemons were soaking in a bath of carbonic acid gas. The same course ruined many shipments of citrus fruit on the way to England. But lemons laid on the floor of cellars with due provision for a current of air from below have kept for many months, and preserved all the freshness of appearance, while acquiring that peculiar shade of colour which connoisseurs insist on. Probably some processes will claim to be successful simply because the other surroundings have been suitable. In any case, the grower who provides himself with a storeroom which can be kept dark and well ventilated, while the temperature is consistently low, may feel quite sure that he can keep his lemons all right, and be ready for a good market when it offers.

THE CELLAR.

The building used for curing the fruit is a combination of a cool cellar and packing-house. It is built on an elevation where good drainage is possible, as this is a factor that must not be overlooked in constructing a curing-house. Damp floors, damp walls, and such conditions will adversely affect the curing processes.

The cellar in this instance is excavated to a depth of 9 feet, and is 18 feet wide and 35 feet in length. The walls of the whole structure are 20 feet in height, which permits of the occupation of the above-ground portion for ordinary purposes. The walls are built of brick and are double, with a 2-inch space between, which provides the needful ventilation, gratings being let into the wall near the floor at every few feet, through which a constant current of air is passing. The floor is of single brick, with effective provision for drainage beneath—a matter of importance. The roof is of galvanised iron. There is nothing in the structure but what any ordinary tradesman or handy man can easily and cheaply construct; an ingenious man may vary the method of construction to suit his local circumstances either in material used or expenditure. The principal object in view is the construction of a cellar by which the temperature can be lowered to about 53 to 57 degrees Fahr., the range of heat Mr. Williams finds favourable in Victoria for successful curing of both lemons and oranges.

The method adopted in gathering the fruit is to clip the lemon carefully as near to the fruit as possible, pack into ordinary cases, which are conveyed to the packing-house and remain for a couple of days in the cases before being transferred to trays in the cellar. The lemons are cut when just turning yellow, and when cured the short piece of stalk left on will drop off the fruit if just touched by the finger, which is one way in which Mr. Williams determines the curing stage. The usual time taken to cure is from seven to eight weeks, sometimes longer, and is dependent somewhat upon the character of the season and the crop. Lemons thus cured will keep for twelve months, a sufficient time to meet all commercial demands. The lemons after a couple of days are removed and laid ,without any packing, in shallow trays that hold but one layer of fruit. The form of tray most favoured is one constructed from the Maryborough orange case cut in half; this, in Mr. Williams' opinion, is the ideal curing-tray. These are now packed one on top of the other in the cellar, and, save for an occasional overhaul to remove any faulty fruit, are left in this state until required for market.

Mr. Williams, though not an orange-grower to any extent, has been equally successful on a minor scale with this class of fruit. I had the pleasure of tasting on a scorching hot day, such as can only occur in Victoria, oranges of a delicious flavour and excellent in condition, colour, and general appearance that had been put in the cellar four months previously. To cure oranges successfully I was informed that they must be better coloured before clipping than lemons, require the most tender handling, and must on no account be too ripe. The gleanings regarding this industry I now record are simply the results of my good fortune in meeting with so practical and well-informed a man as Mr. Williams, who in the most disinterested manner put at my disposal his own valuable experience for the benefit of those whom it may concern. From my own personal knowledge of the citrus trade of the Commonwealth, I am sure there is a profitable market for the Queensland orchardist at his hand. To get this market, he needs not only to cure his lemons, but must also carry out experiments in the cool storage of oranges. Given the ability to store our local oranges in good condition until the summer months, less will be heard of both agent and low prices during the winter months. I trust that the information here given, which is not the result of my own practice, but merely of observation, will do something to stimulate our local growers to aim at the complete capture of the Australian markets, which, so far, have, for many reasons, been in the hands of outsiders.

Another factor in the curing of citrus fruit must ever be borne in mind, without which the whole system will prove unsatisfactory; and that is, keeping the fruit free from disease. Fruit infested with fungus or scale diseases is harder to cure, and, if the operation is successfully completed, its general appearance is such as to prejudice buyers, and thus loss ensues to the packer. Mr. Williams, by means of his kerosene spray pump, of which he is the inventor, manages, in spite of the multifarious duties involved in irrigation, &c., to keep his fruit in clean condition. This, no doubt, is a factor in the success attending his operations. My experience is that clean fruit properly packed in clean cases can defy all the inspectors, command good prices, and is generally satisfactory to producer and consumer.

Having some few years since had the opportunity of observing the method of lemon-curing at Mildura, the great irrigation colony, I find that the system employed there is much on the same lines as the method herein described. In Mildura, with its larger areas, the curing processes are on a much greater scale, but comparison of methods used at both places indicates that the fruit is equally good in all essential features. The kind of lemon principally grown at Doncaster is the Lisbon, which thus far has proved most satisfactory. Mr. Williams also grows a few acres of the variegated species, but these are giving place to the Lisbon. The old adage that "Imitation is the sincerest form of flattery" stands good in this region.

Since Mr. Williams practically demonstrated some years since the suitability of the district for the cultivation of the lemon, the area under that fruit has increased considerably. Thus, through the enterprise of one person, a region that was considered but ill-adapted for this purpose, has now become, next to Mildura, the largest lemon-producing district of the State. The fruit sent to Melbourne ranks with the best, and brings the highest ruling prices either for factory purposes, for making peel, or the more popular use as the basis of the most refreshing of drinks in the trying heat of a Victorian summer.

MEETING OF FRUITGROWERS.

On the 8th of January last, a meeting of representatives from the chief citrus fruitgrowing districts of the State of Queensland was held at the Department of Agriculture, at which the following gentlemen were present:—

A. H. Benson, Instructor in Fruit Culture, Department of Agriculture (in the chair).

W. H. Parker, Enoggera (Queensland Fruit and Economic Plantgrowers' Association).

W. Fielding, Redland Bay.

S. F. Walker, Coomera (Agricultural and Pastoral Society of Southern Queensland).

J. Holzapfel, Mount Cotton (Mount Cotton and Tingalpa Division Fruitgrowers and Farmers' Association).

H. Soegaard, Nerang (Southern Queensland and Border Agricultural and Pastoral Association).

E. J. Burnett, Buderim Mountain (Buderim Mountain Coffee and Fruitgrowers' Association).

J. C. Dixon, Mary street, Gympie (Razorback Fruitgrowers' Association).

J. Rose, junr., Woombye (Maroochy Pastoral, Agricultural, Horticultural, and Industrial Association).

B. T. McKay, Tinana (Tinana Farmers and Fruitgrowers' Association).

J. Tench, Burrum (Burrum District Fruitgrowers).

A. Philp, junr., Mount Whitestone, Grantham (Lockyer Agricultural and Industrial Society).

H. Roessler, Toowoomba (Drayton and Toowoomba Agricultural and Horticultural Society).

In opening the meeting, Mr. Benson (in the absence of the Minister for Agriculture, the Hon. D. H. Dalrymple, and of the Under Secretary, Mr. P. McDermott) welcomed the delegates. He then read the official letter of invitation which had been sent to each of the fruitgrowers' associations to consider the best means of marketing the expected large crop of citrus fruits. He explained that it was a purely business meeting, having for its object the discussion of the disposal of the coming and future crops of citrus fruits, and suggested the formation of a Queensland Fruitgrowers' Association, to consist of a central body with branches in all fruitgrowing districts of the State. The objects of such an association, which he would propose for their discussion, were:—

(*a*) To have power to deal authoritatively with all matters relating to the marketing of Queensland-grown citrus fruit outside of Queensland.

(*b*) To appoint one agent for the sale of such fruit in each of the southern States.

(*c*) To appoint one agent for the sale of such fruit in each or any over-sea market that may be established.

(*d*) To arrange with transportation companies for the carriage of such fruit.

(*e*) To establish central packing-houses.

(*f*) To decide on the size of citrus cases—(1) for the southern States; (2) for over-sea markets.

(*g*) To arrange with sawmillers for the making of such cases.

(*h*) To obtain paper for the wrapping of such fruit as is sent to over-sea markets.

(*i*) To obtain all the necessary information respecting the opening up of over-sea markets.

(*j*) To obtain spraying or cyaniding outfits, as well as the material required for the working of the same.

(*k*) To purchase manures.

(*l*) To undertake any such work that in the opinion of members will prove of value to the citrus-growing industry of Queensland.

The articles of association should include the following:—

(*a*) Members must be citrus-growers.

(*b*) Members must sign an agreement to consign all their citrus fruit, which is to be sold outside of Queensland to the agent appointed by the association for the particular market to which it is to be sent.

(*c*) Members must sign an agreement not to sell citrus fruit to agents in Queensland for reconsignment to outside markets.

(*d*) Any member breaking such agreements shall be liable to a penalty of £ .

Plate XIV.

FRUITGROWING, WESTBROOK STATE FARM.

AGENTS.

(*a*) Only one agent shall be appointed in each of the southern States or oversea markets to which citrus fruit is to be consigned.

(*b*) All citrus fruit sent to such markets shall be consigned to the agent so appointed.

(*c*) Such agents shall be placed under a substantial bond.

(*d*) Such agents shall communicate at least weekly to the general association and to all branches of the association, and shall give definite information respecting the state of the citrus market of their own particular State. (This shall not apply to the agents representing oversea markets.)

(*e*) The information supplied by such agents respecting their markets shall include:—

(1) The state of the market at time of writing.

(2) The probable requirements of the market for the following two weeks.

(3) The condition in which the fruit consigned to them is received.

A lengthy discussion ensued, in which all those present took part, Mr. J. Ross, of Woombye, stating that in his district alone the output would reach 8,000 cases; whilst Messrs. Dixon, Razorback, and E. J. Burnett, Buderim, set down the output of their districts at 6,000 and 7,000 cases respectively. The Burrum would have over 6,000 cases and Grantham 10,000 cases this year, and with good rains the succeeding crop should reach 25,000 cases. Nerang and Mount Cotton would have 9,000 and 2,000 cases respectively.

After discussion it was unanimously decided to form a Citrus Growers' Association, to elect a sub-committee to carry out preliminary arrangements, the management to be in the hands of members owning not less than 100 citrus-trees. Some discussion then ensued on the appointment of a secretary, and it was agreed that the committee advertise for a gentleman who would accept payment by result, and make inquiries in Sydney and Melbourne with the view of appointing suitable agents.

The whole question of dealing with agents was, on the motion of Mr. Fielding, left in the hands of the sub-committee.

The subject of suitable cases was next dealt with, and the Shoobridge case was decided upon as the most suitable for the southern markets. The Californian case would be needed for oversea shipments.

The proceedings closed with a motion by Mr. Philp (Gatton), "That this meeting of citrus-growers is in entire sympathy with the Queensland Chamber of Agriculture in its request that the Department of Agriculture erect a cyaniding chamber at the Roma-street Railway Station."

The motion was seconded and carried, and a vote of thanks to the chairman concluded the business.

FRUITGROWING AT WESTBROOK STATE FARM.

By S. C. VOLLER.

I have the pleasure of presenting readers of the *Journal* this month with a few notes on some of the bearing trees in the Westbrook orchard, together with illustrations which should help to convey a clear idea of their capabilities and value.

No. 1 is a Japanese plum, "October Purple." It has shown itself a vigorous grower, as will be seen by the picture; of a very nice habit of growth, and a prolific cropper, bearing fruit of very good quality.

Nearly all the Japanese trees have come out well as heavy croppers with us, and there has been no difficulty whatever in selling the fruit at very profitable prices, and I am of opinion that they deserve and will, later on, receive far more attention from growers than they have met with so far.

I have hopes of seeing Queensland manufacturing jams of high quality, not only for local consumption but for the world's trade in a way that few people have yet dreamt of, and when this comes about these Japanese plums will have a good deal to do with it.

Their vigorous growth and heavy cropping qualities make them a profitable tree for the grower. The "October Purple" is, to my mind, one of the best of its class, though not the largest. It colours very slowly, with a reddish tinge on one side; this tinge gradually spreading and deepening until it becomes a strong purple-red, and covers nearly the whole fruit.

In addition to this colour, there is a slight dotting and striping of bronze occasionally showing. The size of the fruit, as will be seen in our illustration, is, for the Jap, medium.

The quality is good; in fact, when only half-coloured, the fruit is unexpectedly sweet, with a decent flavour, which becomes at maturity very good indeed. The fruit is very juicy; flesh, yellow when ripe.

This plum, with us, was available for marketing either for jam or cooking right through January, and will hang till the second week in February. It should not be pulled too soon, until the grower is quite satisfied that it has come well up.

No. 2 shows the Wickson. A big plum, very handsome; should be a good plum in the jam factory. It is no good to eat until perfectly ripe, when it is like a jelly. Ripens yellowish at first, then colours to a strong purplish bronze, somewhat striped occasionally. Shows brick-yellow flesh.

This is a great cropper; in fact, it will very readily overbear itself and break down.

The specimen shown here was prevented by late frosts from setting too many fruit, though it had a very respectable crop.

No. 3 shows one of our European plums, "the Diamond." This is the first attempt at fruiting, and not a bad one for a young tree. It is a fine showy plum of good size; oval in shape; dark purple, almost black, when ripe; flesh pale, and quality only fit for jam or cooking. It is sour to the taste, and cannot be classed as a dessert plum; at the same time, by present appearances, it will be worth growing with other good sorts on the Downs.

No. 4 illustrates one of our "Robinsons" at Westbrook, and one of the gamest, pluckiest little fruit trees I have ever met with.

This specimen is a member of the Chickasaw family, and has one very great recommendation in common with the Wild Goose, Newman, and others of its class, in that it is *proof against the attack of the fruit fly.*

It is not an eating plum, not being of a true dessert quality, but for jam-making and cooking it is excellent.

There can be no doubt about its bearing capabilities, as the illustration shows, and the only thing I regret is that we could not reproduce the whole thing in the natural colours, for it would then be as pretty a sight of its sort as could well be met with.

It is very suitable for growing all along our coast country, even where wholesale production is not aimed at, as it will well repay the smallest grower for a little care and attention.

In size, it is similar to the Wild Goose, with a brisk, sharp, acid taste, and ripens a bright red. As shown in the picture, it bears in heavy clusters for some length along the limbs.

To return to the Japs for a moment: I would like to remind readers who may be inclined to plant Japs extensively that they are *subject to the attack of the fruit fly*, and successful production will depend very largely on a strong effort being made to keep the fly in check. As we are constantly pointing out, this can best be done by carefully gathering and destroying all fallen and infested fruit by boiling for a few minutes.

Some readers may say, "That is all very fine, but what about our dirty neighbours who don't do this?" My reply is a very simple one, viz.: "Let each man take care that *he* is not the *dirty neighbour*, and this part of the trouble will soon vanish."

Plate XV.

FRUITGROWING, WESTBROOK STATE FARM.

Viticulture.

MANURING VINES.

By E. H. RAINFORD, Instructor in Viticulture.

The only individual who consistently manures his vines in Queensland is the "lazy man," for he systematically fertilises his Isabellas with empty jam tins and broken pickle bottles But although his prudence is to be commended his choice of material is hardly satisfactory, for it takes long to decompose and is apt to communicate a tinny flavour to the grapes.*

There would appear to be a general idea that vines never require manuring, and that they will continue to bear fruit for any number of years without exhausting the soil or requiring fertilisers. This is a mistake. The writer has frequently seen vineyards of under fifteen years of age, when they should have been in their prime, showing all the signs of insufficient nutrition from exhaustion of one or more of the chemical constituents of the soil necessary to their welfare. Undoubtedly some deep rich scrub or alluvial soils will take a long time to exhaust of their fertilising elements, but on this class of land the vine is not so frequently planted as on the lighter, loamy, sandy, or gravelly country, and vignerons will most certainly find it to their advantage to use manures on these soils after cropping them for several years in succession. The gravelly and loamy ridges between the coast and the range; the same kind of ridges about Warwick and on the Eastern Downs generally; the bright-red, sandy loam ridges and sandy alluvials in various parts of the State require the addition of one or more fertilisers after several years heavy cropping if the quantity and quality of the fruit is to be kept up.

Authorities differ as to the amount of each element removed from the soil by an average crop of grapes, and this is easily understood if we take into consideration the effect of climate, rainfall, &c.

Professor Krichauff, in his pamphlet on vine manuring, says that a hectare ($2\frac{1}{2}$ acres) of vines gave, in 1892, 143 gall. of wine, which took from the soil 74 lb. of nitrogen, 22 lb. of phosphoric acid, and 82 lb. of potash. The crop of 1893 of 1,224 gall. removed 82 lb. of nitrogen, 23 lb. of phosphoric acid, and 102 lb. of potash. It is evident that the first crop was a dry season crop with a considerable amount of cellular matter and seeds, whilst the second must have been a heavy watery crop.

Muntz puts the amounts removed by an average crop at 48 lb. of nitrogen, 11·5 lb. phosphoric acid, 38 lb. of potash per acre.

Coste Floret states that the elements removed from one hectare of soil by a crop of 94 hectos of wine (2,068 gall.) together with canes and leaves are:—

37·5 kilos	or	82·5	lb. of nitrogen	=	33 lb. per acre.
10 ,,	,,	22	lb. of phosphoric acid	=	9 lb. ,, ,,
30 ,,	,,	67	lb. of potash	=	27 lb. ,, ,,
80 ,,	,,	176	lb. of lime	=	70 lb. ,, ,,

To give some idea of the amount of impoverishment that each crop causes, it will be sufficient to state that to replace in the soil the 48 lb. of nitrogen, as calculated by Muntz, 250 lb. of sulphate of ammonia would have to be put to it, or about 400 lb. of dried blood. To replace the 38 lb. of potash, 75 lb. of sulphate of potash or 300 lb. of kainit would be required, and for the 11·5 lb. of phosphoric acid, about 90 lb. of Thomas's phosphate or 100 lb. of superphosphate would have to be used, or from 6 to 8 tons of farmyard manure.

* On digging round an Isabella grape vine which bears a heavy crop every year we removed nearly a barrow full of old tins, kettles, lamp glasses, &c., placed there by a former tenant of the house.—Ed. *Q.A.J.*

It may be argued that a moderately fertile soil containing, say—

1 per mille of nitrogen
1 per mille of phosphoric acid,
2 per mille of potash,
50 per mille of lime,

has practically an inexhaustible supply of those elements, inasmuch as 1 acre of that soil 6 inches deep contains nearly 1 ton each of nitrogen and phosphoric acid, 2 tons of potash, and 50 tons of lime.

But this is a mistake; it would appear that if the elements fall below a certain standard most crops and fruit trees are unable then to absorb the amount necessary for maintaining their vigour and cropping powers. It is an undeniable fact that fruit trees will be sickly and unable to bear anything of a crop in an exhausted soil which yet contains theoretically sufficient elements of fertility to keep them in good health for another twenty years.

So soon then as vines begin to show that the reserve in the soil is below their requirements manuring is advisable. Chemical analysis will tell which particular constituent or constituents are wanting, but without resorting to analysis experience has taught us that if the leaves are not dark-green in colour, but of a decided yellowish tint, then nitrogen is required. The vigneron must, however, use his judgment as to whether bad drainage may not be the cause of this appearance.

A deficiency of phosphoric acid is indicated by small bunches and berries with badly developed seeds. A deficiency of potash is shown by poor fruit and stunted thin canes. A soil rich in nitrogen which will cause a luxuriant growth of wood and leaf may be deficient either in phosphoric acid or potash, and when this is the case the crop will be out of proportion to the vigour of the vine. Moreover, it has been proved repeatedly that vines growing in such a soil are more readily attacked by fungoid diseases, and the grapes are more prone to rot in wet weather; the wine made from those grapes is also more liable to become diseased than that made from soils where potash or phosphoric acid is abundant. A small yearly addition to the soil of the deficient element will be amply repaid by the increased crop and improved resistant powers of the vine to fungus attacks. Grapes grown in soils containing a sufficiency of phosphoric acid and potash will always make a better wine than those from a soil deficient in these elements. An extended analysis of the finest growths of French wines proved that the quality decreased in proportion to the decrease of the amount of those two minerals in the wine.

It follows then that when manuring vines, more attention should be paid to the use of potash and phosphoric acid than to nitrogen; the soil is always absorbing nitrogen from the atmosphere if it is kept in good cultivation and in fine tilth, and it also receives some in the rainfall, in small but appreciable quantities; whereas potash and phosphoric acid are always being removed from the soil by crops, but none is returned naturally. It does not follow, however, that nitrogen is to be neglected in the fertiliser. A fair proportion of the elements to be used in general manuring would be 40 parts of potash to 60 of phosphoric acid and 60 of nitrogen, but of course, these proportions are very variable according to the composition and physical condition of the soil to be fertilised. Lime is a most necessary element to the soil and should always be added where it is deficient, as it is not only required by the vine but it is necessary to the nitrification of ammonia compounds before they can be utilised by plants and to the decomposition of other chemical compounds in the soil. The use of lime is followed by increased vigour and fruitfulness of the vines, but the soil is impoverished to the same extent, so that the employment of lime should always be accompanied by that of other fertilisers. It is well, however, not to put them on at the same time, or there may be a loss of nitrogen. Lime, moreover, acts most beneficially in a mechanical manner as it renders sticky soils more porous; it would prove of great service on the heavy black and chocolate soils which abound in Queensland. Plaster or gypsum is an excellent form of lime manure, but it is too costly in this State to be available.

With regard to the manures most suitable to the different soils, farmyard manure, which contains all the elements required for the vine, should be used when obtainable, on clay soils and light sandy soils deficient in humus. It should not be used too fresh and it gives better results if accompanied by bonedust. Eight tons to the acre with 4 cwt. of bonemeal is a good manuring. It should be ploughed in and not left on the surface of the soil.

It is not the writer's intention to recommend any particular formula of chemical manures, for when this is done it invariably happens that a host of partisans of other formulas rise up to smite him hip and thigh. It will be sufficient to show how much of each element is required and which fertilisers are best suited for a given quantity of soil.

Muntz's estimation of the amount of each element removed by an average crop of grapes, &c., is generally accepted as correct, viz.: 48 lb. of nitrogen, 11·5 lb. of phosphoric acid, 38 lb. of potash per acre.

Now	100 lb. of sulphate of ammonia	contains	20 lb.	nitrogen
	100 lb. of dried blood	,,	13 ,,	,,
	100 lb. of refuse of wool, hair, horns, hide, &c.	,,	5 ,,	,,
	100 lb. of nitrate of soda	,,	15 ,,	,,
	100 lb. of bonemeal	,,	15 ,,	phosphoric acid
	100 lb. of Thomas' phosphate	,,	17 ,,	,,
	100 lb. of superphosphate	,,	15 ,,	,,
	100 lb. of Australian potash	,,	25 ,,	potash
	100 lb. of kainit	,,	13 ,,	,,
	100 lb. of sulphate of potash	,,	50 ,,	,,
	100 lb. of muriate of potash	,,	61 ,,	,,

It will be easy, therefore, for the vignerons to calculate the amount per acre required of any one or more of the above fertilisers to replace the loss in the soil, bearing in mind that the crops taken off in Queensland are frequently heavier than an average European crop upon which Muntz's calculation is based. It is not sufficient, however, to replace the precise amount of phosphoric acid lost; experience has proved that phosphates are dissolved in the soil with some difficulty, and to maintain the equilibrium the amount of phosphoric acid should be considerably increased, and that the proportion of nitrogen, phosphoric acid, and potash replaced should be as 100 : 100 : 75. Since soils vary as much in their physical conditions as in their compositions, it stands to reason that any one fertiliser is inappropriate for all soils. Some directions to the choice of fertilisers for each class of soil will therefore be advisable.

Soils.	Nitrogen.	Phosphoric Acid.	Potash.
Heavy calcareous... ,, non-calcareous	Nitrate of soda ... Dried blood	... Superphosphate ...	Sulphate of potash Muriate of potash
Farmyard manure with superphosphate for a complete manure.			
Medium calcareous ,, non-calcareous	Dried blood ... ... Sulphate ammonia ...	Superphosphate ... Bonemeal	Sulphate of potash Muriate of potash Australian potash
Farmyard manure with bonemeal for complete manure.			
Light calcareous	Dried blood ... ... Refuse of wool, hide, hair, horn, &c.	... Superphosphate ...	Sulphate of potash Muriate of potash
Farmyard manure with superphosphate and ashes for complete manure.			
Light non-calcarerous ...	Dried blood ... ... Refuse of wool, hide, hair, horn, &c.	Thomas' phosphate	Kainit Australian potash
Farmyard manure with Thomas' phosphate and ashes for complete manure.			

Light non-calcareous soils are invariably deficient in phosphoric acid, consequently heavier doses of phosphate manures should be used than on other class of soils.

Generally speaking heavy calcareous soils have an abundance of potash, and on these the potash manures could be diminished in quantity; but nitrogen should be increased. Always take note of the subsoil, which frequently differs considerably from the surface soil, so that possibly the one may supply a deficiency in the other.

The best time for putting in the manure depends upon the kind that is being used. Dried blood, refuse of hide, wool, &c., sulphate of ammonia, kainit, Australian potash, Thomas' phosphate, and bonemeal should be ploughed in at the first winter ploughing; nitrate of soda and superphosphates at the second ploughing or first spring cultivation.

One principle which the vignerons should keep in mind is, that it is better to fertilise frequently with smaller quantities of manures than manure at longer intervals with larger quantities. In the case of droughts or exceptionally heavy rains there will be less loss, and the vine will respond better to it. He must also bear in mind that the benefit of manuring is only apparent in the year following its application, and should not be disappointed therefore if there is no great increase of crop the year it is applied.

BRANDY DISTILLATION IN WESTERN AUSTRALIA.

By A. DESPEISSIS.

Several inquiries have of late been made to me regarding the probable profits to be derived from the distillation of brandy in Western Australia, and in the following notes I have assumed that a vineyard established for that purpose be located on a stretch of deep, free, and moist soil, such as is commonly met with in the belt of country running along the coast of Western Australia, from the latitude of Perth and Fremantle to Cape Naturaliste to the southward. My calculations are based on average figures. The cost of clearing may in some localities exceed that given in these notes, while in others it is sometimes under that estimated. Considerable fluctuations also occur in the yield of vineyards, but all those who are familiar with the heavy producing grapes from which wine is made for the purpose of distilling brandy will recognise that my valuation is very reasonable. Indeed, along the stretch of Tuart gum country, which runs parallel with the coastal line of Western Australia, many isolated vineyards occur, which for many years have yielded annually five to eight tons of grapes to the acre. That our Tuart gum country is destined to be one of the most profitable belts of vineland in Australia, the results achieved give us every reason to believe.

Before discussing the profits to be made in this country in distilling brandy, it is necessary to review some of the facts on which the following estimates have been based:—

IMPORT OF SPIRITS.

These returns have been taken from the "Blue Book," and show that the amount of spirit imported is rapidly increasing. The population of the State was in—

1894	82,072	1897	161,924
1895	101,235	1898	162,129
1896	137,946	1899	171,032

The male population, from which the spirit consumers are chiefly counted, constitutes about one-half of the general population.

The table below gives in detail the quantity and the value of ardent spirit imported during the last three years :—

——	1898.		1899.		1900.	
	Gallons.	£	Gallons.	£	Gallons.	£
Brandy ...	39,309	23,694	31,550	20,204	39,993	28,414
Geneva and Schnapps ...	13,812	4,365	13,400	3,953	31,409	8,881
Gin ...	11,603	2,725	9,438	2,257		
Rum ...	13,026	2,318	9,631	1,671	14,447	2,641
Whisky ...	166,917	68,200	146,745	60,032	184,583	83,515
Liqueurs ...	2,108	2,061	1,652	1,552	2,075	1,837
Spirits of Wine (rectified) ...	4,700	389	2,661	218	1,088	223
Methylated ...	260	25	8,900	638	10,440	879

These returns bring the average price of brandy in bond close on 10s. to 12s. a gallon, and of whisky between 8s. and 9s.; while they show that the consumption of ardent spirit in Western Australia is over 1·5 gallons per head of the population.

Genuine brandy, even of ordinary grade, and newly distilled, it is a well-known fact cannot be purchased either at Cognac, Bordeaux, or Marseilles, the three centres of the brandy trade, for less than 6s. a gallon, while the superior grades are quoted at a higher price, and yet at the present time so-called "brandy" can be purchased in bond at Fremantle for 5s. a gallon.

The extensive manufacture of pure Australian brandy at a reasonable price has of late done much in Victoria and South Australia to limit the importation of adulterated spirits and check illicit distillations.

The manufacture of Australian brandy is, however, susceptible of vast improvements, and although it is mostly made of "pricked" or unmarketable wine, bought for the purpose at a greatly reduced price, still, by means of careful distillation and proper maturing, three or four of the leading brandy manufacturing firms of the Eastern States have lifted it up, in the face of unreasonable prejudice, to the level of the best brands of French brandy. The trade is a rapidly increasing and profitable one, and the Army Commissariat, recognising its merit, now puts it on a par on its tender list with the best brands of French Cognac placed on the market.

Relation of Raw Material to Manufactured Brandy.

The production of brandy at per acre of grape vines varies with two or three factors, which it is well to bear in mind in making an estimate of the cost of manufacturing the brandy. These factors affect mainly the cost of the raw material used for distillation.

The same kind of grapes will yield differently when grown in a dry, arid locality or in a moister one. The class of soil will also affect the crops. Varieties of grapes also differ very widely as regards quantity of grapes, quality of wine, and its suitability for the purpose of brandy-making.

In this estimate I will consider for that purpose one of the most favoured localities for vinegrowing in this State, and, for that matter, in the whole of Australia.

The coastal zone of the south-western district of Western Australia possesses a climate admirably adapted for the production of fine crops of healthy grapes. One does not meet here with either extremes in the ranges of production. A good average yearly crop of grapes can be reckoned upon with certainty, the yield being neither very low, as is often the case in very dry localities, nor very high, as is the case on the rich bottom lands of the South of France.

Where heavy bearing varieties of vines are extensively grown, the result is apparent in the quality of the must pressed out of the grapes. It is neither excessively heavy with sugar, and for that reason difficult to ferment, nor is it watery and tart. The wine resulting from it is, when carefully made and handled, good of quality, keeps well, and neither excessively spirituous and heavy, nor thin, of poor body, and of bad keeping quality.

In the following list I give, with the kind of grapes more extensively used in Western Australia, the amounts, in gallons, of wine made from what is considered a yield above and below the average:—

Class A comprises grapes producing small crops of wine of special quality, which are used for blending with wines made from grapes named under Classes B and C.

Class B are good, all-round grape vines, much in favour and extensively cultivated.

Class C represents vines of heavy yield, generally planted for blending with wines from grapes in Classes A and B. These grapes by themselves make the best wines for the manufacture of brandy, and are for that purpose much grown in France, Algeria, and California.

Class A.

Cabernet	100 to 200 gallons
Pinot	100 to 200 ,,
Riesling	150 to 250 ,,

Class B.

Verdelho	200 to 250 gallons
Pedro Ximènes	200 to 300 ,,
Shephard's Riesling	200 to 300 ,,
Shiraz	200 to 300 ,,
Malbeck	200 to 300 ,,
Morastel	200 to 300 ,,
Br. Muscat, of Frontignan ...	200 to 300 ,,

Class C.

Mataro...	300 to 400 gallons
Aramon	350 to 500 ,,
Trebbiano (Curror's)	350 to 500 ,,
Folle Blanche	350 to 500 ,,
Doradillo	350 to 500 ,,

In the coastal districts grapes named in Classes A and B give a must containing 18·5 to 24 per cent. sugar, which, after fermentation, produce a wine containing 12·5 to 17 per cent. alcohol by vol. (10 to 14 per cent. by weight), equivalent to 22 to 30 per cent. proof spirit.

Class C grapes give a must containing from 17 to 22 per cent. sugar, producing a wine with from 11·5 to 15·5 per cent. alcohol by vol. (9·2 to 12·5 per cent. by weight), equivalent to from 20 to 27 per cent. proof spirit.

Theoretically speaking, of wine from Classes A and B, 6 to 8 gallons will make 1 gallon of absolutely pure grape spirit, but these are not used for that purpose.

Of Class C, 8 to 10 gallons will make 1 gallon of pure grape spirit.

During the process of skilful distillation, however, there are impure alcohols, unfit for consumption, which are separated from the bulk of the spirit and discarded; and, when these waste products are accounted for, the average of grape brandy reduced to proof strength—the strength of the good brandy of commerce—it is considered that it takes 4 gallons of the stronger wines and 5 gallons of the lighter to produce 1 gallon of proof-strength brandy.

In the Eastern Australian States brandy is to a very great extent made of "pricked" or "off" wine—*i.e.*, wine rendered unmarketable owing to a taint of, very often, either acetic or lactic acid, or of moulds, which make the wine "mousy." As the acids named have been produced at the expense of some of the alcohol in the wine, it follows that, for brandy-making, such wine is impoverished of its alcohol proportionately to its degree of acidity, and of such wine 7 to 8 gallons are required to make 1 gallon of proof brandy.

The following table gives the maximum amount of the raw material required to make 1 gallon of proof brandy:—

- 5 gallons of sound wine.
- 8 gallons of sour wine.
- 8 gallons of grape pomace from the fermenting vat, plus 4 gallons of water.
- 8 gallons of lees or of piquette.
- 16 gallons of wash.
- 16 gallons of pressed skins and 8 gallons of water.

Cost of Production of the Raw Material.

By "raw material" with reference to brandy-making, I mean sound wine especially prepared for the purpose, and also the refuse of the fermenting house and of the wine cellar, which would, unless utilised for that purpose, be to a great extent wasted. I will assume, in order to arrive at an approximate estimate of the cost of the production of white wine for the purpose of making brandy, that a large stretch of the second-class land of this State, such as is met with, say, in the region of the Swan, the Murray, or the Ferguson and Preston Rivers, and consisting of light loam overlying a sub-soil of gravelly ochre-coloured stiffish loam or of limestone formation, with abundance of fresh water at a depth of from 10 to 30 feet from the surface, and with a good and reliable rainfall of 28 to 30 inches.

That kind of country is often under stunted Jarrah, Red Gum trees, with occasional patches of Blue or Flooded Gums, Stinkwood, Wattle, Banksia, and Sheoak (*Casuarina*), or under Tuart Gums and Blackboys and Banksia. Numerous small vineyards have been very successfully established upon the latter kind of country, and present a healthy and thriving appearance, bearing well and producing a wine clean and free from the peculiar "earthy taste" sometimes noticeable in wine made from vines grown on rich alluvial bottom lands. In arriving at the following estimate the high cost of labour and horse feed at present ruling has been taken as a basis for working out the cost. I also assume that provision has been made the previous year for striking vine cuttings in a nursery, as, in this climate, rooted vines give far more satisfactory results than vine cuttings when a vineyard is planted. Attention to this detail would cheapen the cost of rooted vines by £2 an acre, or £200 for a 100-acre vineyard:—

First Year.

	Cost per Acre. £	s.	d.
Grubbing and clearing	6	0	0
Fencing	0	15	0
Ploughing and harrowing	1	5	0
Plotting and digging holes	1	10	0
Planting	1	0	0
Cost of rooted vines and fertilisers ...	1	10	0
Baiting for grubs...	0	10	0
Scarifying and hoeing	1	10	0
	£13	10	0
Interest at 7 per cent. on capital ...	0	18	6
	£14	8	6 per acre,

or for 100-acre vineyard, £1,442.

Second Year.

	£	s.	d.
Pruning	0	6	0
Two ploughings	1	0	0
Hoeing	0	15	0
Replacing misses	0	15	0
Scarifying	0	15	0
Sulphuring and baiting	1	0	0
Interest at 7 per cent. on capital ...	1	3	0
	£5	14	0 per acre,

or for 100-acre vineyard, £570.

Third Year.

	£	s.	d.
Pruning, tying, and picking cuttings ...	1	0	0
Two ploughings	1	0	0
Hoeing	0	15	0
Replacing misses	0	8	0
Scarifying	0	15	0
Sulphuring and baiting	1	0	0
Interest on capital at 7 per cent. ...	1	12	0
	£6	10	0 per acre,

or for 100-acre vineyard, £650.

Approximate total cost, at per acre, for three years	£26	10	0
Total cost, at per 100 acres, for three years	2,650	0	0

To this should be added cost of water conservation, cottages for men, tools, implements, carts, horses, and also cost of land and cost of supervision.

At the termination of the third year there would be in hand a crop which, after deducting the cost of picking, would be an asset against the upkeep of the vineyard for the fourth season.

About that time it would be advisable, in order to maintain the fertility of the land and the fruitfulness of the vineyard, to spend every three years, on alternate blocks, about £1 worth of chemical fertilisers, or, say, an expenditure at an annual rate of 7s. per acre.

Fourth Year and After.

From the time of pruning to vintage, inclusive, the cost, when the vineyard is in full bearing, would be—

	£	s.	d.
Pruning, tying, picking, and removing cuttings	1	10	0
Two ploughings	1	0	0
Hoeing round vines and scarifying	2	0	0
Sulphuring and manuring...	1	5	0
Picking 4 tons grapes and carting to cellar ...	2	10	0
Interest on capital at 7 per cent....	2	10	0
	£10	15	0

or on a 100-acre vineyard, £1,075, bringing the cost price of the grapes up to £2 16s. per ton.

This does not include interest or sinking fund on purchase cost of the land and plant, and on cost of supervision.

Cost of Manufacturing Wine from Produce of 100 Acres of Grapes—Class C.

One ton of grapes gives from 125 to 135 gallons of must; allowing a shrinkage of from 25 to 35 gallons to represent waste, evaporation, lees removed, racking, &c., up to the time when the wine is distilled (a very liberal allowance). We see that 1 ton of grapes yields at least 100 gallons of marketable wine; or 1 acre, yielding 4 tons of grapes—planted with Class C grapes—will produce 400 gallons of wine; and 100 acres, 40,000 gallons.

Given a well-equipped wine cellar, the cost of crushing, pressing, fermenting, caskage, racking, and housing for one year is well within 4d. a gallon; for 1 acre, at 400 gallons, equals £6 13s. 4d., and 100 acres, at 40,000 gallons, equals £666 10s.

Total Cost at per Gallon per Acre, and per 100 Acres of good sound Wine for Brandy-making.

From the above data we see that the cultivation of 1 acre of vineyard, producing 4 tons of grapes, delivered at the cellar, will amount to £10 15s. The manufacture of same into 400 gallons of wine amounts to £6 13s. 4d., or a total of £17 8s. 4d., or for 100 acres, £1,770, which brings the cost of the wine, at per gallon, to 10½d.

Of course it should be borne in mind this only applies to vineyards planted with vines yielding large crops of grapes.

Cost of Brandy Manufacture.

I have not considered the amount of capital required for providing cellarage accommodation and distillation plant for manufacturing the wine from a 100-acre vineyard into brandy. The amount at per acre will decrease as the area under cultivation increases, but after going very carefully into the matter I estimate that the initial capital required in the case under consideration will be within 1s. for each gallon, or £20 per acre, or for 100 acres about £2,000, with a material decrease for every additional 100 acres.

Victorian and South Australian distillers estimate the cost of distillation at 1½d. per gallon; in France it is somewhat less when handling large quantities of wine. It is safe to reckon it at 2d. per gallon. From this we see that brandy costs:—

	s.	d.
Five gallons of wine, at 10½d.	4	4½
Cost of distillation, at 2d. per gallon	0	2
	4	6½

We thus see, by grouping these figures together, that—One gallon of pure grape brandy would cost to produce, say, 4s. 6d.; 1 acre of brandy grape vines would produce 80 gallons of brandy, costing 4s. 6d. a gallon, equalling £18, or for 100 acres £1,800.

Utilisation of Refuse.

The wine from a 4-ton crop to the acre, of grapes of the heavy-bearing class under consideration, it is thus seen, will yield 80 gallons of proof brandy, but there is still left, besides this, a quantity of grape spirit in the pomace or the compressed cake constituted by the skins and stalks from the fermenting vat, which can easily be extracted at the following approximate cost:—

I have stated above that it is reckoned that it takes to produce 1 gallon of proof brandy—

8 gallons of fresh grape pomace and 4 gallons of water.

16 gallons of wash.

16 gallons of compressed cake and 8 gallons of water.

8 gallons of lees or piquette.

One ton of grapes will yield about 130 gallons of grape juice (about 1,600 lb.), leaving about 600 lb. of stalks and of pressed skins; 600 lb. of fresh grape pomace represents, roughly speaking, 60 gallons, which after fermentation would yield, theoretically, 7½ gallons of proof brandy, but, after allowing for the elimination of the undesirable alcohols and fusel oil, would practically yield 3 to 4 gallons of pure proof brandy, or at the rate of about 15 gallons of brandy for 1 ton of fresh grape pomace, the produce of a 4-ton crop of 1 acre of grapes. Thus a 4-ton crop of grapes would yield—

400 gallons of sound wine, producing	80	gallons of brandy.
One ton, or over, fresh pomace ...	15	,, ,, ,,
Lees	2	,, ,, ,,
Total amount of brandy from 4 tons of grapes	97	gallons of brandy.

These figures show that, without reckoning the interest and sinking fund on purchase of land and cost of management, 100 acres of productive vineyard land in the locality referred to would yield, at a cost of a little over £1,800, 9,700 gallons of pure grape brandy, worth at least 16s. a gallon, equal to £2,900, or, after making a very liberal allowance for interest and sinking fund on capital cost of land and plant, supervision, and cost of production, the net profit on such a venture can safely be put down at £500 to £600 per 100 acres.—*Journal of Agriculture of Western Australia.*

A NEW ENEMY OF BEES.

Mons. A. Girard, says the *Revue Générale Agronomique*, has just made a most interesting communication to the Entomological Society of France on the above subject. We know, he says, that the common bee (*Apis mellifera*), which was introduced into Australia in 1862 by Edward Wilson, thrives admirably there, thanks to the abundance of honey-yielding flowers, and doubtless also because a large number of its enemies in the old country have not been transported to Austral lands.

But Mr. Walter W. Froggatt, Government Entomologist of New South Wales, has just published a singular fact which might, by becoming general, cause serious losses to apiculturists. A little Lamellicorne very common in Australia, the *Phyllotochus Macleayi*, Fischer, about 8 millimetres long (about one-third of an inch), which up to the present lived exclusively in the flowers of certain shrubs, especially in those of *Angophoras* and *Leptospermum*, has for the past two years begun to enter the hives, finding it more convenient to devour the honey collected by the bees. The *Phyllochus* begins pillaging at twilight, and in three nights an apiculturist at Cooma destroyed 9 litres (9½ pints) of these depredators by placing in the hives vessels full of honied water, in which they were drowned.

There must be some mistake about the European bee having been first introduced into Australia in 1862. In 1860, bees were so numerous in Queensland that splitters and timber-getters would often get three or four large colonies in a day, and quantities of honey could be found in any settler's house. The bee was more probably introduced by Governor Phillip, who brought over a great many valuable European animals. Honey was found by settlers in Governor Bligh's time in 1795, but it is not stated whether it was the honey of the stingless native bee or of the European variety. Dr. Lang, who landed in New South Wales in 1823, mentioned the existence of our honey bee in that State. Mr. F. M. Bailey, Government Botanist of Queensland, saw the European bee in Adelaide in the fifties. There is, in an old *Illustrated London News* of 1854 or 1855, a picture of a New South Wales blackfellow tracking the European bee to its hive in a hollow tree.—Ed. *Q.A.J.*

Horticulture

SOME SEASONABLE NOTES FOR MARCH.

By the EDITOR.

Those who intend starting a vegetable garden in the autumn will probably be glad of a few hints on the method of growing different vegetables which may save them some trouble and loss. We should like to see the boys and girls on the farms on railway lines and near to large centres of population cultivating a small plot which they can call their own. There is plenty of pocket money to be made during the next six or eight months by growing the common vegetables—far more than by going about with a pea-rifle, as so many boys do, shooting at every little bird they come across, generally destroying useful insect killers, and not seldom putting a bullet into one of their mates. A small vegetable garden can be easily looked after by devoting an hour or two of early morning and evening to the work. If you have a bit of good, rich soil, and a water supply, the crops will only require to be properly sown and, where necessary, planted out at the right time to ensure a regular succession of vegetables. Keep the weeds down; water when required. Keep the surface in good tilth, and little more is required.

To begin with, dig the land deep, and lay it out in long narrow beds, preparing also finely tilled seed beds. Say you are going to sow several varieties of vegetables, such as cabbage, cauliflower, carrot, lettuce, French beans, beetroot, parsnips, peas, radish, eschalots, seakale, &c.

Get your seeds from a reliable seedsman. Don't get too much at once, because you have to keep up a succession of vegetables, and to do this you will make sowings of most of them at intervals of a month about. In sowing carrots sow the seed in drills 1 foot apart. As the seed clings together, mix it with sand, and rub it well in your hands just before sowing. Rake it gently in, bearing in mind that seeds must not be covered, as a rule, deeper than their own diameter. When they are up, keep the hoe going, killing any weeds and stirring the soil. Thin the plants out to 6 inches apart; 100 bunches of carrots will bring you in from 8s. to 10s.

Cauliflowers.—For these the soil cannot be too rich, but for the seed bed a lighter soil is sufficient. Therefore, if your soil is not naturally very fertile, take care to thoroughly manure the bed to which the plants will be removed when large enough. Do not sow the seed too thickly, and shade the seed bed by putting in a few small leafy branches or by a light framework of bushes. This shade may be removed when the first young leaves are well developed.

Transplant in dull weather in rows about 2 feet apart—2 feet 6 inches is better. Give them water at the same time. Then, as they grow, supply them occasionally with liquid manure. Keep the ground well stirred, and draw the soil up to the stems to support them. As soon as the flower appears, water it frequently, and bend two or three leaves over it to preserve its colour and prevent it branching out.

Cabbage.—The largest sowings of cabbage should be made in January, February, and June, but you may sow in March and keep up a regular succession of sowings and transplantings. Shade the seed bed in the same way as for cauliflower seeds.. When transplanting, clip off the extreme ends of the roots, and that will make them throw out plenty of lateral or side roots. Plant out in rows, 3 feet apart for the large sizes and 2 feet for the smaller. In poor soil they may stand much closer. Keep the ground open, water well, and it is a good plan to mulch them (I will tell you something about mulching later on). If you can get any lime, give a slight dressing of it. It helps the roots to more plant food.

Lettuce.—Make monthly sowings. Plant out only small quantities at a time, allowing 15 inches between each plant. You can give your lettuce beautiful white hearts by tying the plant tightly round and round with soft string or banana fibre, thus preventing the rain, dew, and light from penetrating inside it. About ten days will be sufficient to blanch the leaves.

Cress and Mustard are very easily grown and make a very delicate salad. Sow a little every ten days on very fine soil, giving plenty of water. The mustard should be sown a week later than the cress, as it grows much quicker.

Radishes.—Make fortnightly sowings of these, either in drills 6 inches apart or broadcast. In either case, thin out the plants to 4 inches apart. They do not require to be transplanted. They grow rapidly and must be pulled young.

Beetroot requires a very rich, deep soil. Turn it up to two spades' depth, and turn plenty of manure into the bottom. Sow it in drills 2 feet apart. Cover the seed with about 1 inch of fine soil; and when the young plants are up, thin them out to 12 or 18 inches apart in the row. Bonedust is a good manure for beets.

Celery requires a little more trouble than any vegetable yet mentioned. It wants a deep, rich, moist soil. In making the seed bed, choose a shady spot; give the bed a good soaking of water, and sow the seed thinly. You may tread it in or cover it lightly with sifted stable droppings. While the seed is growing get another bed ready. Cover it with 2 or 3 inches of fine manure, and dig it in, mixing it with 3 or 4 inches of soil. Water it well, and next day plant out the young seedlings 6 inches apart. See that you have other seedlings coming on, so as to have a regular monthly planting. Now start at your third bed, and open out trenches in it 1 foot deep, 1 foot wide, and 5 feet from centre to centre. Cover the bottom of each trench with well-rotted manure, then give it a thorough watering. Take up your plants carefully from the second bed and plant them in the trenches 1 foot apart from each other. They will be about 10 inches high. Shelter them till they are rooted, and see that all side shoots are removed. Be careful to have the bed so arranged that the water will drain away from the trenches and that the manure is not in contact with any part of the plant but the roots. Celery has to be blanched. The blanching is done in the following manner:—Having kept the plants going by means of plenty of water and weak liquid manure until they are almost full grown, take off any side shoots you may see, then gather the leaves of each plant in one hand and tie them up. Then draw the soil in to the trenches. Do not apply stable manure directly to a celery crop as the stalks will probably turn rusty Therefore, plant it after some crop—say cabbage—which has been heavily manured.

If stable manure is applied directly to carrots, they are liable to become forked. In both the above cases it is better, when the land has been previously manured, to use for celery a fertiliser containing 7 per cent. of available phosphoric acid, 7 per cent. of potash, and 4 per cent. of nitrogen, and for carrots the percentage of the same fertilisers should be 8, 10, and 3 respectively. On damp, black soil, rich in humus, rich in nitrogen, and proportionately poor in potash, increase the latter by one-half, and reduce the nitrogen by one-half.

As to the quantity to use, it is impossible to prescribe any fixed quantity. That must be determined by the gardener himself, because there are many different varieties of soil, some containing more of one kind of plant food than others. But approximately, the fertiliser should be supplied at the rate of 700 lb. per acre—that is, nearly 4½ lb. per perch of 30¼ square yards. The cost per perch will come to about 5d.

The next thing is, how to apply the fertilisers. Nitrate of soda is prompt in its action, and is only applied to land which has a growing crop ready to make use of it. Without a crop it will rapidly leach out of the soil. It is put on as top-dr ssing. When used, as it should be, in conjunction with superphosphate, sow the superphosphate with the seed; and when the young crop is up, top-dress with the nitrate.

Potash is applied in the form of Kainit or muriate of potash, and these, as well as superphosphate, not being much liable to be washed out, may be sown with the seed at any convenient time.

All artificial manures should be reduced to the condition of a fine powder before application. They may be sown broadcast with the seed or be drilled in to a depth of 6 inches. The operation will require to be repeated. It should only be done in dry weather. By not planting celery in trenches, a knobby stem is produced, the whole of which is fit for use.

Parsnips require a deeper soil than carrots, and should be thinned out to 10 inches apart. Otherwise their cultivation is the same as for carrots.

Peas may be sown all through the winter. You can grow cabbages and peas simultaneously. Suppose you grow the climbing varieties, which reach a height of 5 or 6 feet, sow them in rows 8 feet apart; thinned out to 6 inches in the rows, you can grow two rows of cabbages between them by manuring liberally and giving liquid manure in dry weather. Stake the peas as soon as the tendrils appear. A good trellis for peas is wire-netting set a foot above the ground. Sow the dwarf sorts in drills from 2 to 3 feet asunder. Earth up both cabbages and peas as they grow up. If the peas are slightly soaked before planting they will germinate all the sooner.

French beans like plenty of light and air and a light rich soil. Sow in drills 2 feet apart, with 8 inches apart in the rows. We would not advise sowing after April, although we had a splendid crop from beans sown in May. One inch is deep enough to cover the seed. As they are liable to be blown over in high winds, earth them up. Give plenty of water and gather them regularly, as this will make them bear regularly and longer.

Eschalots are always saleable. Throughout the year you may propagate them by division of the bulbs. They like a sandy soil, rich in humus. Make little ridges and plant the bulbs on the top of them. Thus they will develop large bulbs, the rootlets only having a hold of the soil.

Seakale and *Rhubarb* need similar cultivation. Deep, rich soil for both. Get two-year-old roots and plant them 2 feet apart each way, the crowns 2 inches below the surface. Water with liquid manure and soapsuds. The young shoots of seakale must be blanched early in spring by covering them with large flower-pots, the hole in the pot being corked up. Swede turnips treated in the same manner will send up very delicate white shoots, equal to those of seakale. When the shoots of either are 10 inches high they are ready for table.

Turnips are very simply grown. Sow the seed broadcast. When the rough leaves have grown to an inch in breadth, thin out to 6 inches apart, water with liquid manure should the soil require manure, and keep the weeds down.

Mulching.

This is what Weathers' *Garden Plants* says about mulching, and you will do well to "read, mark, learn, and inwardly digest" what is set down here. During all the dry weather from November to the end of January, the writer of this article grew excellent lettuce, French beans, tomatoes, and other vegetables, as well as dahlias, carnations, dianthus, and many garden flowers, mainly by the help of mulch. If you cannot thoroughly soak your land in a dry season, it is better to water very little and trust to the mulch. What is mulch?

"A 'mulch' or 'mulching' in gardening language means an extra covering of soil, rotten leaves, or manure, either separately or combined, placed over the roots of plants either after the latter have been newly planted, or at any period during their growth when it may be considered advisable.

The advantages of mulching may be summed up as follows :—

"(i) During the hot and dry summer months it prevents excessive evaporation from the soil, and thus not only preserves the moisture for the roots to absorb, but it also prevents the soil from becoming excessively hot by day, and cold by night, thus maintaining a more regular temperature.

(ii) In winter it protects the roots from frost, and also keeps the soil warmer.

(iii) When a rich mulch is applied to newly planted trees, shrubs, or vegetables, it not only has the above advantages, but the manurial matters contained in it are washed down into the soil and enrich it with food for the benefit of the newly formed or forming roots.

(iv) A good mulching of rich manure to all kinds of fruit trees after they have set their fruits is highly beneficial in assisting them to swell rapidly and ripen more quickly. Once a plant—no matter whether a tree, shrub, or annual—begins to develop fruit and seeds, a demand is made upon its reserve materials. If these are not quite sufficient to meet the demand, it is easy to conceive that the extra food supplied by means of a good mulching will supply the deficiency."

On the subject of winter mulching the *Fruitgrower* remarks :—

"Do winter mulches do harm or good? This may seem a curious question to many readers, but there is so much difference of opinion as to what constitutes a mulch that we are not surprised such a question should be put. Some say winter mulches do harm, that they are cold, or keep the soil cold, and consequently retard growth. Well, that again depends not only upon the nature of the mulch, but the season. What is a mulch? Well, a mulch, broadly speaking, may be made of anything almost, used as a covering round the roots of a bush or tree, or on the top of a bed. In summer we put on a mulch to certain crops to keep the roots cool, and that coolness comes from preventing the heat of the sun striking into the soil covered. It retards maturity, and is useful to that end, always provided that mulch is damp and of a lower temperature than the soil itself. Now, with regard to the winter mulch. Does it retard growth and do harm to crops? That, to a very great extent, depends upon the nature of the mulch and the conditions. For instance, a man claims that a winter mulching of stable manure acts as a cold sheet and retards growth, but, at the same time, he fails to see that a mulch of stable manure may not, properly treated, be itself of a lower temperature than the soil. If not, how can it retard growth? Take our mulch; it is composed of stable manure and loam, well mixed. It would never do to say that the application of such a blanket in winter time to the strawberry bed and plant could keep them cold and thus retard growth. On the contrary, it would protect the rootlets from a very severe and destructive frost, and furnish them with a good supply of plant food at the same time. We claim that the free use of this mulch, made up as it is of short stable manure only and loam, is productive of wonderful results, and especially when put on strawberry beds which are two years old and more. No grower can test this method without seeing that the improvement in the health of the plants and the size and quantity of the fruits are most marked, and when once used it will never be discarded. We quite agree that to throw on a lot of hard cakes of coarse manure loaded with straw and general refuse may retard the growth of an asparagus bed if it is done under certain conditions, but even only then. In winter—that is, when wintry weather prevails—the soil is as cold as it can well be, and whether wet mulch be put on or not will not make any difference. In open weather it is well, naturally, for the air and light to act on the soil; that is why such a mulch if used should be removed when the weather is open, to induce early growth."

PESTS AND DISEASES.

It must not be supposed that after all has been done as suggested in what has been written on vegetable gardening for the farmers' sons and daughters, there will be nothing to prevent all the crops growing luxuriantly right through the season. So far from that, you will have to contend with many kinds of pests and diseases. Caterpillars, slugs, fly, locusts, birds, worms, scale insects, fungoid diseases of various sorts, will all attack your garden in their turn, and they must be destroyed as soon as they appear, or there will be very little pocket-money.

What is the best way of fighting them all? In a small garden you can do a great deal by picking off the caterpillars, but the slugs (*vaginula* particularly) are night intruders, and these may be destroyed by the use of the powder of tobacco refuse. A dusting of this is fatal to them. Then there are sprays which will destroy both insect parasites and fungous diseases. Whale-oil soap, 1 lb. to 2 gallons of warm water, applied when cold is an excellent spray. Paris green and Bordeaux mixture will also help If taken in time most of the enemies of the vegetable garden can be destroyed by proper appliances. Study the writings of scientific vegetable gardeners, and make use of the remedies suggested by them and you will find that you will be successful with your garden, and still have plenty of time to do chores on the farm.

NITRAGIN FOR BEANS.

Mr. Henry Kent, late gardener at Ravensbourne Station, in the Tambo district, made a most interesting experiment in nitraginising a piece of new ground which it was intended to be used as a vegetable and fruit garden. When the land was broken up, Mr. Kent sowed a portion of it with beans, the long variety known as "Chinaman's beans." He planted four rows each 100 feet long, 2 feet apart from each other. In order to ascertain whether the new ground contained sufficient nitrogen for vegetable crops, he manured one row with well-rotted manure from the cow-pen. The other three rows were treated with nine buckets of soil from the old garden on which beans had been grown for a long time. No nitrogenous nodules could be seen on the roots of the beans with the naked eye, and even under the microscope only a few could be noticed. When the crop was gathered, it was found that the first row which had not been treated with the bacterial soil produced 25 per cent. less in weight of beans, whilst the plants were four weeks later in flowering. An experiment such as this is valuable, showing as it does that the successful application of nitragin to the soil is not such a myth as many would make it out to be.

GROWING TOMATOES.

Most growers of tomatoes for sale or export aim at producing very large, smooth fruit. That the smooth variety is preferred to the wrinkled kind is evident from the fact that the public, as a rule, do not care for the latter, and that a better price can be obtained for the former. But abnormally large tomatoes are a mistake. As a general rule, the public prefer a moderate size. The housewife does not like getting two or three fruits to the lb., because there is often much wasted in the large sizes. From 2 to 3 inches in diameter is quite large enough, and such tomatoes will always command a better price than the very large ones, which are more useful to the cook for "fancy work" than for general purposes.

Tropical Industries.

COFFEE IN BRAZIL AND JAVA.

In a communication to the Journal of the Jamaica Agricultural Society it is stated that an exceedingly large area of land in Brazil, formerly sugar-cane lands, but subsequently planted in coffee, have now practically been proved to be quite unsuited for growing coffee, owing to the intense heat and dryness. This was to have been expected, but certainly the confirmation comes with great effect. The coffee-trees are described as being partially burnt up or roasted, whilst growing—in French, *grille sur-pied*—roasted on foot. Brazilian coffee is mainly exported from Santos, where an exceedingly short crop is anticipated. One account puts the loss at 30 per cent. It will be remembered that the exceedingly large exports from Santos to New York, some two years ago, had the effect of lowering the price of ordinary coffee beyond precedent, and it may reasonably be supposed that, with the lessened export that is now in prospect, and one existing cause of low prices being removed, better prices are in store for the ordinary coffee so largely produced in Jamaica. In this connection it may be mentioned that in Java also a new and very injurious disease has just begun to manifest itself extensively in numerous coffee plantations, the damage being due to two sorts of boring insects, which pierce both the growing wood and the coffee-cherries.

PULPING LIBERIAN COFFEE.

(Translated from the *Journal d'Agriculture Tropicale.*)

The pulping of Liberian coffee (*Coffea liberica*) is attended with much more difficulty than that operation on *Coffea arabica*. This is principally owing to the unequal size of the berries, which prevents the pulping apparatus being properly regulated, and also to the nature of the pulp, which is harder, more fibrous, and, above all, more closely adherent to the berry.

Since plantations of Liberian coffee have multiplied, all the manufacturers of coffee-pulping machines have directed their efforts towards overcoming the difficulties, and almost all have placed on the market machines which are more or less modifications of the pulpers for *Coffee arabica*. There are several of them which deserve special notice, considering the results they have shown.

We may mention those of John Gordon in England, of Graafland in Holland, of Butin-Schaap and of Van Riemsdek in Java. These two last machines took part in a special competition organised in 1900 at Genampir (*Klatten*). At the conclusion of the trials, *De Indische Mercuur* published a long account of them. We are now obtaining the necessary information concerning them, and we hope in the near future to furnish it to the readers of the *Journal d'Agriculture Tropicale*.

To-day we shall speak of the Liberian coffee-pulpers of Messrs. J. Gordon and Co., London, and are able to present two illustrations of them.

For this particular class of work, the Messrs. Gordon have abandoned the disk type in favour of the cylindrical type. On this principle they have constructed two machines—one for hand, the other for motor power, the latter differing slightly in the method of working.

In both, the cylinder is of rather large diameter. It is covered with a thick plate of copper; the teeth (*déchireurs*—lit. rippers, Ed. *Q.A.J.*) and projections are stronger, and farther apart than in the ordinary pulpers. The counter-plate is formed of adjustable steel plates, mounted on hinges, and regulated by screws and nuts.

The hopper is placed in such a position as to prevent the admission of stones to the pulper. For this purpose it is lined on the entrance face with a plate of sheet-iron, which curved in such a manner as to form a small compartment. The current of water dashes against this curved partition, and forms an eddy which forces the stones to fall to the bottom of the receptacle. Thus the cherry being lighter. is alone carried away by the current to the pulper.

Notwithstanding this arrangement, when the crop contains a quantity of stones, it is advisable to first pass the coffee and the water, which carries it away, into a little passage provided with partitions which effect the same purpose.

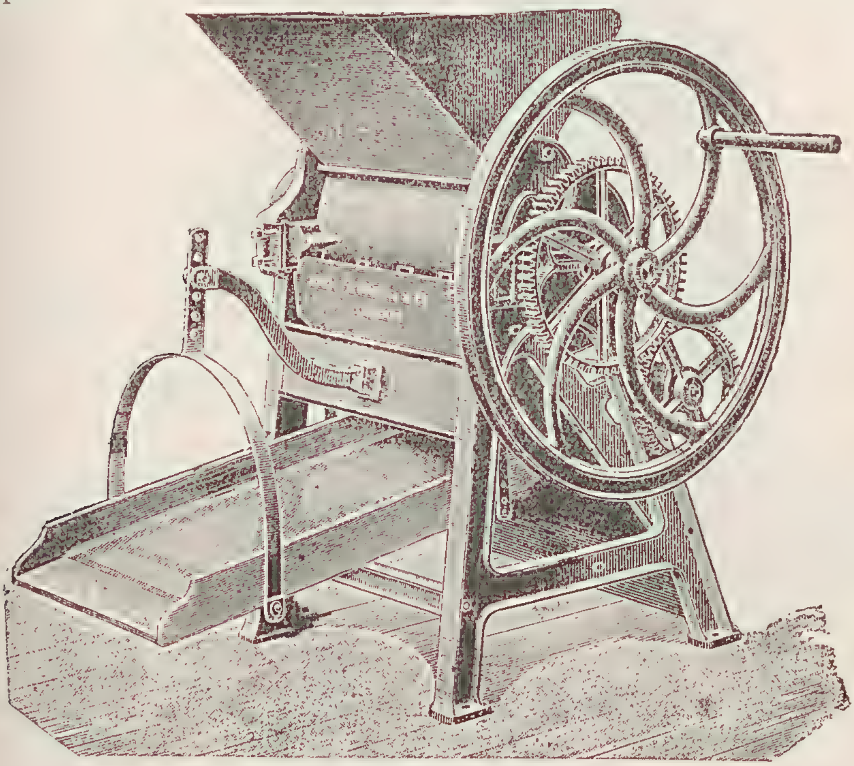


Fig 1.—The Hand Pulper.

In this machine (Fig. 1) the fruit passes from the hopper against the cylinder, which lies as close as possible to the counter-plate. This latter is in the form of a number of channels or gutters, the bottoms of which are movable and easy to regulate according to the size of the fruit. The skins and a portion of the pulp are carried away by the cylinder, whilst the berries fall through the channels of the counter-plate on to a sieve which oscillates rapidly, allows the pulped berries to pass through the perforated sheet iron, and delivers at one end the smallest berries which have not been torn. The perforated iron of the sieve can be changed according to the average size of the crop dealt with.

The makers state that this machine is capable, according to size, of working off from 800 to 1,600 kilos (1,760 to 3,520 lb.) of cherry per hour. It weighs from 250 to 400 kilos (550 to 880 lb.), and has a maximum speed of 120 revolutions per minute.

The copper-plates of the cylinders are interchangeable, as well as the side plates of the channels, which are liable to wear away owing to the constant friction of the pulp.

With this machine it is necessary to pass the smaller berries a second time through the pulper, but the same firm has constructed a more powerful machine which delivers every berry properly pulped.

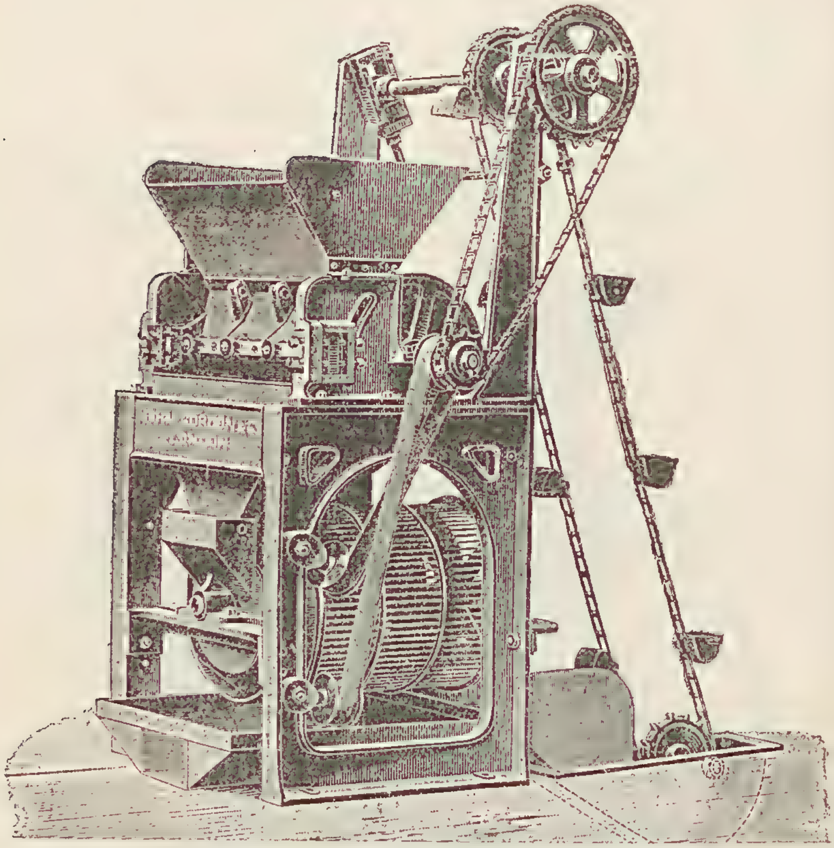


FIG. 2.—THE STEAM PULPER.

The machine, Fig. 2, here shown is based on the same principle, and presents the same peculiarities as the hand machine; but the hopper is subdivided, and the two portions of the counter-plates which correspond to each half of the hopper, are so arranged as to be separately regulated. The berries are poured into a part of the hopper (seen on the left of the drawing) when the separation of the stones is effected; the berries pass on to the pulper, the left half of which is so arranged as to allow the small ones to pass, and only to pulp those of a certain size. Then the whole mixture falls into a sieve (in this case a rotary one), which delivers in front (on the left) the pulped berries, and in rear (on the right) the berries which have escaped the action of the cylinder. These are collected in a small trough, whence they are removed by a chain elevator, which delivers them into the right-hand part of the hopper. Thence they fall into the pulper, the counter-plate of which has been kept closer to the cylinder, so that no unpulped fruit can pass.

Thus the operation is carried out without the necessity, as in the hand machine, of passing the berries a second time through the pulper, whose action requires to be altered.

The construction of this machine is clearly shown in Fig. 2. It is strong, easily taken to pieces, and easy to examine. The sieve only, which requires little power, is set in motion by a belt; the cylinder has direct action.

The tension of the chains of the elevator is easy to regulate by modifying the position of the superior arm.

This machine, making 120 revolutions per minute, works off 1,600 kilos (3,520 lb.) of cherry per hour. It weighs from 600 to 700 kilos (1,320 to 1,540 lb.)

Lastly, it is easy to set up, requiring only the erection of the frame and the preparation of the site for the trough of the elevator.

Forestry.

FIXING SAND DRIFTS.

In South Africa there are sand drifts which invade cultivated land, and do a great amount of mischief, so much so that Mr. D. E. Hutchins, the Conservator of Forests in Cape Colony, has given the matter serious attention. Writing about a successful experiment at "fixing" the drift sand which he witnessed, he says that a Mr. Marais some years ago bought a farm which was seriously threatened by a sand drift. After trying all sorts of screens with poor success, he decided to try marram grass. Mr. Hutchins tried to dissuade him, pointing out that this grass grew near the coast, and even there suffered for want of moisture. But Mr. Marais still determined to try it. He got a few roots and found they grew splendidly, so more was planted, and at last the drift was partly covered with a growth as high as Pampas grass. Mr. Hutchins was then satisfied that the problem of fixing the drift had been solved. Soon it will be all planted, and will represent the best veld on the farm.

It is hoped that other farmers along the Breede River, where these drifts are numerous, will follow Mr. Marais' example. A sand drift left unfixed is always liable to spread and increase, and there is no knowing where it will stop. It destroys all vegetation as it advances, and mountains 1,000 feet high are no bar to its progress. The first thing to be done when attempting to fix a sand drift is to fence.

A double fence of brushwood or palings is first erected. This stops the sand as it is blown along. When the sand is as high as the fence, another fence is built on top of it, and another on top of that, till the sand is about 20 or 30 feet high. Then marram grass is planted on the slopes, and afterwards various kinds of pine-trees.

There are great masses of shifting sand now in Queenston in the far interior, which cover the fences so that they may be driven over, and it is said that even the settlers' houses are invaded by it. When the scorching heat lately experienced has quite passed away, a trial might be made in such localities with marram grass. Such sand drifts are useless and dangerous, and there is only one purpose they can be used for—forestry and to grow timber on them, they must first be fixed as above described.

MARRAM GRASS.

Mr. A. Molineux, secretary of the Agricultural Bureau of South Australia who has just returned from Port Fairy, Victoria, showed a representative of the *Observer* a number of samples of marram grass which had been grown at that place and photographs illustrating the benefits derived from its culture. The first picture showed a perfectly bare wind-swept hummock of pure sand, 600 acres of which was being laid with rooted plants 6 feet in the rows and 2 feet apart. It was stated that this sand had been making most serious encroachments on neighbouring country worth from £70 to £80 per acre for agronomical purposes. The second picture indicated a complete transformation. It was taken three years later, and in it the same mound is shown covered with a dense growth of the grass, which will support a cow to the acre, while men are engaged pulling up the redundant roots for sale and export to establish other plantations. It will therefore be seen that the shifting of the hummocks has been completely overcome, and ground which was a nuisance and a menace has been made to provide a double source of revenue. Mr. Molineux has a bundle of plants grown from seed sown twelve months ago, the grass in which is 18 inches long, with strong fibrous roots of equal length. As the sand rises the marram plants throw out lateral runners, which root and spread with amazing rapidity. They have been known to strike through a drift gradually accumulating until it was 100 feet over the original level of the roots, all the time sending forth laterals until eventually the plant triumphed and stopped the drift. The seed heads are borne at the third year, are very prolific, and run up to 1 foot in length; but the plant does not always grow readily from seed. It is, however, as a rule, cheaper to purchase plants. These are being exported from land at Port Fairy planted three years ago, and are being taken up at the rate of 10 tons per acre. They are delivered on trucks there at 30s. per ton, and large quantities are sent to all parts of the world, but more especially the Australian States. South Australian pastoralists and others have taken a considerable quantity. The plants have a great vitality, and will strike if put in three months after being taken up. They form a coarse fodder for cattle. The Port Fairy correspondent of the *Melbourne Argus*, referring to the visit, said that Mr. Tucker, M.P., who accompanied Mr. Molineux, in addressing the local borough council, remarked that he had expected to see something extensive, but the result was ten times greater than he had anticipated. He considered the Port Fairy Borough Council was doing a most important national work, which was not sufficiently recognised by the Government of Victoria, and he thought that if the Government were to make a present of 1,C00 sovereigns to Mr. Avery, the borough ranger, under whose direction the work had been performed, they would not be giving him anything more than he deserved.—*Adelaide Observer*.

FORESTRY IN AMERICA.

The Yale school of Forestry, says *Engineering News*, has divided its senior class into two sections, and has sent one of these sections to a lumber camp in Maine, and another to a similar camp in Pennsylvania. Each section must spend three weeks in studying lumbering methods, and each student must report his observations.

As yet we have no forestry students in Queensland, but if future officials of the Forestry Department are to be of practical use they should be chosen from men who have, in addition to a book knowledge of forestry, a practical knowledge of lumbering, or as we call it in this country, timber-getting in all its branches, from saw-mill logs to shingles and laths.

FORESTRY IN SOUTH AUSTRALIA.

In the Annual Report of the Minister for Agriculture of South Australia, stress is laid upon the great necessity and importance of forest-tree cultivation, and regret is expressed at the continued decrease in the area of afforested land in Australasia generally, and in South Australia particularly. The General Secretary of the Agricultural Bureau says: "We are convinced that this denudation is exercising a most injurious influence on our climatic conditions. But apart from any consideration in that direction, our supplies of timber for fences, bridges, mining purposes, &c., and for firewood, are becoming scarcer every day, and unless very extensive plantation of forest trees is soon commenced, both by the State and by private owners of land, we shall surely, in the near future, experience much inconvenience in obtaining supplies of hardwood timber and of firewood—the latter difficulty being intensified by the absence of conveniently situated coalmines in this State. Our farmers should not only be urged, but should be encouraged in every way, to plant shelter belts of trees round or about their holdings, and individuals could be aided in raising trees for free distribution in their neighbourhood, whilst every means should be adopted of distributing information respecting the best methods of establishing plantations of forest trees. The wholesale destruction of indigenous forests should be stopped, and, if possible, some concessions should be made (as is done in some other countries), to those persons who succeed in growing a considerable number of useful forest trees.

Sand Drifts

occur on or near the coast, and serious losses have resulted from the drifting of the sand dunes and hummocks on to good land adjacent. In nearly every instance this drifting has followed the destruction by stock of the natural vegetation, and the efforts to check or remedy the trouble have, with few exceptions, been very spasmodic. About ten or eleven years ago a quantity of marram grass was imported from New South Wales, and it was planted with most satisfactory results on the sand dunes in the vicinity of the Normanville Jetty, and there are now several hundred acres of this grass thriving in the locality. We have ample local proof, if such is required, that by systematic work and the planting of marram grass, the worst of drifts can be conquered. Owing to the destruction, by overstocking, of the indigenous vegetation which held the sand together, there are now many thousands of acres of drifting sand, which is rapidly overwhelming much good grazing country."

FORESTRY IN SOUTH AFRICA.

The King's birthday was commemorated at Bloomfontein, South Africa, by the planting of 16,000 trees on land chosen for afforestation.

TO DESTROY RATS WITHOUT TRAPS.

A correspondent of the *Brisbane Courier* of 11th February forwards to that journal an extract from an English paper on the subject of dealing with rats. The plan seems so simple that it is well worthy of a trial here. We may state that birdlime can be easily made by boiling down linseed oil. If boiled oil is used, the concentration will take less time than with unboiled oil. The proper way to bring it to a right consistency is to treat it as glue is treated. Put the oil into a tin, place the tin in a saucepan of water over the fire, and let it boil slowly until it is of the right thickness and stickiness.

The following is the extract referred to :—

"Rough on Rats and Mice.

"It is not generally known how readily rats may be caught by means of birdlime. If it is desired to make a colony desert their burrows, it is only necessary to smear a little round the entrances. If it is desired to catch them, the best way is to dress plenty of straws and spread them thickly on the ground around the burrows. Among the straws throw some attractive bait—malt sprinkled with oil of carraway is a good draw. When the spot is visited next morning the straws will be found gathered up in little bundles, and in the centre of each will be found a rat, alive or dead according to the extent of its entanglement. Do not be tempted to place your foot upon one of those rats if it still struggles, but kill it with a stick. If the birdlime is to be used indoors, take a piece of stiff brown paper and put the sticky stuff in the centre. In England, use 'Cheshire'; abroad, 'Jap' or 'Dak.' And, caution—When you go to see the bag, don't take your dog, or the last stage may be worse than the first."

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1901.												1902.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
North.													
Bowen	17·25	6·23	8·26	4·75	0·94	0·19	0·10	6·36	0·18	0·93	0·92	0·71	0·19
Cairns	11·53	22·09	14·93	8·87	13·18	0·57	0·89	2·53	1·82	2·34	5·23	2·78	3·79
Geraldton	23·32	32·93	37·64	26·10	26·.2	1·21	2·58	11·77	3·37	3·85	6·45	1·60	3·78
Herberton	8·25	4·16	10·95	2·87	3·80	0·18	0·64	2·53	1·04	4·92	1·13	1·30	0·57
Hughenden	1·62	1·41	2·82	1·74	3·48	0·03	Nil.	0·33	Nil.	0·31	0·29	1·43	1·57
Kamerunga	15·91	22·36	13·09	9·57	13·18	2·09	2·60	1·94	1·72	1·19	5·74	2·16	2·58
Longreach	0·41	0·22	3·09	2·56	5·95	0·09	Nil.	0·37	0·58	Nil.	Nil.	1·71	0·87
Lucinda	31·80	24·76	15·78	9·16	8·63	2·89	2·17	5·89	0·30	2·59	Nil.	0·32	3·55
Mackay	24·85	8·99	10·13	6·80	1·32	0·25	1·07	5·14	2·29	1·35	1·85	0·71	3·78
Rockhampton	0·49	8·26	5·53	2·84	0·79	0·24	2·29	3·04	1·78	0·51	0·41	0·19	4·79
Townsville	14·91	12·94	4·95	3·13	0·74	0·32	0·19	1·87	0·14	0·90	0·16	0·61	2·24
South.													
Barcaldine	0·15	1·17	3·70	1·90	2·21	0·82	0·63	0·25	0·51	0·54	0·55	0·09	2·39
Beenleigh	5·99	4·30	11·44	4·17	4·55	4·15	1·34	4·49	0·70	3·35	1·35	0·14	2·41
Biggenden	1·11	2·55	6·19	6·35	1·47	1·56	0·74	2·81	2·11	1·35	0·47	0·92	2·12
Blackall	0·29	0·90	2·28	3·96	3·80	0·90	0·55	0·44	0·88	0·60	0·97	0·32	1·68
Brisbane	3·43	2·96	11·70	3·10	2·29	3·29	1 31	3·71	1·30	3·25	1·41	0·75	1·38
Bundaberg	2·34	2·61	3·17	10·27	1·14	0·71	2·01	5·59	1·80	2·18	1·28	Nil.	6·33
Caboolture	1·11	5·51	11·53	4·64	3·34	2·27	3·70	3·18	1·55	5·01	3·17	3·45	2·29
Charleville	0·19	0·22	1·10	2·61	3·28	0·93	1·27	0·92	0·32	0·04	0·65	0·96	0·47
Dalby	2·89	0·44	4·77	3·12	1·12	3·59	2·83	1·66	1·11	4·09	0·15	0·42	1·65
Emerald	3·65	4·43	3·25	0·88	1·31	0·63	0·90	1·74	1·11	Nil.	0·09	0·63	3·28
Esk	3·99	3·15	8·36	4·11	1·78	2·45	3·01	3·03	1·72	4·87	1·08	2·20	1·81
Gatton College ...	6·27	1·54	6·73	3·86	1·55	2·93	1·53	3·23	1·06	3·02	0·86	0·26	2·27
Gayndah	1·22	2·10	4·22	3·97	0·97	2·32	2·29	Nil.	1·91	2·39	0·04	0·38	2·54
Gindie	1·57	1·62	2·07	0·44	1·21	0·84	1·34	1·77	1·81	0·53	0·02	0·57	1·35
Goondiwindi	0·59	0·25	3·53	1·82	1·90	1·73	2·30	1·55	0·67	2·83	0·21	0·20	2·06
Gympie	2·57	3·10	18·56	3·89	3·38	2·82	3·40	3·39	1·34	1·91	1·34	1·25	1·49
Ipswich	2·09	2·88	7·01	3·38	1·43	3·16	0·97	2·47	3·54	3·98	1·17	0·35	1·45
Laidley	4·01	1·58	6·94	3·81	1·47	2·54	2·00	5·32	1·22	3·37	1·10	1·65	1·79
Maryborough	5·03	5·51	11·76	5·58	4·09	2·22	3·07	5·02	1·05	1·54	1·84	1·54	1·29
Nambour	4·25	9·13	18·01	3·33	7·25	3·33	6·80	4·42	0·98	3·89	2·85	3·89	1·30
Nerang	4·26	4·22	14·91	5·12	5·42	5·34	0·79	5·41	0·88	4·57	2·70	0·46	3·98
Roma	1·13	0·11	1·77	1·11	1·11	2·66	2·26	0·98	0·43	0·71	0·54	0·83	2·72
Stanthorpe	1·94	0·80	3·95	2·13	0·77	2·74	1·52	4·22	1·42	2·93	2·22	1·67	3·17
Taroom	1·40	0·10	3·15	1·88	1·70	2·19	2·74	2·34	2·11	0·92	0·42	0·31	0·53
Tambo	0·52	0·51	1·66	2·75	2·85	1·47	0·73	0·74	1·47	0·51	Nil.	0·16	1·73
Tewantin	7·04	14·18	20·33	11·70	12·20	5·45	8·34	4·61	2·71	3·26	1·66	2·70	3·09
Texas	1·29	1·35	4·58	1·46	1·10	1·87	1·00	3·06	1·47	1·47	0·26	0·43	1·95
Toowoomba	3·60	1·76	6·84	6·59	1·04	3·57	2·22	5·57	1·85	4·45	1·10	0·87	3·46
Warwick	2·90	0·26	5·56	2·91	0·82	3·47	1·57	5·74	2·05	3·12	1·19	0·71	3·48
Westbrook	1·88	0·73	4·37	3·38	0·74	3·48	1·64	6·50	1·75	2·27	0·59	0·31	...

NOTE.—The figures for Westbrook were not available when the *Journal* went to press.—ED. *Q.A.J.*

CLEMENT L. WRAGGE,
Government Meteorologist.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER (duty free).—Market for colonial, steadily improving. Australian, choicest, 108s. to 110s.; Danish, 114s. to 118s.; Canadian, 72s. to 102s.

CHEESE (duty free).—American, 32s. to 49s.; Canadian, 40s. to 50s.; New Zealand, 49s. to 50s.; Australian, 47s. to 49s. per cwt.

CONDENSED MILK.—18s. 6d. to 20s. 5d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d.; refined, 4s. 2d. and $\frac{1}{4}$ per cent.).—Refined, £16 to £18 15s. per ton; German beet, 88 per cent., 6s. 9½d. per cwt.

SYRUPS (duty, 2s. per cwt. and $\frac{1}{4}$ per cent.).—Finest, 14s. per cwt.

MOLASSES (duty, 2s. per cwt. and $\frac{1}{4}$ per cent.).—5s. 9d. to 8s. per cwt.

Rice (duty free).—Rangoon, £10 to £15; Japan, £13 to £18; Java, £20 to £25; Patna, £18 to £21 per ton; Queensland (Pimpama Island), valued at £18 10s. in the London market.

Coffee (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, small to good middling, 46s.; peaberry, 75s.; Santos, 32s.; Mocha, 80s.; Jamaica, finest, 100s. per cwt.

Arrowroot.—St. Vincent, 1½d. to 4½d.; Natal, 5d. to 8d.; Bermuda, 1s. 5d. to 1s. 8d. per lb.

Wheat.—Australian, white, 30s. to 30s. 6d.; New Zealand, white, 29s. 9d. to 30s.; Duluth, red, 32s. 6d.; Manitoba, red, 32s. per 480 lb.

Flour.—Australian, 20s. to 21s. per 280 lb.

Malting Barley.—English, 26s. to 38s. per 448 lb.

Oats.—New Zealand, 24s. to 26s. 6d. per 384 lb.; Canadian, 16s. to 28s. per 320 lb.

Split Peas.—44s. per 504 lb.

Ginger (duty free).—Calicut, good medium, 80s. to 100s.; medium, cut rough, 39s.; small, cut rough, 30s. to 34s.; Japan, rough, 44s. to 45s.; Jamaica, good bright, 60s. to 70s.; middling to fair, 40s. to 56s. per cwt.

Pepper.—Capsicums, 16s. to 80s.; chillies, 35s. to 38s. per cwt.

Tobacco.—American:—

STRIPS.	1902.	LEAF.	1902.
Western—		Western—	
Fillers	4½ @ —	Common export	— @ —
Rather short	5¼ " 6	African export	— @ 5 @ 6½
Very middling to middling	6¼ " 7	Short trade	3½ @ 4
Good to fine	7¼ " 8½	Medium to good trade ...	4½ " 6
Burley	6 @ 8 @ 11	Burley	7 @ 7½ @ 8
Virginia Dark—		Virginia Dark—	
Fillers	4¾ @ —	Common export	— @ —
Rather short	5 " 6	Short trade	— " —
Very middling to middling	6½ " 7½	Medium trade	4 " 5
Good to fine	8 @ 9 @ —	Good to fine trade	5½ " 6
Virginina afd Carolina Bright—		Virginia and Carolina Bright—	
Semi-dark	— @ 6½	Common or semi-bright ...	— @ 6
Semi-bright	7 @ 7½ @ —	Medium or mixed	6½ @ 8½ @ —
Medium or mixed	8¼ @ 9½	Good to fine	10 @ 11 @ 15
Good to fine	10 @ 11½ @ 13		

Wine.—Australian Burgundy: Wotonga 13s., Waratah 18s., per dozen.

Green Fruit.—Oranges, Valencia, from 6s. 3d. to 8s. for common sorts to 17s. to 27s. for finest selected per 420; lemons, finest selected, 17s. to 20s. per case of 420; bananas, 8s. to 14s. per bunch.

Cotton.—Clean upland, 5½d. per lb. In America, seed cotton, 2½d.; lint, 9d. per lb.

Cotton Seed.—£6 8s. 9d. per ton.

Cotton-seed Oil Cake (decorticated).—£4 15s. to £4 16s. 3d. per ton.

Cotton-seed Oil.—Crude, £21 per ton.

Linseed.—52s. 3d. per 416 lb.

Linseed Oil.—£30 to £30 10s. per ton.

Linseed Oil Cake.—£7 17s. 6d. to £8 per ton.

Manila Hemp.—£25 to £30 per ton.

New Zealand Hemp.—£33 10s. per ton.

WOOL.—The first series of the London wool sales closed on 5th February very firmly. Bidding was active, and competition brisk. Prices for merinos and fine crossbreds were 5 per cent. higher than on the previous day.

FROZEN MEAT.—The following are the latest quotations for the various descriptions of frozen meat mentioned (last week's prices being also given for comparison) :—

New Zealand Mutton.

(Crossbred Wethers and Merino Ewes.)

	Feb. 8.	Feb. 15.
Canterbury	$3\frac{9}{16}$d.	$3\frac{9}{16}$d.
Dunedin and Southland	$3\frac{5}{16}$d.	$3\frac{5}{16}$d.
North Island	$3\frac{3}{16}$d.	$3\frac{3}{16}$d.

Australian Mutton.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$2\frac{15}{16}$d.	$2\frac{15}{16}$d.
Light (under 50 lb.)	$3\frac{1}{16}$d.	$3\frac{1}{16}$d.

River Plate Mutton.

(Crossbred and Merino Wethers.)

Heavy	$2\frac{15}{16}$d.	$2\frac{15}{16}$d.
Light	$3\frac{3}{16}$d.	$3\frac{3}{16}$d.

New Zealand Lambs.

Prime Canterbury (32 lb. to 42 lb.)	$4\frac{7}{8}$d.	$4\frac{7}{8}$d.
Fair average	$4\frac{5}{8}$d.	$4\frac{5}{8}$d.

(The quotations for New Zealand lambs are for old season's.)

Australian Lambs.

Prime (32 lb. to 40 lb.)	$4\frac{1}{2}$d.	$4\frac{3}{8}$d.
Fair average	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.

New Zealand Frozen Beef.

(Fair Average Quality.)

Ox, fores (100 lb. to 200 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{8}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$4\frac{3}{4}$d.	$4\frac{5}{8}$d.

Australian Frozen Beef.

(Fair Average Quality.)

Ox, fores (100 lb. to 200 lb.) ...	$2\frac{11}{16}$d.	$2\frac{13}{16}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$3\frac{1}{8}$d.	$3\frac{1}{4}$d.

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations for New Zealand and Australian lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 15s. to 16s.; Danish, 14s. to 17s. 6d. per 120.

BACON.—Irish, 57s. to 63s. ; American, 50s. to 54s.; Canadian, 50s. to 56s. per cwt.

HAMS.—Irish, 104s. to 114s.; American, 51s. to 52s. per cwt.

HIDES.—Queensland heavy ox, $5\frac{1}{2}$d. per lb. ; light ox, $4\frac{3}{4}$d. ; cow, $4\frac{5}{8}$d. New South Wales heavy ox, $4\frac{3}{4}$d.: light ox, $4\frac{3}{8}$d.; cow, $4\frac{1}{4}$d.

TALLOW.—Beef, fine, £34 ; medium, £31 ; mutton, fine, £38 6s.; medium, £33 6s. per ton.

Plate XVI.

GRAPE FRUIT ROT.

Sun Scald.

Vegetable Pathology.

By HENRY TRYON,
Entomologist and Vegetable Pathologist.

GRAPE FRUIT-ROTS.

(Plates XVI. and XVII.)

Two forms at least of Fruit Rot of the grape, brought about by distinct agencies, have recently constituted subjects of complaint.

1. Sun-scald and Bees (Plate XVI.)—In the February number of the *Queensland Agricultural Journal* (Vol. X., page 107) occurs a reference to some observations made by Professor J. Jablonowsky, State Entomologist at Budapest, relating to an instance of the display of an habit by bees, under exceptional circumstances, of attacking previously uninjured grape berries, after having for a while exclusively directed attention to such as had their skins already broken.

With respect to the incident now under notice, examples of the common Honey Bee (*Apis mellifera*) and of an indigenous Wasp (*Polistes variabilis*, Fabr.) were submitted as actual grape depredators also, and as causing the injuries that the fruit exhibited and the destructive changes that it had undergone.

The grapes, partially ripened, had been derived from one of the direct bearers, amongst the American types of grape vines, known as the Iona. And not only were the damaged berries, that preponderated, dull brown in colour and more or less outwardly collapsed, but in many instances had been almost wholly deprived of their pulp and juice content, evidently in each case through a more or less conspicuous jagged-edged opening, that occurred upon the exposed face; pips and empty grape skin alone remaining.

These appearances indicated on Plate XVI., that represents a portion of a thus injured bunch, favoured the alleged explanation regarding their origin. On closer examination, however, it was soon perceived that many of the affected berries, distended with their pulp and juice to a normal or even to an excessive degree, merely manifested on their exposed surfaces an area of brown colouration, that was traversed by a more or less gaping skin-fissure, extending almost across them, through which the subjacent tissue was accessible. Others, again, presented merely the bruise-like area of discolouration and a special turgidity, no fissure having as yet arisen, much less surface depression or collapse. It was also remarked that the injury was almost wholly confined to one face of the grape bunch.

A few leaves, still attached to the bunch of grapes conditioned as described, had their borders narrowly occupied by an almost continuous band of reddish-brown discolouration interrupted along its inner edge.

These features, presented by the leaves and fruit, are quite characteristic of sun-scald, a recognised form of injury pertaining to the grape vine, and one that might be expected to have occurred during the present vintage in South Queensland, in consequence of the phenomenally hot, dry windy weather that had been experienced during the few days that had preceded the manifestation of the injury complained of.

The prevalence, moreover, of comparative arid conditions had removed the ordinary source of supply whence bees and wasps derive their usual sustenance, and in this absence of flowers the exposed sweet and juicy pulp of the Iona grape had furnished the food substances they needed.

None of the berries exhibited injuries, such as it might be anticipated would be exclusively occasioned by one or other of the Hymenoptera named. But that these had availed themselves of the gaping fissures in the skins, that had arisen as the result of the changes consequent on sun-scalds to gain access to the pulp of the fruit, and enlarged them whilst exercising their feeding habit, was very evident.

The berries that were already partially deprived of their contents also harboured small flattish beetles, belonging to the genus *Brachypeplus* [Fam. *Nitidularidœ*]—insects that in Queensland attack fruit manifesting the changes attendant on incipient decay. Moreover, on one of the berries of the bunch of grapes illustrated, it was remarked that the surface was densely occupied by small black elevations, the pustules of a tubercularia-like fungus, apparently *Strumella vitis*, McAlp. This in the state represented occurs as a saprophyte.

2. DEMATIUM FUNGUS ROT (Plate XVII.)—This form of Fruit Rot differs from the preceding (that designated Sun-Scald) in the fact that the berries are never fissured, their contents shrinking instead of increasing in volume. It may, moreover, occur on any part of an affected bunch and not on its exposed face only; and, though usually developed to a less degree, may ultimately involve the whole of the berries that constitute it. It is met with upon the grape fruit when this is but two-thirds grown, and at any subsequent period: and the phenomena to which it gives rise vary, in their main features, in correspondence with this early or late development. The Muscat varieties of *Vitis vinifera* are especially susceptible to its attacks; but by no means are exclusively its victims.

An affected bunch of grapes (variety unascertainable), on which the berries were about two-thirds grown, derived—early in December—from a district near Brisbane, presented the following characters. The fruit was damaged in a very uneven manner. Not only did individual grapes arising from the same branchlet of those composing the bunch vary in the degree to which they exhibited its presence, but one might be subject to the rot, whereas the other appeared quite healthy. The diseased berries contrasted with those surrounding them, and which were green and intact, in exhibiting a reddish-brown colouration (that of new leather), and had their surface puckered with conspicuous folds, indicating a shrinkage of their contents. Those berries in which the affection had been longest manifested were already of a deep chocolate hue, and were dried up to a greater or less extent with much wrinkling.

In an instance of its occurrence in one of the Muscat grapes grown on the Darling Downs, and whose fruit more nearly approached ripeness, some of the berries exhibited like appearances, but in the case of others the disease only extended to one face. Here a large brownish or purplish-brown depression occurred with marginal circumferential wrinkles; suggestive of the effects of pressure from the finger-tip on a yielding surface.

Examples of its presence in connection with a variety of grape with purple fruit, named Aramon, derived from the Darling Downs, also, during the first week in February, illustrated the effects on fruit that was fully ripe. In this case in some instances the entire fruitage was affected, in others the berries on one or two of the branches at the "shoulder" of the bunch were still free from attack. In the majority of instances the extremities of the bunches manifested the effects of rot in greater degree than other parts, and appeared to have been earliest infected.

The natural tint of the fruit, generally speaking, masked all colouration changes. Berries most recently affected were soft and yielding to the touch, their contents having apparently lost their normal consistency. This might be especially pronounced on one face, or the entire berry might exhibit these characteristics. At a later stage, the berry had the appearance of a bag of fluid with foldings of the surface immediately beyond the termination of the pedicel to which it was attached. With still further advance of the disease the grape had its surface fully occupied with wrinkles, and was evidently in process of drying, until ultimately small dried-up raisin-coloured objects occurred in the place of luscious fruit. Concurrently with the development of these

Plate XVII.

GRAPE FRUIT ROT.

DEMATIUM FUNGUS ROT.

symptoms of the disease it was observed that the main axis and branches constituting the bunch had already become brown or shrunken, or were in process of undergoing this change. As is shown in the plate illustrating this note, a primary branch on one side of the main axis might be affected in this way, whilst that occurring upon the opposite side was as yet still green and of the usual thickness, indicating in its case a low degree of progress in the development of the malady.

On removing the fruit from a branch in which the disease exhibited this early stage in its history, from an affected bunch, it was observed that there was a brown discolouration with shrinkage of the basal portion of the pedicel of individual berries, or of the ultimate ramification of the branchlet whence this sprang. In this position indeed the disease appears to often originate, and so to readily determine changes in the fruit whose maintenance in a condition of health is dependent on the intactness of its support; these parts of the bunch containing the conduits through which transference of material is effected on which growth and ripening depend.

This form of rot is brought about by the attacks of a definite fungus organism named *Exobasidium vitis*, or *Dematium pullulans*, according to the point of view from which it is regarded; a parasite that is only to be detected externally upon the parts affected by the disease when conditions of humidity and warmth occur to favour its external development.

On the entire dead wood forming the basis of the bunch of grapes it was to be met with in the form of minute white tuffs, densely sprinkled over the surface; also on some of the grapes to a lesser extent. In the case of the latter, however, it was usually restricted in occurrence to depressed areas, and especially to spots where skin injuries were met with. In the first instance described, in which the fruit was but two-thirds grown, the outward manifestation of the organism took the form of small pale-yellow pustules occupying the sites of the granule-like bodies (lenticels) that occur upon the pedicels or stalks of the berries. When the disease attacks varieties of Muscat grapes, in which the fruit is light-coloured, there may be a deep purplish-black discolouration of the surface, due to the presence of the parasite beneath the surface, in its Dematium stage. With these exceptions, the external occurrence of the fungus is revealed only as the outcome of microscopical investigation.

The disease and its parasite were first described as occurring in Australia in 1896 by the Government Vegetable Pathologist of Victoria, D. McAlpine (*Additions to the Fungi on the Vine in Australia*, Aureo Grape-Rot, pp. 16-20, Pl. III.). In Queensland its occurrence was first noticed in December, 1900.

The parasite itself McAlpine named *Aureobasidium vitis*, var. *tuberculatum*, and recently, as he has informed the writer, he regards the latter—that he now agrees with him in assigning it to the genus *Exobasidium*—not as an autonomous organism, but as a stage in the development of *Dematium pullulans*. This conclusion is concurred in, with the suggestion that the so-called tubercular base of the fungus that this authority both describes and figures [*op. cit. p.* 18, and Pl. 3, fig. 10] is assignable to the Dematium condition of the organism.*

In addition to the phases of existence mentioned, and that need not be described on this occasion, the parasite has doubtless a higher condition that still awaits discovery, and which will only be brought to light when the biological history of the organism has been made a subject of investigation.

The inquiry is one, however, to which especial difficulty attaches, since, as has been indicated by the researches of A. N. Berlese, *Dematium* is anærobic,†

* In accepting this view it would seem, however, necessary to regard *Dematium pullulans* as a collective form representing a special state of a number of different fungi, belonging both to the *Sphæriaceæ* and other groups, according to the view held by A. N. Berlese, and having a phase (saccharimycetiform) corresponding to Aureobasidium (Exobasidum) in the course of its development.

† Anærobic organisms are such as not only develop without the presence of oxygen in the medium in which they occur, but also experience an obstacle to their vegetation or even death in consequence of its presence.

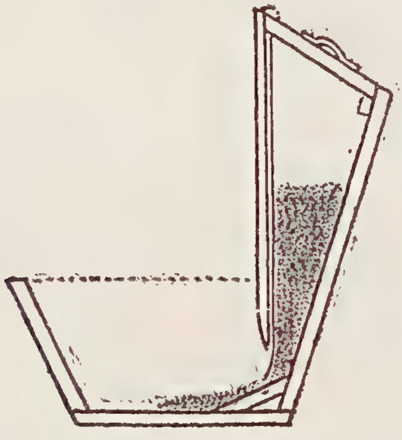
and attempts that have hitherto been made to secure its development under conditions of experiment in different artificial media have not been attended with any positive results. And in this connection it may be mentioned that externally sterilised grapes exhibiting rot disease have been kept by the author for twelve months, with the outcome that their condition at the conclusion of this period has been such as to indicate that the Dematium or resting stage of the fungus will not develop in free air. This apparent occurrence, it may be added, of such striking vital distinctions pertaining to two different phases in the life history of a single organism—afforded by its developing in ordinary air during one stage of its existence and its refusing to do so at another—is a most remarkable incident.

With regard to the means by which the malady becomes communicated from diseased to healthy vines, it may be added that there are grounds, afforded by field observations, for concluding that this may be through the agency of the minute spores that occur so numerously in the Exobasidium stage of the parasite and are found developing on the surface of affected parts. These, it may be added, are oblong and less than $\frac{1}{250}$ inch in length.

In conclusion, it may be added that an organism, apparently identical with the one associated with the grape fruit rot described, has been found by the writer on apricots (Sardinia variety), grown on the same Darling Downs farm that yielded one of the examples of affected grapes described. It is possible, however, that in its case a distinct organism is concerned, indistinguishable in the Exobasidium stage from the one accompanying Grape Rot.

FEED BOX FOR GREEDY HORSES.

For preventing, or at least moderating, the greedy propensities of a horse, and particularly for circumventing the practice of the animal which bolts its food, a device such as is shown in the accompanying diagram may be resorted to. It is easily made, and the cost is trifling. The horse can get only a small mouthful of grain at a time, and is thus induced to chew it thoroughly. At the



back of the box is a receptacle for the grain, which falls in a steady stream into that portion from which the animal feeds. At the bottom of the shute is a bevelled board, upon which the grain falls, passing it well into the feed box in small quantities. The slot at the bottom of the board must not be more than $\frac{1}{4}$-inch in width, and may extend the whole length of the box, or for a less distance if deemed necessary. The grain is poured in at the top of the shute.

Agricultural Patents Accepted.

Filter Press and Process for Grape Sugar.—Classes 23, 24, 25, 30, 31—6217: The Cereal Sugar Company, of No. 828 Gratiot street, St. Louis, Missouri, United States of America (Assignees of William Rilea Long). "Improvements in and relating to Process and Apparatus for Refining Grape Sugar." Dated 17th September, 1901. Instead of refining grape sugar by moistening in a centrifugal, the dry non-pasty crude sugar is cut up by a revolving drum shredder, and re-compacted into suitably shaped cakes by a preliminary pressing in canvas wrappers. These cakes (with the wrappers) are then sandwiched with iron plates in an hydraulic press, each plate having rubber borders to prevent lateral spreading. Under a pressure of 2,500 to 5,000 lb. per square inch, at a temperature of 90 degrees Fahr., the impurities are expressed in a liquid form, and a superior marketable product is obtained in about one-twelfth of the time required for the centrifugal process.

Tonic and Digestive Medicine.—Class 81—6233: Edward Silver, of Horse Creek road, Mount Morgan, Queensland, Australia, miner. "An Improved Medicine for the Treatment of Indigestion and other Diseases of the Stomach." Dated 21st September, 1901. Two ounces of dried leaves of *Prostanthera rotundifolia** are extracted with 12 oz. of boiling water. One ounce of dried bark of *Atherosperma moschatum*† is extracted with 10 oz. of boiling water. Mix 10 oz. of the first infusion with 1 oz. of the second infusion, and with 1 oz. of spirits of wine. The recommended dose is one tablespoonful an hour before each meal.

Maize Husker and Dresser.—Class 29.—(3 Figures).—5739: Robert Gustav Münchow, of Templin, near Boonah, Queensland, farmer and mechanic. "An Improved Corn Sheller, Husker, Winnower, and Bagger." Dated 29th October, 1900. (Drawings, 10s.; specification, 4s.) The corn-cobs are fed into a shoot and fall revolving between a spiked drum and spiked base-plate, where the husking takes place; the base-plate having a hinged spring adjustment provides for the irregularity of the size of the cobs; the crushed cobs and the husked corn fall on to a jigger or shaking table, the corn and dust passes through the upper screen to the lower screen thereof, and the crushed cobs are discharged at the mouth of the jigger from the upper screen, whilst the corn is discharged from the mouth of the jigger from the lower screen, after which it is raised by elevator buckets into a storage receptacle and thence discharged into bags or other desired receiving agent; whilst the corn is falling from the jigger to the elevator the dust is blown away by a fan.

Cotton-seed Plant; Grinder and Carder.—Classes 24, 25, 31, 39.—(5 Figures).—5959: The Cotton Seed Company, Limited, of 37 Old Jewry, London, England (Assignees of John Charles William Stanley, of 8 Drapers' Gardens, London, England, engineer.) "Improvements in or relating to the Treatment of Cotton-seed." Dated 9th April, 1901." (Drawings on application; specification, 22s.) A plant is described for treating cotton-seed, separating the fibre, and reducing the seeds to two grades of meal. After preliminary sifting to remove refuse, the seeds are cracked between rollers, thrashed and screened in shaking sieves three or more times, giving two grades, one of kernels with a little hull and the other hulls with a little kernel, both having some adhering cotton fibre. The kernels are further sifted, and the hulls treated in a special screening carder consisting of two conical peg drums in series revolving against fixed teeth and above fixed screens; in this stage the products are classed in three grades, as (1) nearly clean kernel meal, (2) mixed fragments, and (3) hulls with most of the cotton. The middle grade is recrushed in three-deck rolls, alternated with shaking sieves; the kernels are now nearly all crushed to meal, but with traces of fibre; the hulls are now further ground under millstones, and finally the cotton is all separated by shaking sieves, in the form of balls or rolls of fluff suitable for paper-making or packing. The fine and coarse meals are suitable for oil pressing, cattle foods, and the like. (20 Claims.)

*One of the Mint family found in New South Wales. †The Black Sassafras of New South Wales.—Ed. *Q.A.J.*

General Notes.

SPRAY FOR NOXIOUS WEEDS.

Mr. George Valder, Principal of the Hawkesbury Agricultural College, has been making experiments with arsenite of soda for the purpose of destroying noxious weeds, such as prickly pear, blackberries, &c. He finds that a solution of 1 lb. of the chemical to 8 quarts of cold water to be very effective. The spray will kill every living plant on the ground, and where the spray falls nothing will grow for quite a month. Hence it is greatly to be recommended for garden walks.

THE "LAWTON PROCESS" OF FRUIT-PRESERVING.

A shipment of bananas from Central America and Jamaica by the R.M.S. "Para," the fruit being preserved by the "Lawton Process," turned out most successful, although carried out under exceptionally trying conditions. The success of this process will enable delicate fruit taken almost ripe to be carried from the ends of the earth to London, with safety; still Jamaica has always the advantage of being many days nearer to Great Britain than Australia or India. —*Journal of the Jamaica Agricultural Society.*

REMEDY FOR COLDS, CUTS, BRUISES, SCALDS, &c.

Mr. Gorton gives us a remedy, a sort of universal remedy, for various ailments to which bush people are liable.

To a small bottle of castor oil add a large cake of camphor, breaking the camphor up. It soon dissolves. If used at the first sign of a cold on children or grown-ups, it will stop it. Rub it in well with the hand on the chest and back, between the shoulders, round the throat, and rub a little on the temples and the nose at bedtime.

Although whole families were suffering badly from influenza in the immediate neighbourhood, Mr. Gorton's children never had cold or cough. The remedy is also invaluable for cuts, nail wounds (the camphor seems to kill the poison), bruises, scalds, burns, and last, but certainly not least, rheumatism.

For bites and stings, kerosene is a simple and effective remedy.

RABBITS IN ENGLAND.

Few Australian farmers have any idea of the extent of the rabbit pest in the old country. The Queensland rabbit has not as yet invaded the large farming districts, whatever the hare may have done. In Devonshire it is no uncommon thing to kill 3,000 rabbits on a 250-acre farm in a single year. This means 7,680 on a 640-acre farm. Yet the farmers are prohibited by law from shooting them, and the only means of keeping them down is trapping. On many farms in North Wales, we have seen rabbits in hundreds nibbling at the crops in every field. Ferrets are largely employed to drive them out of their burrows into nets set at the mouth of the burrow, but where the rodents are as numerous as in parts of Devonshire the burrows are so large that the ferrets cannot drive them out. Let us hope that it will be long before the Downs or any other farmers are handicapped in like manner.

TO MAKE A PUPPY IMMUNE TO DISTEMPER.

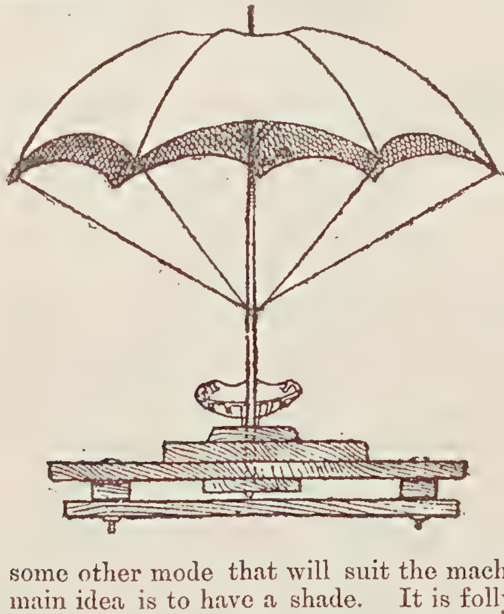
Take from a quarter to a pint of blood, according to the size and age of the dog, from the jugular vein. Tie up the vein by pinning it together and twisting horsehair round the pin. Our informant says that this is infallible.

SHADE FOR THE PLOUGHMAN.

During the late extremely hot weather, the work of ploughing and other work with implements has been very trying to the drivers, and on many days positively dangerous. The only wonder is that scarcely any cases of sunstroke have been reported from the farming districts. With very little trouble a sunshade can be fixed to the driving seat, which will afford thorough protection to the driver, and which can be closed or removed in windy weather. Here is the idea, which we take from *Station, Farm, and Dairy*:—

Buy a large, strong cotton umbrella, having a stout handle without knob or hook at the end. Take a 2 x 4 block about 3 feet long, and bore a hole a little larger in diameter than the handle of the umbrella in the centre of the board, and about two-thirds through. Take a block (2 x 4) 1 foot long, and bore a corresponding hole through its centre, and spike to the first in such a way that the holes will correspond. Take another block somewhat shorter and do likewise with it, thus making a hole 6 inches deep. This is used as a socket for the umbrella handle. By wedging it can be held firmly in place.

The shade is now ready to be mounted on the cultivator. Much depends on the kind of frame the cultivator has as to the mode of attaching it. There is such a variety of cultivators that it would be useless to describe any particular one. In almost every case, however, the machines are put up in such a way that, by taking a 2 x 4 corresponding in length to the longest of the standards, boring ½-inch holes in the end of each, and putting in bolts 6 or 8 inches in length, the device can be securely fastened. Set the standard in the desired position across the frame. Then beneath the frame put the second 2 x 4. Put in the bolts and tighten up the nuts as much as possible. If desired, more than two bolts can be put in; but two will prove sufficient on most machines. Most machines have the seat back of the shade, instead of in front of it, as shown in the illustration:—



There may be some other mode that will suit the machine you are using. If so, use it. The main idea is to have a shade. It is folly to endanger life and health by overheating and sunstroke when a trifling expense and a little work will ensure safety and comfort. The only great difficulty is the wind, but the need of a shade is not great with a good breeze blowing. The umbrella may then be taken down or lowered.

TO KEEP FLYING FOXES FROM FRUIT TREES.

A correspondent advises persons who have only a few trees or vines to wind several turns of worsted round the trees. The foxes will avoid trees so treated. He can give no reason for it, but vouches for its efficacy.

HOW TO CLEAN SAUCEPANS.

Saucepans in which rice, oatmeal, or any sticky substance has been boiled are especially unpleasant to clean. The cook's usual plan is to scrape them with the best silver spoon; hence the condition of silver table and dessert spoons in many houses. Here is an easy plan by which saucepans may be rapidly and effectually cleaned. The moment the pan is emptied, put a cupful of ashes into it, add water and allow it to boil up—the saucepan will be cleaned.

WHEN FENCE POSTS DECAY.

Station, Farm, and Dairy takes the following good idea from the ***Orange Judd Farmer*** :—

In some soils, and with some kinds of stakes, there is a tendency for the stakes to rot off quickly at the surface of the ground. The alternate wetting and drying at that point seem to cause this. Repairs can be made without tearing down the fence in the least. Use a crosspiece at the bottom, and two

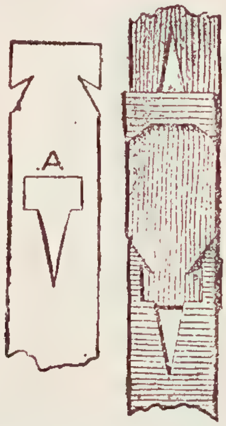
narrow strips for stays, put on as shown in the cut, and the fence will be well supported for many years. A somewhat similar contrivance might be used for making a moveable fence. The post in this case would not go into the ground at all, but the fence would be supported by the broad base.

HOUSEHOLD HINTS—KEROSENE IN THE LAUNDRY.

Many laundresses use kerosene in washing because it not only whitens the linen, but removes stains from it without damaging the material. If any fabric holds ink or fruit stains, soaking it in the oil and then washing in hot suds will usually remove them. When washing clothes, soak them as usual—the fine in one tub, the coarse in another. Wherever fruit stains are found, pour boiling water on the spots. Then, to every bucketful of water put into the boiler next day, add one tablespoonful of pearline and one of kerosene. Stir these in well, and let the water boil before using. The least soiled places in the linen will require no rubbing. While these are boiling the most soiled places in the rest can be rubbed out, using suds from the boiler. After twenty minutes' boiling, take them into the washtub and rinse them twice. The cleanest clothes will require no rubbing at all—indeed very little rubbing, if any, is needed—as by this method the suds soften and whiten the material. Prepare special suds for nice coloured clothes and wash them separately, because the laundering of all coloured pieces must be done as quickly as possible.

WHEN A BUCKLE IS LOST.

The accompanying illustration (from the *American Agriculturist*) shows how to join the ends of the driving reins together when the buckle has been lost. With a pocket-knife cut the end of each rein, as shown at A; then, by slipping the extreme end of each through the tack-shaped opening of the



other, a reasonably firm union is effected. The necessity of always keeping the reins fastened together cannot be too strongly emphasised. If a horse becomes frightened, and one rein is dropped, there is no possible way of recovering it, if it is not fastened to the other.

IMPORTANT TO RICEGROWERS.

The *Tropical Agriculturist*, Ceylon, writes:—*Indian Gardening* publishes a most interesting article, detailing a curious discovery made by Mr. N. G. Mukerjee, M.A., M.A.R.C., Professor of Agriculture, Civil Engineering College, Sibpur, in the cultivation of rice, which should have an important practical bearing on this crop—in Bengal, at any rate. Mr. Mukerjee has, in fact, succeeded in evolving an *aus* paddy with *aman* tendencies, in addition to producing superior varieties of *aus* paddy. It is expected that the discovery will be of material benefit to cultivators, and our contemporary recommends that steps should be taken to make known the discovery far and wide.

A LARGE PIG.

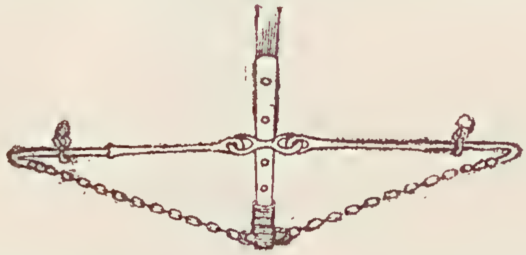
A Jersey red boar was recently slaughtered in the county of Essex, England. It was two and a-half years old, weighed alive 1,610 lb., and killed out, dressed, 1,337 lb. It was 30 inches across the loin, 30 inches across the ham, 72 inches in girth, and 108 inches from tip of snout to end of tail. When split at the shoulders its flesh cut just 3 feet thick from rind to rind outside shoulder blades. The cheeks or jowls were nearly 24 inches wide at top. The face of the monster hog measured only 16¼ inches. From hip bone to toe measurement was 5½ feet, or 66 inches, which gives one the idea of the size of the ham.

TO GET RID OF COCKROACHES.

Mr. E. S. Gorton sends us the following recipe for getting rid of cockroaches, and, as we have ourselves succeeded in ridding the house of all but a few small ones by the same means, we can vouch for its efficacy: Put sixpennyworth of boracic acid in the nooks and corners. Within a couple of months there will not be a cockroach left. Do not expect them to disappear at once or even in a few weeks. Just keep the acid going, and the result is certain. Mr. Gorton says he has never seen a dead cockroach killed by the acid. Neither have we. They simply vanished, all but some small ones, which seem immune to any poison.

BACKING DEVICE FOR HORSES.

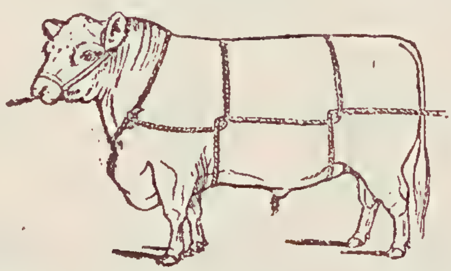
The heavy work horses harnessed beside a pole have to perform in agricultural districts, and particularly where the country is at all hilly, is often harmful to them, because of the strain to which they are put when descending an incline in front of a heavy load. This result can now be obviated by means of an exceedingly simple but none the less effective device known as the "Plywel." It consists merely of two extension bars, pivotally attached to the



forepart of the pole, so that the horses may exert their backing or retarding forces therefrom in the same straight lines as those in which they are enabled to pull straight forward, by reason of the extended splinter bar which is behind them for that purpose. Thus the harmful conditions under which horses are compelled to labour are done away with, and sore withers, sprained tendons, and other serious ailments are the exception rather than the rule.—*Farmer and Stockbreeder.*

HOW TO THROW A BULL.

Put a halter on. Take a sound, ordinary cart rope, make a loop at one end and pass it over the head, and let it rest close around the neck low down like a collar (writes T. McFarlane in the *Farmers' Review*); bring the rope to the near side, pass it over the back just behind the shoulders, bring it underneath the chest, and pass it under and then above the rope so as to make a loop around the chest; carry the rope back, pass it over the loins, and bring it



underneath the belly close to the flanks; make another loop as before, and carry the rope straight behind the animal, tighten up the loops, one close to the elbows, the other close to the hind flanks.

All being ready, instruct the man who holds the halter shank to pull forwards, and at the same time the men who have hold of the loose end of the rope to pull straight backwards, and down the animal goes, generally without a struggle. Keep the head down and the rope firm, and as a rule the animal lies quietly until such time it is desired he should get up, when slacken th rope and up he gets, none the worse for the casting. The heaviest bull may bc cast in this way, but, of course, no one would think of casting an in-calf cow or heifer, either in this or any other way.—*Farmer and Stockbreeder.*

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

SOFT-SHELLED EGGS.

Hen-wife, Nambour—

Question.—Several of my hens—the common barn-door fowls—have lately taken to laying eggs with soft shells. Can you tell me the cause?

Answer.—You are probably feeding them too liberally. Give less food and make them work for it, as recommended in this issue. Feed them on wheat instead of corn. Corn is too fattening. If you don't mind a little trouble, give them half-a-teaspoonful of Epsom salts, dissolved in hot water, twice or three times in ten days. Let them have access to grit of some kind. Pounded glass is good if you have nothing else.

LIME PRESERVATIVE FOR EGGS.

C.A.F.L., Calvert—

Question.—How much lime per gallon of water must be used in making a lime solution for preserving eggs?

Answer.—Four pounds of unslacked lime to 3 gallons of boiling water. Stir the mixture well. Let it stand for two days, then pour the clear lime water into the egg vessel. Keep it well covered from the air in a cool place. Examine the eggs before you put them away, and reject any cracked or stale ones. You may add 1 lb. of salt to the solution, but this is not necessary. If the fresh eggs float, reduce the strength of the mixture by adding cold water to it.

H. C., Clifton—

Question 1.—What is the best depth to plough to get rid of couch grass?

Answer 1.—It all depends upon the nature of the soil On sandy loam where it has got a good hold, the remedy is to plough, harrow, and fork-off again and again in dry weather. On black or brown soil choose dry weather and plough to a depth of 3 inches or deeper if the roots have got down in well-worked land. Leave the upturned roots to wilt in the sun. A good plan is to sow a crop of oats, and when the stubble is ploughed the couch will easily come away before the harrow.

Question 2.—How many pounds of *Paspalum dilatatum* seeds are required to sow an acre?

Answer 2.—We would not advise sowing the seed either broadcast or in drills, as so much *Paspalum* seed is unreliable. Get 1 lb. or so, and raise the plants. Plant these out in damp weather. You can soon divide them again, and put out the divided plants. In this way you are sure of soon getting a large area.

Question 3.—What are the best wheats to grow for hay on light-brown soil?

Answer 3.—Any good wheat with plenty of flag. Belatourka has been grown over 7 feet in height at Lord John Swamp, near Warwick. Some of Farrar's hybrids have a dense flag. Either sow a beardless variety such as Budd's Early or Steinwedel, or, if sowing a long-bearded sort, cut it just before it is in the ear, the beard being harmful to stock. It is, however, a matter difficult to advise on; so much depends on soil, climate, &c. An old experienced farmer says: "Sow any flaggy wheat for hay."

Publications Received.

THE JOURNAL OF AGRICULTURE OF VICTORIA.

We have received the first number of the *Journal of Agriculture of Victoria*, published by direction of the Minister for Agriculture (the Hon. John Morrissey, M.L.A.), and edited by Mr. H. W. Potts, F.C.S., F.L.S. This first issue reflects the greatest credit on all concerned with its production. The articles by the various writers are well and clearly written, and extremely varied and well chosen, so that, as stated in the introduction, "producers with ordinary intelligence and capacity will be enabled to derive benefit from them." The letterpress is clear, whilst the illustrations leave nothing to be desired. We heartily welcome this latest addition to State journalism, and wish it a long and successful career.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY.
	Top Prices.
Peaches, per half gin case	7s.
Plums, per half case	5s. 6d.
Australian Lemons, per case	6s. 6d.
Italian Lemons, per 150	9s.
Apples, per case	12s. 9d.
Oranges, Australian, per case	8s.
Oranges, Italian, per 150	8s.
Mangoes, per case	6s. 6d.
Nectarines, per quarter-case	3s.
Apricots, per quarter-case...	6s. 6d.
Grapes, per lb.	3d.
Pineapples, rough, per dozen	1s. 6d.
Pineapples, smooth-leafed, per dozen	3s. 6d.
Passion fruit, per half gin case	6s.
Pears, per half case	12s.
Persimmons, per case	3s.

AVERAGE TOP PRICES FOR JANUARY.

Article.		January. Top Prices.
		£ s. d.
Bacon	lb.	0 0 $7\frac{3}{10}$
Bran	ton	4 4 0
Butter, First	lb.	0 0 $10\frac{7}{10}$
Butter, Second	"	0 0 $8\frac{2}{5}$
Chaff, Mixed	ton	3 15 0
Chaff, Oaten	"	4 3 0
Chaff, Lucerne	"	3 14 0
Chaff, Wheaten	"	3 10 0
Cheese	lb.	0 0 6
Flour	ton	7 6 0
Hay, Oaten	"	3 10 0
Hay, Lucerne	"	2 14 0
Honey	lb.	0 0 $1\frac{4}{5}$
Rice, Japan (Bond)	ton	14 10 0
Maize	bush.	0 3 0
Oats	"	0 3 $2\frac{1}{5}$
Pollard	ton	5 3 0
Potatoes	"	6 16 0
Potatoes, Sweet	"	2 6 8
Pumpkins	"	3 5 0
Sugar, White	"	21 15 0
Sugar, Yellow	"	18 10 0
Sugar, Ration	"	15 12 0
Wheat	bush.	0 2 11
Onions	cwt.	0 3 6
Hams	lb.	0 0 $9\frac{7}{10}$
Eggs	doz.	0 0 11
Fowls	pair	0 3 $7\frac{1}{5}$
Geese	"	0 5 $7\frac{4}{5}$
Ducks, English	"	0 3 $6\frac{3}{5}$
Ducks, Muscovy	"	0 5 $0\frac{3}{5}$
Turkeys, Hens	"	0 8 11
Turkeys, Gobblers	"	0 17 $9\frac{3}{5}$

ENOGGERA SALES.

Article.	January. Top Prices.
	£ s. d.
Bullocks	8 16 6
Cows	7 3 6
Wethers, Merino	0 13 0
Ewes, Merino	0 10 10
Wethers, C.B.	0 12 $5\frac{1}{2}$
Ewes, C.B.	0 11 11
Lambs	0 10 $0\frac{3}{4}$
Baconers	...
Porkers	1 12 6
Slips	0 15 0

Orchard Notes for March.

By ALBERT H. BENSON.

By the end of February the marketing of deciduous fruits is practically finished in Queensland, as, with the exception of a few varieties of late apples in the Stanthorpe district, and of persimmons in the various parts of the colony, this season is over.

The finish of the deciduous fruits, however, marks the commencement of the citrus season, and these fruits will be ready for handling in the earlier districts of the State during the month. This being the case, I take this opportunity of calling the attention to all citrus-growers to the following very important considerations:—

FIRST: *The necessity for preventing this fruit from being destroyed by pests.*

In addition to the various scale insects attacking citrus trees and citrus fruits, the ripening fruit is liable to be destroyed by insects that either suck the fruit, such as the orange-piercing moths described by Mr. Tryon in the April number of this *Journal* for 1898; or by insects boring into the fruit, such as the yellow pearl moth, sometimes known as the corn moth or borer moth, and the fruit fly. In order to obtain a good crop of marketable citrus fruit, these three pests must be carefully looked after, and every possible means must be taken to keep them in check so as to reduce the damage caused by them as much as possible. The orange-piercing moths can be destroyed in large numbers by the use of poisoned baits consisting of well-ripened Cavendish bananas impregnated with a solution of arsenite of soda, or a soluble arsenical poison, such as the well-known wite-ant exterminators. These poisoned baits should be hung up among the orange trees, and they will attract and destroy large numbers of the moths. Ripe Cavendish bananas, unpoisoned, also act as an attraction to the moths, and they may be caught by means of an ordinary butterfly-net when sucking the fruit at night. The yellow peach moth, the second of these pests, is much more difficult to deal with, as it is not easily attracted or captured. It lays an egg on the skin of the fruit, usually where two fruits touch, or else in the folds of the skin, near the stem—in fact, in positions where it is not likely to be rubbed off. The egg hatches out into a minute caterpillar, which eats its way into the fruit, and increases in size till it is fully an inch long. Green fruits attacked by this insect rapidly turn yellow, and usually fall off, the loss in some instances being considerable, as the pierced fruit is useless, and rots rapidly. There are two remedies—first, the destruction of the young caterpillar as soon as it has hatched from the egg and before it has eaten its way into the fruit, and the second remedy is by the gathering and destruction of all fruits and seeds harbouring either the larvæ or pupæ of the insect. The destruction of the young larvæ or caterpillar is accomplished by spraying the infected trees with Paris green or arsenate of lime, as described in the October number of this *Journal* for 1900, under the article on citrus culture. The arsenical spray must be put on in the finest possible form so as to completely cover all the fruit on the tree, so that when the young caterpillar starts to eat the skin of the fruit, it will eat a minute quantity of arsenic and be poisoned. This remedy has proved very effectual in the treatment of the codling moth which attacks pomaceous fruits, and there is no reason why it should not be equally efficacious in the case of this insect as well. One spraying will not be sufficient, as the moths continue to lay their eggs for a considerable time, so that in districts where this moth is especially destructive to citrous fruits, spraying should be repeated at intervals of not less than three weeks.

The last and by far and away the most destructive insect is the fruit fly. It attacks the orange whilst still quite green, and although the eggs seldom hatch out when laid in the unripe fruit, the injury to the latter caused by the puncture of the ovipositor of the fly tends to a premature ripening of the fruit and to its falling from the tree. Kumquats are especially liable to be attacked by the fly, and often form a very good trap for it, as if the tree is carefully watched and all infested fruit is gathered and destroyed, a large number of larvæ which would otherwise hatch out and destroy a quantity of fruit, would be prevented from so doing. As stated over and over again in these notes and in the articles on fruit culture appearing in this *Journal*, there is no better remedy for the fruit fly than the destruction of infested fruit, and the removal from the citrus orchard of all worthless and unprofitable fruit trees of all kinds which tend to harbour and breed these insects. Systematic and combined effort on the part of all fruitgrowers to carry out these recommendations will do more to keep this pest in check than anything else, and surely the citrus industry alone is worth taking a little trouble to save, as the quality of the fruit is recognised throughout Australia, and, it is to be hoped, will be shortly recognised in the Home markets as well.

SECOND.—The Peacock or Shoobridge case, which was accepted as the standard case at the Brisbane Fruitgrowers' Conference in 1897, and again at the Melbourne Conference in 1900, for all hard fruits, should be the only case used in which to market the fruit; as it is the only case at present in use in Australia in which it is possible to pack every grade of oranges, so as to have the fruit of even size throughout, and to have the case properly filled. Fruit, packed in this case, carried well to Vancouver, and no difficulty was experienced in packing the various sized fruits.

Strawberry planting can be continued during the month on same lines as recommended in the notes for February.

Where new orchards are to be planted, it is fully time to see about the preparation of the land, if this has not already been done, as it is advisable to get the land well sweetened before planting. Old worn-out trees, and inferior trees that it is desirable to do away with, can be taken out during the month, the holes from which they have been taken being left exposed to the action of the air, so as to be thoroughly sweetened by the time a fresh tree is planted in the same place. Keep the soil well worked, and where weeds have got the upper hand during the previous month mow them down, and turn them under with the plough, a plough having a short digging mouldboard being the best for this purpose.

A SEEDLESS WATER-MELON.

The *Chicago American* reports the discovery of a seedless water-melon as a fact. The credit of the discovery, it is said, is due to ex-Senator Swink, of Colarado, who has been working for years, in this great melon centre of the west, on the seedless melon proposition. After working night and day at the problem, he has, it is declared, succeeded. A 20-lb. water-melon grown by him was cut in two, and not a single seed was to be seen. Mr. Swink has not revealed the secret of his discovery, but he is quite satisfied that he can always produce a seedless melon.

Farm and Garden Notes for April.

FARM.—The late maize crop should now all be got in. Land which it is intended to put into wheat must be got ready as soon as possible, and sowings of early wheat may be made this month. Earth up all potatoes sufficiently advanced. Watch the tobacco crop, and gather the leaves as they ripen. Sow lucerne, and keep clean what was sown last month. Sow oats, barley, rye, vetches, early wheat, mangolds, and Swede turnips.

KITCHEN GARDEN.—Transplant cabbages and cauliflowers to the beds, which should have been dug and manured last month in readiness for them. Thin out all crops that are over-crowded. Sow broad beans, peas, onions, radishes, mustard and cress, and vegetables generally. Earth up early celery in dry weather. Be careful that no soil gets between the leaves. Hold them in one hand and fill up with the other. With an occasional filling up, the celery will be ready in about two months.

FLOWER GARDEN.—The garden will now want a thorough overhauling, and digging and trenching must be undertaken vigorously. Keep the weeds down in the beds. Make sowings of a few annuals, as you will find the seedlings come in handy by and by. Prick out into beds or into permanent positions those already growing. Shorten back the growth of shrubs and creepers. Cut out all weak or straggling growth of plants from which much flower is expected. Plant out shrubs of all sorts. Prune and plant out roses. Plant bulbs, marking them with a stick so as not to destroy them when hoeing or digging.

Agriculture.

FIRST STEPS IN AGRICULTURE.

2nd Lesson.

THIRD STAGE.

By A.J.B.

Farming Forest Land.

Much of the best agricultural land is covered more or less with timber of various kinds, mainly gums, ironbark, apple-tree, and box.

Ironbark, however, like stringy bark, prefers stony ridges, which are unsuitable for farming, however valuable they may be for fruit and vine growing. If you take up forest land, it is, of course, with the intention of combining grazing and dairy farming with general agriculture. This means three things. First, a good water supply either from a good creek or permanent water-holes. Second, good grazing and good arable land. Third, good shelter for stock in winter cold or summer heat. Never take up land on hearsay. Go and examine it. If you doubt your own judgment, get some well-qualified judge of country to accompany you.

If, after inspection, you are satisfied with the conditions, it will be well for you to lay out your plans before you start to clear and fence. Choose a site for your house on rising ground and near a water supply. Don't build your hut on the best part of the site, because some day you will want to build a good substantial weather-board, brick, or even stone house. Therefore leave room to do so without having to remove the original buildings until they are replaced by better ones

If the forest timber is of fair size, you will be able to get all your fencing material out of it as you clear. When the trees are far apart on the land selected for cultivation, there is no need to grub out every stump at first. After disposing of the tree, cut the side roots close to the stump. You can then plough close to it without danger. When you have more leisure you can get rid of the stumps either by grubbing or burning them out.

As soon as you have enough fencing stuff, start putting up the fence, first hauling the posts on to the line. There is no need to tell you how to erect the fence and to stretch the wire, as you need only observe what your neighbour has done to avoid mistakes. See that the straining posts are well and deeply strutted. This is a most important matter. As your clearing and fencing should be carried on simultaneously, by the time your first cultivation paddock is ready for the plough it will be fenced in. Then you are ready for the first breaking up. How this is to be done will depend on the nature of the natural grass and herbage. I will give you an example of a serious mistake I once made in the matter of breaking up new land. I had fenced in about 40 acres of a rich, black soil flat. The blady grass was very thick and high, and several acres were covered with a dense growth of ferns. The work was given out on contract at £1 per acre. The contractor employed bullocks. Instead of first mowing down the tall grass or even ploughing shallow, he cut furrows 1 foot wide and 8 inches deep, with the result that the subsequent cross-ploughing and harrowing were useless. The land was merely thrown into huge irregular lumps, and in the end an area of 18 acres cost me over £6 per acre before I put a crop into it. That came of not attending to the work myself. There is a proverb which says, "The eye of the master is worth both his hands." And this is very true. Unless you elect to do the work yourself, you must keep your eye on the man you employ and see that it is properly done, otherwise you will lose money. A good farmer never says, "*Go* and do this or that." He says, "*Come* and do it."

The best plan with new land only shortly grassed is to plough it to a depth of about 3 inches, run the harrows over it, exposing the grass roots to the sun and wind, and then to plough deeper according to whatever crop it is intended to plant. This is a rather difficult matter to advise you on, as soils differ so much in depth and quality that what might be a suitable depth on one farm, or even on one field of the same farm, might not do for the neighbouring land. Some farmers merely, so to say, scratch the soil to a depth of 4 inches, others go to 8 inches. On an average, I think you may take 6 inches as a fair depth for wheat.

If you intend to sow maize, or corn as it is called in Queensland, choose your richest soil and plough to a depth of 7 or 8 inches. Maize roots have been proved to attain a depth of 6 feet.

However, it is not at this stage that I propose to teach you how to plant, sow, cultivate, and harvest your crops. We are dealing now with the preparation of the land for the reception of the seed, and for the present I will assume that the land does not stand in urgent need of draining. Consequently all that we have to consider, now that your land is cleared and fenced and your first house built, is: What are the most indispensable implements required, and what live stock should be bought?

On a scrub farm, as I have already pointed out, you cannot use either horses or horse implements for cultivation. You must depend on manual labour, with axe and hoe. A horse and dray or spring cart, however, will be needed for many purposes, and you may safely make a start at pig-breeding with a boar—a good one—and a couple of sows. It will not be long before you will get plenty of feed for them, even before your first crops are ready, in the shape of thistles and other succulent green feed, and you can buy cheaply some pumpkins and a little dry feed from the neighbours.

On the forest or plain land it is different. Whether you give a contract for the first breaking up, or whether you do it yourself, you will need three or four good, staunch, steady horses, a good beam plough, adding afterwards a sulky and a double furrow or disk plough, a pair of harrows, and a roller which you can make yourself out of a good log. If you sow your first crop of wheat broadcast, you save the expense of a seed drill. At harvest time you will want a reaper and binder which you may buy or hire, and for your maize crops a corn-sheller. Finally, add to these the necessary fencing tools and some carpenter's tools. I take it for granted that, by the time you were ready to start farming for yourself, you have learnt to plough and to use the ordinary farm implements.

Still, a few words on ploughing will not be thrown away, for many men are able to turn a furrow who do do not turn it to the best advantage for the intended crop.

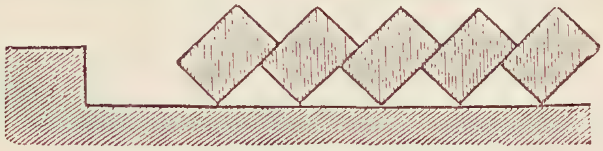
What are the requisites of good ploughing? These are: (*a*) that the furrow slice shall be turned over in such a way as to bury all rubbish, and leave as large a surface as possible exposed to the weather; (*b*) that this surface shall be in such a state as to harrow down with as little labour as possible, without again exposing the rubbish; (*c*) that there shall be as little shine on the bottom of the furrow as possible, so as to prevent the formation of a pan, and to allow the capillary action between the furrow slice and the subsoil to establish itself as quickly as possible; and last, but not least, that as much as possible should be done in a day.

Remember that ploughing should vary according to what it is required for. Suppose you intend to broadcast wheat, your furrow slices must be sharp on the edge, upright, and closely pressed together. On the other hand, if you intend to drill in the seed, let the furrow slice have a broken edge, so that, when harrowing, one stroke of the harrow will make a tilth; it must also be flat, so that when cross-harrowing you will not turn it over, and loosely pressed to avoid shine.

There are various types of furrows. The one most commonly adopted is

THE RECTANGULAR FURROW,

shown in Fig. 1, which gives a cross-section of a field ploughed in this fashion.

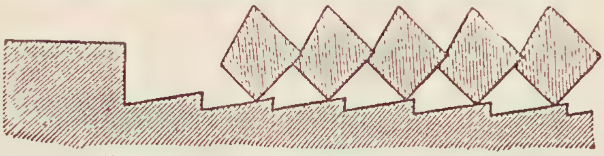


SECTION OF RECTANGULAR FURROW.

Here a fair amount of surface is exposed, the furrows lie compactly, the surface rubbish is well buried, and the soil of the furrow is level, thus allowing the water to run freely from the top to the bottom of the ridge.

Fig. 2 is a cross-section of

THE CRESTED OR TRAPEZOIDAL FURROW,



SECTION OF TRAPEZOIDAL FURROW.

by which a greater surface is exposed than in the preceding type. Hence the soil is more influenced by the weather, and is more easily worked into a seed bed. You will find that on some soils there is a difficulty in making the furrows pack neatly together, consequently the surface rubbish is not well covered. Then there is another objection; and that is, that on the land lying in ridge and furrow the notched soil hinders the water from running freely to the water furrows; also, when cross-ploughing or turning the furrows back subsequently, the ledge left has to be cut, and this makes additional work. Then, again, a raw piece of soil is by this means brought to the top, and this is objectionable because it will not work down well like the rest and tends to spoil the quality of the seed bed. At the same time the crested furrow is far better than a compressed furrow laid flat.

THE BROKEN FURROW.

SECTION OF WIDE BROKEN FURROW.

Fig. 3 gives a section of a wide, broken furrow turned by the digging plough. This is a very suitable form of furrow for most purposes, especially on light soils where it is desirable to consolidate the seed bed. For wheat, for instance, it is desirable to consolidate the seed bed. The digging plough is far superior to the common plough in this respect, as the action of the digging breast is to loosen and disintegrate the particles of soil, and so produce a kindly tilth easily affected by frost, sun, and rain.

I need not tell you that thousands of acres are ploughed each season which do not give the best results, for the simple reason that the furrows have not been properly turned. You will often see a farmer turning his furrows in such a way that they stand nearly upright; and if you watch him at work, you will see him every now and then dab his foot at a clod falling back into the furrow after the ploughshare has passed. This gives him much extra labour. Besides this, the top of the sod will not decay, but keep on growing, and the grass and weeds will shoot up between the furrows, which causes trouble in after cultivation.

When ploughing an old soil, which was planted in the previous season, do not make the furrows too wide. The old ground is crumbly, and the slice will not lie over bodily, but will roll about, and, if wide furrows are taken, some of the soil will not be moved at all.

As to the plough you buy, be careful to remember that very much depends on the make of the mould-board whether you do good or bad work. If you decide on some particular make, first go and see it at work somewhere—see two or three at work, and, if they turn a neat furrow, then buy.

In ploughing very hard land, you will find the plough will go much more easily if the draught chain is lengthened 3 or 4 feet.

In first ploughing, set the skim coulter so that it will just clear the grass, and, when coming back after drawing the first furrow on the ridge, set the coulter deep enough to bury the grass.

When you reach the end of a furrow, do not lift the plough to the next piece, but bear down on the handles. This raises the plough, and it will turn over to the right, balanced on the large wheel. Then it will be drawn towards the next piece.

Now, a word about

HARROWING.

If ploughed land has been unavoidably left to cake and harden, the harrows will make good work on the first occasion if used across the furrows, but it is invariably better to use the harrows both up and across the field. Never harrow in wet weather, because if the land dries quickly it will set hard. What you want to do is to make a fine tilth—that is, to cover the surface with a blanket of loose earth, thick enough to exclude free air, and to prevent the escape of too much moisture at the surface.

The roller is a very necessary implement which you can easily make for yourself out of a sound, evenly-rounded ironbark or gum log. It crushes coarse clods; it packs together the top soil, and gives a smooth, even surface. But, as in ploughing and harrowing, do not roll in wet weather.

BENEFITS OF ROLLING.

The importance of this work is well recognised by the best farmers, especially in the drier inland areas. The effects of the roller are to promote the growth of the crops and to facilitate harvesting operations. In regard to the effect upon the crop of pressing the soil about the stems and roots of the plants, all who are familiar with gardening work know the need of such treatment. The plant cannot grow if the soil does not support it in a fixed position, while the effects of alternating rainy and dry weather are to draw the soil away and to destroy that close relation between soil and plant which is necessary for the process of vegetation. The roller counteracts this loosening effect and restores the required close contact between soil and stem and between soil and roots. This is especially important for the wheat crop, which requires a firm seed bed. The harrowing of the growing crops, or, even better, horse hoeing after the drill, in order to keep the surface from setting and cracking, is work for a later date, the want of the young plant at present being to get well rooted in a firm soil. The young crops are in special need of the treatment. The soil on drying becomes loose and porous. The result is that the soil, which, when wet, lies close to the roots, shrinks in parting with its moisture, leaving the stems and roots bare in places, the whole mass being honeycombed with air holes. Afterwards the soil crumbles down, and to some extent remedies the evil, but damage is sustained by the plants in the meantime. Under such conditions the roller is of special value. Then there are the advantages of rolling as facilitating harvest work. The damaging effect of rough, cloddy ground upon expensive harvesting machinery is a real and unnecessary loss to the farmer, while the waste of grain is also very great, the loss being greater in proportion to the thinness or shortness of the crop. During recent dry seasons it was only upon level ground that some crops could be gathered at all. Those who attend to rolling in time will give the young growing crops the assistance immediately required, leaving the soil in good condition for aerating operations later on and removing many difficulties out of the way of harvesting operations.

I do not propose to describe all manners of ploughs, harrows, cultivators, seed drills, mowers, reapers and binders or other farm implements, because you can find out all about them in catalogues issued by the best implement makers, which give full directions how to use and how to take care of them.

Questions on Lesson 2.

1. In what does the farming of scrub land differ from that of forest or plain land?
2. What are the points to be particularly attended to in selecting a farm in slightly wooded or open country?
3. What is meant by the proverb: "The eye of the master is worth both his hands"?
4. To what average depth would you plough for a wheat crop? For a maize crop?
5. What implements and stock are absolutely necessary when starting a farm on any but scrub land?
6. What are the requisites of good ploughing?
7. Name and describe three types of furrow.
8. What points should be observed in harrowing and rolling?

3rd Lesson.

THIRD STAGE.

Let us now suppose that you have made a fair start, that your land is well ploughed and harrowed to a good tilth. If the land is ready by April or May, you will, if in a wheat district, sow a breadth of wheat, and will have to buy the seed. The selection of seed is a most important matter—in fact, you may consider it *the most important* operation in growing wheat. Some people suppose that if wheat is grown continuously on the same soil it will deteriorate. Nothing of the kind. It has been proved by experiments that varieties of wheat seed do not thus degenerate. When buying seed for your first crop get it from a neighbouring farmer, but see that you select a careful man, who grows selected seed in the most scientific manner. Go, if possible, to one of the State farms, where the raising of seed for distribution amongst farmers is made a business of, and you may be sure of getting seed of the best quality.

When you begin to grow your own wheat for seed, study the methods adopted on the experimental farms, and you cannot go wrong. In a general way, proceed in this manner: Sow the seed on a specially prepared plat of, say, 1 acre, more or less, according to the size of your farm and the quantity of land you propose to put under wheat. Plough the plat early. Get it into the best possible condition, and keep it in a high state of fertility. When the wheat is in ear, go through the field and pick out and mark plants which show the qualities it is desirable to perpetuate. Choose those that are well stooled and whose heads are filled with plump grain. The straw should stand up well, and as much as possible be free from rust. When the wheat is ripe, cut these marked plants with a sickle, and thresh them out separately. Then carefully screen the seed, pick it over by hand, and save only the largest and plumpest grain for sowing. Next season sow the seed thus saved at the rate of 1½ bushels per acre. Do the same every year, and you will find that the wheat, so far from degenerating, will improve. At the same time you will do well to locate your seed plat on a different part of the farm every year.

Before sowing for a crop, the wheat seed must be treated in a certain manner for the prevention of SMUT. Do you know what smut is? It is a disease which, if it attacks your wheat, will often cause the loss of half the crop. It is easily recognised. By the way, never buy seed wheat from a smutted crop, nor even from a district where smut is prevalent. Smut is a fungoid disease. It attacks wheat, oats, barley, rye, and many grasses. If you examine wheat in some fields when it is in ear, you will see the ears covered with a dark powder. On looking closer, you will observe that the floral organs and their coverings are destroyed, and in their place is a mass of dark, chocolate-coloured powder. This powder is a mass of small SPORES. What is a *spore?* A spore is a very minute particle which takes the place of the seed in flowerless plants. If you look at the back of a fern-leaf you will see spore cases full of spores, which by and by fall to the ground, and in damp weather reproduce themselves by millions. Such are the spores of smut. Now, before harvest time, these blow away and many settle on the healthy ears and remain there till seed time, when the disease again appears. BUNT is another fungoid disease which attacks wheat. It differs somewhat from smut, for which it is often mistaken. The effects are not seen till harvest time, and then, if you open up an apparently healthy ear of wheat, you find that it contains nothing but a greasy, evil-smelling mass of black spores. If you mix bunted grain with healthy grain, the effect is that the whole is blackened and only saleable at a very low price.

Now the spores of smut or bunt remain on the wheat after it is threshed, and, unless you take precautions, they will be sown with it, and your crop will certainly be smutted or bunted. There are at least two methods adopted whereby the smut spore is killed.

One way is to pickle the seed it is intended to sow in a solution of sulphate of copper. Mix a solution at the rate of 1 lb. of sulphate of copper in 1 gallon of water. This will steep 4 bushels of wheat. You may either put the wheat in a gunny bag and dip the bag into the solution, and then allow it to drain, or you may spread the grain out on a smooth floor and pour the solution over it, turning it over once or twice with a shovel, but this is a wasteful way. Some farmers pickle their seed wheat a month or six weeks before sowing, so as to let the "bluestone" (as sulphate of copper is called) become thoroughly dry, and to give it time to kill the spores of smut before the wheat is sown. The copper forms a film on the seed, and effectually destroys the spores which may be clinging to it without injuring the wheat.

Another method is by HOT-WATER TREATMENT. Take two washtubs and a basket, or, as before, a gunny-bag. Fill the latter three parts full of wheat; then half fill one of the tubs with cold water, and boil an equal quantity, which you then add to the cold water. This will bring the temperature of the water to about from 130 to 132½ degrees Fahrenheit, which latter is the proper temperature. Into this plunge the basket of seed and keep it there for a quarter of an hour, lifting and lowering it several times meanwhile. You will do well to have a thermometer to test the heat of the water, as you must not allow it to go lower than 130 degrees nor higher than 135 degrees Fahrenheit. If it gets below 130 degrees, add boiling water. At the end of 15 minutes remove the basket, let it drain, spread the seed out on the barn floor, and either sow it at once or allow it to thoroughly dry if you are not quite ready for it.

In sowing broadcast, 1 bushel to the acre is more than sufficient. If you use a seed drill, 20 lb. of seed is ample. Most farmers sow too much seed. Take the instance of 1 bushel to the acre. Fair average seed will average 800 grains and good plump seed 700 grains to the oz., so that a bushel of 60 lb. contains 750,000 grains. In a square acre there are 4,840 yards, or 43,560 square feet. So you see that a bushel to the acre means from fifteen to eighteen seeds to the square foot. Let us say that one-quarter of this fails to germinate, being partly eaten by birds, partly insufficiently covered ; still we have from twelve to fourteen plants per square foot—that is, just twice as many as there should be. A seed drill is generally constructed to sow from 35 lb. to 40 lb. per acre, and, since the seed is all properly covered, there will be nearly as many plants per acre as with a bushel sown broadcast.

What is the consequence of this crowding of the plants? They have to fight each other for moisture and plant food, and thus become stunted and do not stool out properly. Far better to drill in only 20 lb. of seed.

When harrowing, harrow crosswise to the direction in which the land was ploughed. The work will be more effective, and it will be better for the crop. Rolling the wheat, even when it is over 1 foot high, is also productive of good. I know of a case where a field of oats was attacked by the wire worm, and to stop their underground working the crop was rolled—at least, half of it was, because wet weather came on and stopped the work. The oats were 6 inches high when rolled. Just four weeks before the harvest the value of the rolling was proved. Heavy downpours of rain smashed down the oats where no rolling had been done, but on the rolled half not a straw went down. It was the same with wheat rolled when it was 8 inches high. The rolling prevents "lodging" by consolidating the soil, and thus, by decreasing its power to supply overmuch nitrogen to the plants, results in the production of a less luxuriant plant, with roots which have a firm hold on the consolidated soil. In this way the danger of lodging is avoided.

Should the great enemy of wheat—rust—make its appearance, do not be in too great a hurry to cut it all for hay, as you might be sacrificing a really good grain crop. If it goes too far, then cut it, for it will pay as hay, whereas it would be worth nothing for grain.

The time to sow wheat in the Southern part of this State is from April to June. Further North, March is considered a good time to sow.

Remember that wheats vary greatly in their adaptation to different soils and climates, so watch what successful growers in your neighbourhood are doing, and also make experiments for yourself. Neither sow too early nor too late; but, if you find it necessary to sow early, sow thin; if late, sow thicker.

I will now give you an estimate of what it will cost you to grow an acre of wheat, and will begin by reckoning the interest on the cost of your farm at 10s. per acre. Then we have the following calculation:—

Dr.

Interest (or rent)	£0	10	0
First ploughing	0	4	0
Second ploughing	0	3	0
First harrowing	0	0	9
Drilling	0	1	0
Second harrowing	0	0	9
Rolling	0	0	9
Reaping and binding	0	8	0
Stooking	0	1	0
Stacking	0	3	0
Threshing	0	5	6
Carting to market	0	1	8
Bags	0	2	6
Seed	0	4	0
Balance	1	4	1
	£3	10	0

Cr.

Value of wheat—20 bushels at 3s. per bushel	£3	0	0
Value of straw	0	5	0
Value of chickwheat	0	5	0
	£3	10	0

Thus you see that the net profit on an acre of wheat, at 3s. per bushel, is £1 4s. 1d., and wheat sold this year—1902—at 2s. 7d. and up to 3s. 2½d. per bushel. Consequently you will have to grow other crops, and add pig-rearing, dairying, and poultry-raising to the wheat business. You cannot reckon on an average crop of 20 bushels. Dry weather at the outset, frost, rust, bunt, smut, caterpillars, and other pests may bring the return so low that your wheat is produced at a dead loss. Never put all the eggs in one basket. Grow different crops; then, if one fails, the others may help to prevent loss. One of the farmer's best standbys is lucerne. Get in a crop as soon as possible. It is a crop which will stand a long spell of dry weather, owing to its habit of deep-rooting. You can cut it at least six times a year, and your lucerne stacks will carry you through a dry season, winter or summer, so far as your cattle are concerned.

I shall not now give you directions how to sow the various farm crops. You will learn much from watching what your neighbours do, and there are numerous publications devoted to agriculture which will help to enlighten you, so the next lesson will be on the subject of drainage. You may possibly not require to drain. Many farmers are so situated and have such an open subsoil that drainage is not wanted, at least as regards the drawing off of superfluous water. But I think I have already shown you that drains act beneficially on the soil, even although little water ever passes through them. At all events, every good farmer should know how to drain his land; therefore I will deal with the subject.

Questions on Lesson 3.

1. State what you know about seed wheat.
2. How would you proceed to grow your own seed wheat?
3. What is smut—bunt—a spore?
4. How can you distinguish smut from bunt?
5. How can you destroy the spores of bunt and smut adhering to seed wheat?
6. Describe two methods of doing so.
7. How much seed would you sow per acre—(*a*) broadcast, (*b*) drilled?
8. What effect has rolling upon a young wheat crop?
9. In what months should wheat be sown?
10. When should you sow thick—when thin?
11. What is the total cost of sowing, harvesting, and marketing an acre of wheat?
12. With a 20-bushel crop at 3s. per bushel, what net profit should you make?
13. What conclusion do you arrive at from this estimate?

4TH LESSON.

THIRD STAGE.

The fertility of the soil is lessened through several causes, amongst which may be mentioned drainage, growth and removal of crops, and the washing away of the surface soil, especially on hillsides. There are also some artificial fertilisers which operate in reducing the fertility of the soil by converting certain insoluble constituents into soluble ones. For instance, muriate of potash has been shown by experiments made in America to convert the insoluble lime compounds of the soil into a very soluble form, which readily passes into the drainage water. Gypsum and salt applied to the soil are said to set free the potash and other fertilising constituents of the soil, thus rendering them more available to plants, but at the same time more likely to be washed out and lost in the drainage water. Thousands of experiments are made at the experiment stations of the United States of America in order to find out the effects of the application of fertilisers to the soil. In one of these* we read: "Whilst these all are possible sources of loss, it is probably safe to say that under ordinary conditions the chances of loss, of appreciable amounts of lime, potash, or phosphoric acid in the drainage water of soils are very small." This conclusion is confirmed by numerous chemical examinations of drainage water which have been made at experiment stations and similar institutions in the United States and elsewhere.

* Farmers' Bulletin No. 73. U.S. Department of Agriculture.

As regards the loss of the important and expensive fertilising constituent, nitrogen, however, the case is very different. The soil appears to have very little affinity for the forms of this element so extensively used in fertilisers—nitrate of soda and sulphate of ammonia—and if they are not quickly taken up by the cro they are likely to be lost in the drainage water. Moreover, the insoluble nitrogen of the soil (in humus), or that applied in the form of cotton-seed meal, dried fish, &c., which are also largely soluble when applied, is rapidly converted by the process of "NITRIFICATION" under favourable conditions into nitrates, which are readily available to plants, but which pass out in the drainage, and are lost if not promptly taken up by the plant.

Experiments have been reported in which the loss of nitrogen in the drainage from a bare soil in the course of a year was over 160 lb. per acre, while the loss from a soil which was kept covered by a crop was almost insignificant, although fully as large amounts of nitrates were formed in the latter case as in the former. This affords a striking illustration of the importance of keeping a LEACHY soil covered with a crop in order to prevent serious loss of the most expensive element of fertility—nitrogen. Such a practice would protect the soil from both LEACHING and surface washing—probably the two most serious causes of decline of fertility of soils.

The terms "NITRIFICATION" and "LEACHING" require now to be explained. The word NITRIFICATION simply means providing the nitrogen required by plants in a form immediately available as plant food. Thus, sulphate of ammonia and nitrate of soda are rich in nitrogen, and they contain it in a soluble form, so that it can be readily taken up by the plant. In some combinations the nitrogen is not so readily available, and a process of OXIDATION is necessary to cause the materials containing the nitrogen to decompose and so release the nitrogen and make it available for the plant's use.

Our air is made up, as you know, of nitrogen and oxygen, and the nitrogen in the air is a free gas. Some of this free nitrogen is changed into AMMONIA GAS in the air, and is brought down to the earth in the rain. But plants cannot make use of this free nitrogen through their leaves or roots, although some plants, notably those of the pea family (legumes) do manage to get more nitrogen than can be accounted for on analysing the soil. They are found, as you will remember, to have little nodules attached to their roots. These nodules contain a tiny microscopic plant which is able to seize upon the nitrogen of the air which has passed into the soil with the rain, and so act upon it that it changes into a form which the plant can take up as food, thus NITRIFYING the soil.

Let me give you an example of nitrification. Away in the far West of Queensland, a gardener was employed on a station to raise fruit and vegetables. This gardener happened to be a man of great observation, with a large experience of his profession. On one occasion he had the idea that the old garden was getting "played out" for certain crops, so he chose a new site, and soon discovered that one deficient element in the soil was nitrogen. How to supply this necessary ingredient was the puzzle. He was 180 miles from a railway station and 350 miles from any large town where it could be obtained in any form. Suddenly it struck him that on a portion of the old garden beans had been grown frequently in succession. You will remember that I told you that beans, peas, and some other legumes collect nitrogen from the air and supply it to the soil. So he carted a quantity of the soil from this part of the old garden and dressed a crop of Chinaman's beans with it, leaving, however, one row undressed. When the crop was gathered he found that the dressed portion yielded 25 per cent. more than the undressed, and, moreover, the beans flowered and came to maturity four weeks sooner. Thus he had *nitrified* the soil. LEACHING is the washing out of plant food from the soil by heavy rain or by drainage.

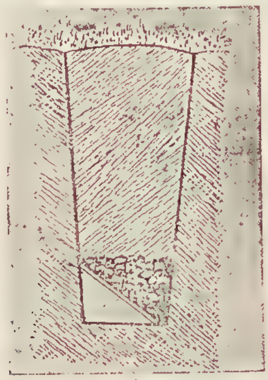
So much for theory—now for practice. I will suppose that your farm requires draining in some parts owing to the retention of stagnant water. This stagnant water has to be got rid of before the low-lying land will yield good crops. Let us take the simplest form of drain first.

The Open Drain.

Open drains answer two purposes, in that they rapidly carry off the surface water, and that they intercept seepage water from the higher land. The size and depth of open drains must depend upon the quantity of water they have to carry off. If the quantity is small, the cheapest way is to run a furrow with a plough and throw out the loose soil from the furrow with a long-handled shovel.

Underground Drains.

These may be made of various materials. The best and one which will last for twenty years is made of slabs and saplings. Dig a drain 3 feet deep ending in a width of 6 inches. Then split and dress a lot of slabs 6 feet long and 10 inches wide. Let one edge of the slab rest edgeways on the bottom of the drain on the left-hand side, and allow it to fall over and lean against the right-hand side, as shown in Fig. 1. When all the slabs have been laid closely



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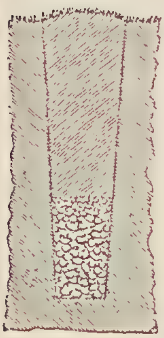
shoulder to shoulder for the whole length of the drain, lay timber or stones at the back of the slabs, cover all with a layer of grass, and then fill up with clay first and then soil. The cost of such a drain is about 5s. per chain (22 yards). A very effective form of drain is one which I made some years ago. I called it the

Burnt Earth Drain.

The drain was dug to a depth of 4 feet. Then it was half-filled with dry brushwood, over which the clay was well rammed. The brushwood was then fired at one end, and in burning out baked the bottom, sides, and roof into a kind of brick.

Stone and log and slab drains are valuable to the selector, owing to their cheapness. Their construction will be better understood by the diagrams than by description.



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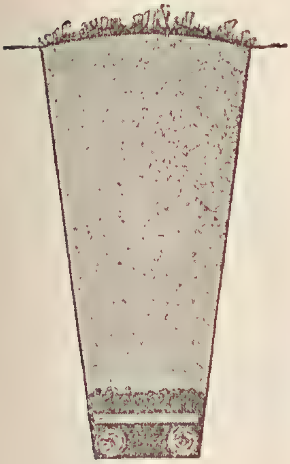

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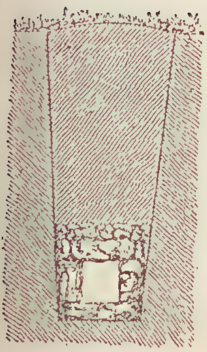

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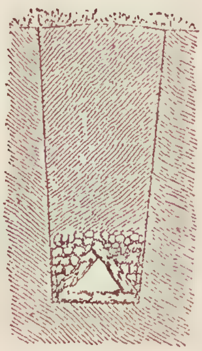

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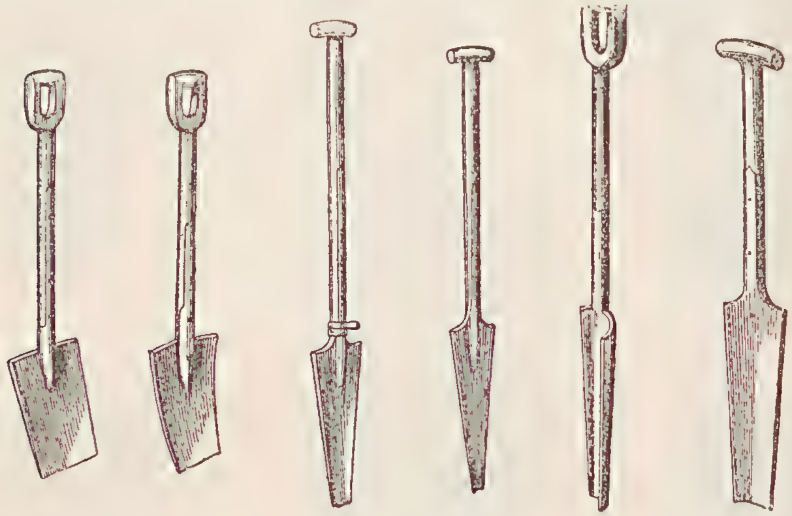
Tile Drainage.

The cost of digging drains, whether you reckon your own time or the wages paid to the hired man or contractor, is a very large item in the operation of draining. Hence it is that tile draining is really less costly than any other style, the cost of the tiles being compensated for by the difference in the cost of digging the drains.

The limit of efficient drainage in any soil is 4 feet deep and the drains 30 feet apart, for if they are placed further apart there will be some land beyond the influence of the drain which is consequently undrained. As a rule, they should be 3 feet deep and from 18 to 20 feet apart. Now about the size of the tiles: 2 inches in diameter is the smallest size that should be used under any conditions for lateral drains, and when they are of any length, say over 100 yards, 3-inch tiles should be used, and for open soils 4-inch tiles are not too large. The size of tile for the main drain will depend upon the area to be drained, and will run to 4, 6, or 8 inches in diameter.

HOW TO DIG THE DRAINS.

There are several special tools used for tile drainage, the spades, as you can see by the illustrations, being of such a width and shape that they will not take out more than is absolutely necessary, and they are often rounded so as to hold the earth better. Such are Figs. 1 and 2. The bottoming tools (3, 4, 5,



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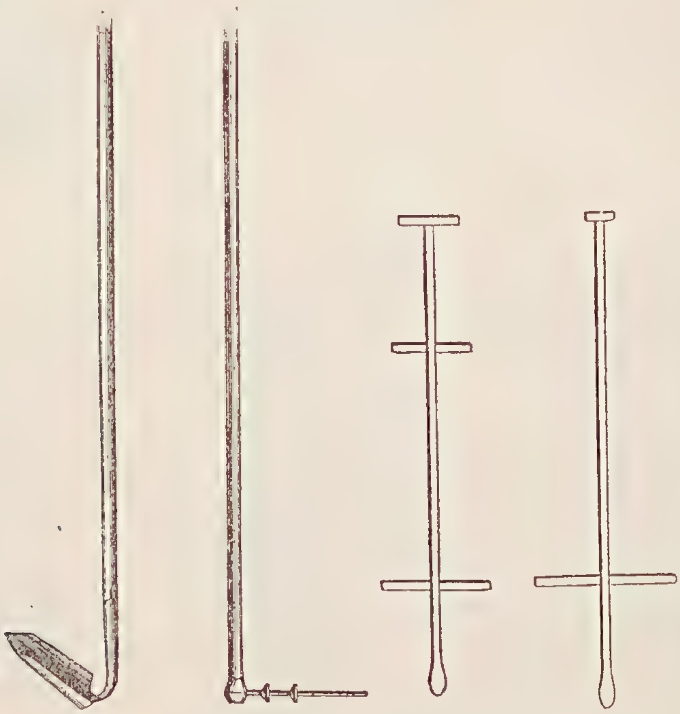
and 6), which are either straight or rounded, preferably the latter, are used for taking out the bottom spit of 10 to 15 inches, according to the soil, and are made of various widths to suit the size of tile to be used.



7 8 9 10

There is a special tool called a bottom-smoother (Fig. 7) for clearing out and preparing the bottom of the drain to receive the tile, and another (Fig. 8) is used for laying the tiles. Figs. 9 and 10 are for regulating the depth and width of the drain.

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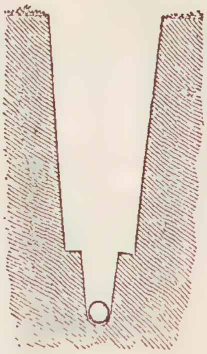

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In Fig. 11 you have a draining-pipe, and Fig. 12 shows a section of the drain and the pipe lying in it. There is no absolute necessity to fit the tiles closely end to end, but they should always be laid even. Grass and rubble may be placed on top of the tiles before the earth is filled in. The total cost of tile drainage where carriage by rail or water is available is about 8s. per chain for tiles and 3s. 6d. per chain for digging, laying, and filling in. On the whole, tile-draining costs about £5 per acre.

There is so much more to be said about drainage that it cannot be condensed into this single lesson, so we will take a month's holiday and resume the subject in the next lesson.

Questions on Lesson 4.

1. What valuable soil constituents may be lost by drainage?
2. Why should a leachy soil be covered with a crop?
3. What is meant by the term "nitrification"?
4. How does the open drain differ from the underground drain?
5. Describe the construction of the slab, stone, burnt earth, and tile drains?
6. What is the limit of efficient drainage in any soil? What is the general rule?
7. What size of tiles (diameter) should be used for lateral drains—(*a*) in stiff soils, (*b*) in open soils?
8. What should be the diameter of tiles for the main drains?
9. How should tiles be laid?
10. What is the average cost of tile draining—(*a*) per chain, (*b*) per acre?

Mr. J. W. Cartwright, Herbert River, has written to me on the subject of irrigation, of which I wrote in your 9th Lesson. I, of course, took Professor Storer's figures as correct. I am much obliged to Mr. Cartwright for his correction, as I wish the lessons to be correct in every particular. This is what he says:—

In the *Agricultural Journal* for January, page 7, "First Steps in Agriculture," Lesson 9, 2nd Stage, it is printed that "Professor Storer says [*re* irrigation] that [to give a hayfield a proper drenching] an amount of water is used which, if it were spread out evenly, would form a layer 4 inches deep over the field, and that for 4 acres 86,400 cubic feet are run over the land in twenty-four hours." If it is intended to convey the idea that a layer of water 4 inches deep over 4 acres contains 86,400 cubic feet, surely it is misleading. Is it not nearer 58,080 cubic feet? which, at 6·232 gallons per cubic foot, would give about 361,954 gallons; this, repeated twelve times, 4,343,448 gallons. The whole calculation, as it appears in the *Journal*, is spoilt by omitting two figures. One other point: In the *Agricultural Journal* for February, 1901, the number of gallons contained in 1 inch of water over an acre was said to be 27,154. In January, this year, the number of gallons is put down at 22,617; and, although it was explained in a subsequent number that the measure used in the February, 1901, calculation was Hawaiian, many did not notice it, and are no doubt getting confused. Might I suggest that, in treating this subject (irrigation)—an ever-increasing important one—one measure, and one only, be used in all calculations in the *Agricultural Journal.*

MAIZE-PLANTING EXTRAORDINARY.

Station, Farm, and Garden says that the following curious story is told of a feat in maize-planting:—A farmer sent a man out with the planter to plant a big field of maize last spring. The farmer supposed that the man knew how to operate the machine, and he did in a way. About the time he had the field planted the farmer went out to see it, and discovered that the man had set the machine so that all the seed was planted from 4 to 5 inches deep. Then the farmer lifted up his voice and apostrophised this farm hand in a most eloquent agricultural way. A third of the maize never showed above ground, and what did had a hard pull to get through. The crop was cared for, however, and then came the drought, and the maize fields with a good stand and properly planted little by little gave up the ghost, and became an acreage of seared fodder, while the hired man's field, with its thin stand and deep-rooted maize, showed up green and luxuriant, and will make a crop of 40 bushels per acre.

[There is nothing so very extraordinary about this. In the olden days of scrub farming in Queensland, when maize was planted in holes made with a hoe, we have seen whole acres planted as deep as the hoe would go, and splendid crops resulted. Certainly the soil was a mass of decayed vegetable matter. Last month we read in one of the Northern papers that a farmer sowed his wheat at a depth of 4 inches and got a 40-bushel per acre crop. There are no rules without exceptions evidently. About a month ago we buried some cotton seed quite 6 inches under ground. To-day it is growing vigorously, ready to be turned under.—Ed. *Q.A.J.*]

A BLOCK OF GRAIN.

Whilst it is doubtless very annoying to graziers, farmers, merchants, and others who send quantities of their produce by rail to the seaport towns of this State, when they find that there are not sufficient railway trucks to be obtained on demand, yet they really have very little to complain of in comparison with their cousins in Manitoba. There was a block of grain there last month, and, in all the North-western Territories of the Canadian Dominion, all the railway storage elevators were filled, and also the grain-buyers' elevators, and this, together with a shortage of cars, caused a serious condition of affairs. The farmers were storing wheat at every available spot, and were piling it about the stations. Not half the crop had been marketed. How would our farmers like to be compelled to store their wheat at the small wayside railway station with not even a tarpaulin over the bags? In California thousands of bags of wheat are left out in the open fields till the light railway comes along to remove it. Whatever cause of complaint farmers may sometimes have, they have never yet had to dump their produce down at a wayside station and leave it for more than a day and a night on an emergency.

THE BREEDER'S TABLE FOR 1902.

"I wonder when I set that hen." "I wonder when that mare will throw her foal." How often does one hear such a wonder expressed by careless farmers and stockowners who take no note of any event on the farm, trusting that things are bound to come out right in the long run?

Now, we propose to give every month during this year a table which only requires a couple of minutes' writing, and lo! everything connected with the breeding times of stock and the arrival of the progeny is faithfully recorded. We take the idea from the "Live Stock Journal Almanac," London, and we advise our readers not to cut it out of the *Journal*, but to make their records in it as it stands. It is then not likely to get lost. In this issue we print the tables for April and May, and shall continue them for each succeeding year in the hope that they will be of some service in enabling farmers and others to ascertain with some degree of certainty when the various kinds of new arrivals are due—accidents, of course, excepted.

BREEDER'S TABLE FOR APRIL, 1902—30 Days.

Day of Month.	Name of Animal, Hen, &c.	Date on which an Animal served or an Egg set on any day of the present Month is due to give Birth or Hatch.										Remarks.
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit 30 days.	Turkey, Duck, Peafowl, 28 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.	
		Mar.	Jan.	Aug.	July.	June.	May.	April.	April.	April.	April.	
1	...	2	6	27	21	2	1	29	22	19	14	
2	...	3	7	28	22	3	2	30	23	20	15	
								May.				
3	...	4	8	29	23	4	3	1	24	21	16	
4	...	5	9	30	24	5	4	2	25	22	17	
5	...	6	10	31	25	6	5	3	26	23	18	
				Sept.								
6	...	7	11	1	26	7	6	4	27	24	19	
7	...	8	12	2	27	8	7	5	28	25	20	
8	...	9	13	3	28	9	8	6	29	26	21	
9	...	10	14	4	29	10	9	7	30	27	22	
									May.			
		11	15	5	30	11	10	8	1	28	23	
10	...	12	16	6	31	12	11	9	2	29	24	
11	...				Aug.							
12	...	13	17	7	1	13	12	10	3	30	25	
										May.		
13	...	14	18	8	2	14	13	11	4	1	26	
14	...	15	19	9	3	15	14	12	5	2	27	
15	...	16	20	10	4	16	15	13	6	3	28	
16	...	17	21	11	5	17	16	14	7	4	29	
17	...	18	22	12	6	18	17	15	8	5	30	
											May.	
18	...	19	23	13	7	19	18	16	9	6	1	
19	...	20	24	14	8	20	19	17	10	7	2	
20	...	21	25	15	9	21	20	18	11	8	3	
21	...	22	26	16	10	22	21	19	12	9	4	
22	...	23	27	17	11	23	22	20	13	10	5	
23	...	24	28	18	12	24	23	21	14	11	6	
24	...	25	29	19	13	25	24	22	15	12	7	
25	...	26	30	20	14	26	25	23	16	13	8	
26	...	27	31	21	15	27	26	24	17	14	9	
			Feb.									
27	...	28	1	22	16	28	27	25	18	15	10	
28	...	29	2	23	17	29	28	26	19	16	11	
29	...	30	3	24	18	30	29	27	20	17	12	
						July.						
30	...	31	4	25	19	1	30	28	21	18	13	

BREEDER'S TABLE FOR MAY, 1902—31 DAYS.

Day of Month.	Name of Animal, Hen, &c.	Date on which an Animal served or an Egg set on any day of the present Month is due to give Birth or Hatch.										Remarks.
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit 30 days.	Turkey, Duck, Peafowl, 28 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.	
1	...	April. 1	Feb. 5	Sept. 26	Aug. 20	July. 2	May. 31	May. 29	May. 22	May. 19	May 14	
2	...	2	6	27	21	3	June. 1	30	23	20	15	
3	...	3	7	28	22	4	2	31	24	21	16	
4	...	4	8	29	23	5	3	June. 1	25	22	17	
5	...	5	9	30	24	6	4	2	26	23	18	
6	...	6	10	Oct. 1	25	7	5	3	27	24	19	
7	...	7	11	2	26	8	6	4	28	25	20	
8	...	8	12	3	27	9	7	5	29	26	21	
9	..	9	13	4	28	10	8	6	30	27	22	
10	...	10	14	5	29	11	9	7	31	28	23	
11	...	11	15	6	30	12	10	8	June. 1	29	24	
12	...	12	16	7	31	13	11	9	2	30	25	
13	...	13	17	8	Sept. 1	14	12	10	3	31	26	
14	...	14	18	9	2	15	13	11	4	June. 1	27	
15	...	15	19	10	3	16	14	12	5	2	28	
16	...	16	20	11	4	17	15	13	6	3	29	
17	...	17	21	12	5	18	16	14	7	4	30	
18	...	18	22	13	6	19	17	15	8	5	31	
19	...	19	23	14	7	20	18	16	9	6	June. 1	
20	...	20	24	15	8	21	19	17	10	7	2	
21	...	21	25	16	9	22	20	18	11	8	3	
22	...	22	26	17	10	23	21	19	12	9	4	
23	...	23	27	18	11	24	22	20	13	10	5	
24	...	24	28	19	12	25	23	21	14	11	6	
25	...	25	Mar. 1	20	13	26	24	22	15	12	7	
26	...	26	2	21	14	27	25	23	16	13	8	
27	...	27	3	22	15	28	26	24	17	14	9	
28	...	28	4	23	16	29	27	25	18	15	10	
29	...	29	5	24	17	30	28	26	19	16	11	
30	...	30	6	25	18	31	29	27	20	17	12	
31	...	May. 1	7	26	19	Aug. 1	30	28	21	18	13	

WHEAT *V.* LUCERNE IN SOUTH AFRICA.

From a very interesting and instructive article in the *Agricultural Journal* of the Cape of Good Hope, we make the following extracts, which deserve to be read with attention by those who propose to seek new homes in one of the South African colonies:—

To begin with, the rainy season of the bulk of the Karroo comes at the wrong time of the year for the sowing and reaping of wheat. We propose to discuss wheat-growing principally, as it is the cereal most largely grown under irrigation in the Karroo. The opinion expressed by many progressive farmers in Victoria (Australia) is that "the man who grows wheat under irrigation is mad." Of course what is meant by this is, that far better results can be got from good ground under irrigation than by growing wheat upon it. Crops such as potatoes, fruit trees, lucerne, vines, tobacco, &c., under irrigation on good soil, will yield far greater returns per acre than wheat-growing. These special crops, however, all require more care and skilled labour than cereal-growing; hence, in our opinion, there is a general run on cereal-growing—the lazy man's crop.

We have been often struck with a curious, antiquated idea prevailing amongst the generality of Karroo farmers, that if a man has good ground under irrigation, he "*must* grow wheat to make his own bread, and thus save buying it." The fact that he would be able, taking one year with another, to *purchase* five bags of wheat by growing lucerne where he would only have raised one bag of wheat does not seem to trouble this "grow your own bread" farmer. We have recently heard of a Cradock farmer with magnificent ground and water supply for lucerne-growing, who has been growing wheat year after year, and only making a bare living out of it. He was asked recently why he did not try lucerne-growing. He replied that he once did have a small patch of it in his lands, and found the infernal "boschje" a great trouble to eradicate from his wheat lands! He is probably still busy irrigating wheat crops for locusts and rust spores. It is the *uncertainty* about cereal-growing in the Karroo that knocks the bottom out of it. If the fruitless expenses of the years of failure be taken into account, the occasional successful crop that is reaped has generally cost as much or more than it sells for. We repeat that in cereal-growing the expense is exactly the same whether a crop is reaped or nothing is reaped. If a proper profit and loss account were kept over, say, seven years of wheat-growing in the Karroo, it would be more readily seen by farmers how poor the average return is, and how much better it would pay them to turn their valuable lands over to the use and support of their live stock. Instead of doing this, however, with the perversity of human nature, they go on, year after year, grumbling at the "rottenness of agriculture," while at the same time allowing hundreds and often thousands of pounds worth of valuable stock to perish for want of food in droughts around the very borders of their grain lands, inside of which a rust-eaten crop of wheat stands bleaching and withering and worthless. Often the crop reaped would not pay for the hides of the stock that have been allowed to perish *outside* the fence, because *inside* the fence that blessed cereal crop was standing on the ground, the half of which would have produced fodder enough to have saved every head of stock from perishing from want of food. Good ground under irrigation in the Karroo is far too valuable to sow year after year with wheat, barley, oats, mealies, and pumpkins.

Lucerne for the Karroo.

The growing of cereals should be left to those parts of this colony and neighbouring States where they can be grown wholesale upon the slopes and hillsides for miles and miles at a stretch, without artificial watering, and depending solely upon seasonable rainfall. Regions blessed with these natural features are naturally adapted to cereal-growing. These features are possessed by some of the coast districts of the Western Province—Malmesbury and Koeberg districts, for instance—and some of the coast districts of the Eastern Province, and also the conquered territory in the Free State. The arid Karroo does not possess them, and, instead of trying to coerce the Karroo into grain-producing, it should be made to carry crops more suitable to its peculiarities of climate, soil, and rainfall. Lucerne is just one of those crops. Where lucerne won't grow in the Karroo, cereals certainly will not. Cereals cannot, generally speaking, be grown in the Karroo without irrigation. Irrigation means the construction of weirs, dams, furrows; levelling and grading of lands, and the yearly maintenance of all these works. Wheat can be grown in such quantity, and so cheaply in the natural wheat regions just referred to, that the wheat grown under irrigation in the Karroo cannot profitably compete. We grant that it pays the Karroo grower of irrigated wheat better to grow wheat during a succession of years of drought than it does during good years, because wheat is then a better price, but this state of affairs at best is merely temporary, being due to the shortfall of production in the natural wheat regions of the colony and neighbouring States. One or two good seasons would again see wheat at such prices as can only mean loss or, at best, very little profit to the Karroo grower of irrigated wheat; for the increased demand due to shortfall will create a stimulated production from the natural wheat regions referred to. For the various reasons we have just reviewed, and because Nature can never be coerced, cereal-growing in the Karroo, even in favourable years, will never be more than an uncertain "head I win, and tail you lose" sort of undertaking. It follows that all large Government irrigation schemes in the Karroo, based upon the growing of grain, and especially wheat, are more or less foredoomed to failure. Van Wyk's Vlei scheme has already proved to be a failure for wheat-growing, for which it was mainly undertaken. The Steynsburg (Thebus) scheme, if undertaken, will probably be the next failure as regards wheat-growing. As a wheat-growing scheme, the Douglas irrigation scheme is foredoomed to failure at the prices paid to acquire plots of ground upon the site of the scheme, and the water rate imposed. It will require some far more profitable crop than grain growing to enable the Douglas scheme plotholders to work at a fair profit. The only consolation left to the taxpayer is that lucerne-growing or fruit-growing will most probably ere long supersede wheat growing upon the sites of these Government irrigation schemes, and thus eventually become a source of real profit and benefit to the country. With regard to the Slagter's Nek scheme upon the the Fish River, mooted from time to time these twenty years, we do not suppose that any sane Government Commission would ever seriously recommend it after a careful inspection of the nature of the bulk of the ground lying below the proposed site. There are dozens of far more promising sites and soils for large irrigation schemes within this colony than the Slagter's Nek site. To proceed with one subject, we assume that it will be readily granted that, to grow cereals in the Karroo generally, irrigation has to be resorted to. Since lucerne is well known to flourish better under irrigation than cereals do, clearly lucerne answers better to the peculiar conditions existing in the Karroo than do cereals. Lucerne appears to be a plant "manufactured to order" for the Karroo and arid countries like it. All those countries of the world where lucerne has become to be regarded as "the king of fodder plants" are arid countries like the Karroo, principally devoted to stock-farming on a large scale, and subject, like the Karroo, to protracted periodical droughts. Lucerne is in its glory in just such countries when it is periodically flooded and then grazed or cut with the mower. The rainfall of the Karroo, or at any rate the bulk of it, is sufficient to give it this periodical flooding by taking the water from rivers, or conserving it in large dams filled from the rivers during the rainy season.

PROFIT AND LOSS—CEREALS v. LUCERNE—COST OF RAISING WHEAT.

We now propose to compare the profit of cereal-growing under irrigation with that of lucerne-growing under irrigation in the Karroo. We believe we are making a liberal estimate when we fix the average yield of wheat under irrigation in the Karroo at about five bags of 225 lb. each per acre per annum, taking a series of years of failures and successes. Mr. John Eaton, of "Droogvlei," in the Malmesbury district (about the best wheat district in the natural wheat region of the Western Province), a good farmer of long experience, writing to the *Cape Times* in 1886, estimated the previous five years' average yield of wheat per acre at 7½ bushels, equal to about two bags of 225 lb. each per acre. Again, from tabulated reports of wheat yields from several coast districts of this colony, the average yield was only 6 to 8 bushels per acre, equal to about one and a-half to two bags of 225 lb. each per acre. The general average yield of wheat even in the United Kingdom, under scientific and heavy manuring, sure rainfall, no locusts, comparatively little rust, is only 29 to 30 bushels, or about seven to eight bags of 225 lb. each per annum. So that our estimated Karroo average (taking the good years with the bad) of five bags of 225 lb. each per acre, per annum, must be admitted, we think, to be a very liberal estimate for a comparison between the profits of wheat and lucerne growing in the Karroo. Of course individual yields of ten and twelve bags, and more, per acre, have been obtained in the Karoo, but we are dealing with practical averages here. We have before us some figures on the "cost of wheat-growing" in the Karroo, which appeared some time ago in the columns of the *Midland News*. The writer, who claimed to be a practical farmer, showed from actual account kept that wheat cost him just about 6s. per bag of 225 lb. to produce. To arrive at the average clear profit per acre, per annum, we shall assume that the five bags of wheat, weighing 225 lb. each (average yield of 1 acre), fetch an average price of, say, 22s. 6d. per bag on the market, realising the sum of £5 12s. 6d. Deduct from this the cost of these five bags at 6s. per bag as shown, making a total of £1 10s., leaving a net or clear profit of £4 2s. 6d.—say (for easy calculation) £4 per acre per annum.

Now, personally we have never, even in fair years, been able to make £4 an acre clear profit at wheat-growing here, still less to *average* it. Nevertheless we take £4, as shown, to be a fair and liberal estimate of the average net profit per acre per annum derived from wheat-growing. We now come to the profit per acre derived from lucerne-growing for stock. By way of preliminary we may state that when once lucerne fields have been properly laid down and established, the yearly expense is almost solely confined to the mere cost of applying the water to them. On fields properly laid down, this should not exceed 5s. per acre per annum.

Cost of Growing Lucerne.

We begin by quoting actual figures of results obtained recently by a leading Graaff-Reinet grower of lucerne, whose lucerne fields depend entirely upon periodical flood water diverted from the Sunday's River by means of a weir across the river. This gentleman informs us that during last year (1898) of terrible drought throughout the Midlands, he made in six months (June to December) £1,300 from fattening hamels, and £700 from making butter—a total of £2,000 in six months from about 150 acres of lucerne. Deduct from this, say, the six months' expenses of milking and tending the cows, and tending the hamels in the paddocks—say £100 for this—and 2s. 6d. per acre on 150 acres for water leading during the six months, amounting to £18 15s., making a total extreme for the six months of £118 15s. This will leave a profit balance of £1,881 15s. from 150 acres of lucerne in six months, being a clear profit of £12 10s. per acre in six months, or £25 per acre per annum, as against £4 per acre from wheat-growing. This is between six and seven times as much as from wheat-growing. This, too, during a very severe drought. The same farmer in the year 1895 made from one 10-acre field of lucerne under dairy cows at the rate of £5 per month per acre from butter, equal to £60 per acre per annum—this is, of course, exceptional. This gentleman was making £70 per month from butter in a drought when without lucerne he would have been quite unable to make butter at all. Lucerne makes the finest deep yellow "gilt edge" butter that fetches highest market price, and yet so little is known of "the king of fodder plants" that many farmers have a hazy idea that it gives butter a peculiar and bitter flavour!

Grazing ostriches upon lucerne paddocks is equally as profitable as making butter or fattening sheep upon this crop. In Oudtshoorn, where there are some 25,000 acres of ground under lucerne, the standard or average capacity of lucerne fields for ostriches is considered to be about ten birds to the morgen, or five birds to the acre all the year round. Double this number during the summer could be run on lucerne, but, to be on the safe side, the number is limited to the above. The Oudtshoorn grazing is worthless, and they have to depend entirely upon their lucerne fields for keeping their birds. The statistics for 1898 show that in that year there were

48,888 ostriches in Oudtshoorn, and these *are all entirely dependent on the lucerne.* This represents about one-fifth of the total number of birds in all the other districts of the colony put together. Now selected birds (having feathers above the average of the ordinary stock of the country) will yield, on lucerne, at least £3 per plucking per bird, clear of marketing fees. As birds running on lucerne can be plucked regularly every eight months, without any damage to the wing, three pluckings can be got in two years, yielding a total of £9 per bird for two years. This is at the rate of £4 10s. per bird per annum. We may state that our birds have done considerably better than this, but their quality is considerably above the average. Since 1 acre of lucerne will carry five birds all the year round and each bird will yield at least £4 10s. per annum, we have a return of £22 10s. per acre per annum, less 5s. per acre expenses water leading, leaving a clear profit of £22 5s. per acre per annum from ostriches grazed on lucerne. This is between five and six times as much as from wheat-growing. Again, let us take the making of lucerne hay as compared with wheat-growing. One acre will yield from each cutting about $1\frac{1}{2}$ to $1\frac{3}{4}$ tons of cured hay, which means about 8 tons of hay per acre per annum. But, to be quite within the mark, we take only 5 tons of 2,000 lb. each per acre per annum. Lucerne hay sells in Port Elizabeth at from 4s. to 5s. per 100 lb. Take it at even 4s. per 100 lb. average. At this price the 5 tons would realise £20. Deduct from this the expense of water leading at 5s. per acre, and expense of cutting and curing the 5 tons at 5s. per ton in stack. This would amount to £1 10s. expenses, which deducted from £20 (amount realised from sale of hay) would leave a clear profit of £18 10s. per acre per annum from making lucerne hay. This is from four to five times as much profit as is derived from wheat-growing, and in weight it is about two or three times as much hay as is obtained from 1 acre of oats.

VALUE OF GROUND UNDER LUCERNE.

Even in Queensland and Victoria, where there are hundreds of thousands of acres of the most fertile grazing land, lucerne fields are found to be very valuable. At a recent auction sale of lucerne land at Bacchus Marsh, in Victoria, 9 acres brought £40 per acre; $7\frac{3}{4}$ acres adjoining were sold at £60 an acre; $9\frac{1}{2}$ acres at £38; 23 acres at £37; 40 acres at £30; 5 acres at £40; $4\frac{1}{2}$ acres at £41 10s.; $5\frac{3}{4}$ acres at £37 10s., and $17\frac{1}{2}$ acres at £40 an acre, being an average for 122 acres of a little over £37 per acre. If lucerne land is found to be so valuable in fertile Queensland and Victoria, how much more valuable ought it not to be in the arid Karroo, where it would be the means of saving hundreds of thousands of pounds worth of valuable stock during one severe drought.

The average value of ground under lucerne in Oudtshoorn, with a fair water supply, is about £100 per morgen, or £50 per acre. Ground under lucerne on the Sunday's River Estate has recently fetched at public auction £70 per morgen, or about £35 per acre. The water supply on this estate is periodical, being flood water only. The water is diverted from Sunday's River by means of several sneezewood weirs, about 5 feet high, across the river.

COLONIAL EXPERIENCE.

We quote from the *Agricultural Journal*, Vol. VIII., No. 5, p. 121, Mr. Richard Gavin's own words, giving the stock-carrying capacity of his little farm of only 95 morgen, in Oudtshoorn, most of which is under lucerne. Mr. Gavin says:—"I may mention I was the first to farm with lucerne in these parts, having tried in 1863, and imported a quantity of seed in 1866, which cost landed 2s. 6d. per lb. I had made thousands of pounds (out of it) before my neighbours took to it. Now, it is an acknowledged fact that lucerne has been the making of Oudtshoorn. As an example, I may mention that on my farm here of 95 morgen (about 201 acres) I have at present in prime condition, 105 oxen, 17 cows and calves, 10 horses, 550 ostriches, and a lot of slaughter sheep, and have already saved about 20 tons of lucerne hay for winter, with about

5 morgen under wheat and oats, and *could feed double the number of stock at present*, but am always careful not to overstock, for fear of a dry summer."

We know of a Karroo farm in the Graaff-Reinet district, now owned by one of the leading and progressive farmers of that district which was not worth more than £3,500 at the outside valuation before it was taken in hand by its present owner. Previous to being taken in hand by its present owner, it was let at £90 per annum, and, were it not for a small shop or store upon the premises, even this rental could not have been paid by the tenant.

The enterprising present owner took over this unpromising farm amid the croakings of several prophets who prophesied speedy disaster. He set to work and built a weir across the Sunday's River at a cost of about £500, by means of which he can now flood from 150 to 200 acres of lucerne ground. Although before he built the weir and laid down the lucerne fields, a tenant could not pay a rental of £90 per annum without the assistance of the small country "shop," the present owner has been offered £800 a year rent for this same farm, and could let it at a rental of £1,000 a year if he wished. Capitalising the rental of £800 per annum at 5 per cent., the value of this farm to-day would be about £16,000, as against £3,500 before the weir and lucerne fields were in existence upon it An Oudtshoorn lucerne farm (Zeekoegat), including a stock of about 1,500 ostriches, was recently sold for the sum of £40,000. The property is only 3,268 morgen in extent, of which about 800 morgen are arable.

There are immense fields of lucerne in Argentina, where it has taken the place of the innutritious and scanty native grasses. In the Corowa district alone (New South Wales) there are about 21,000 acres. There are individual farmers in Australia having as much as 3,000, 4,000, and 7,000 acres of lucerne. A recent Australian writer remarks, "There will be a much larger average of lucerne laid down every year, as not only the value is so much appreciated, but many owners who have let their lands on the half system for wheat have made a condition that the last year the land should be laid down in lucerne. I consider there is a great future before us in this plant." Having given a few instances of the value of lucerne ground here and in Australia, and having shown what the Australians think of "the king of fodder plants," we now proceed to discuss the

Advantages of Lucerne-growing.

Lucerne fields, unlike cereal crops, are not destroyed by locusts, rust, hail, and drought. Locusts seldom touch lucerne, rust does not trouble it, hail may batter but cannot destroy it like cereals. If battered level with the ground by hail, in two weeks after there will be waving a field of magnificent fodder, 5 or 10 tons to the acre. A hail-battered wheat crop, two weeks after, would be but a memory—and a sorrowful one at that. Drought that will kill lucerne, when once it is properly established, will kill the hardy Karroo itself! A field of lucerne, when once established, will last, like a fruit orchard, for years; and will require comparatively little yearly expense and attention to mantain in a state of profitable production. In Oudtshoorn there are fields 15 to 20 years old as good and better than they were ten years ago. In Graaff-Reinet there is a plot of lucerne said to be about seventy years old—probably self-sown from time to time. In New Mexico there are said to be fields which have been under this crop for more than 100 years. The revenue or profit from lucerne fields is both far greater and far more certain than that from cereal crops in the Karroo. To the Karroo stock farmer especially, lucerne is of inestimable value. It is one of the hardiest, yet heaviest yielding, of fodder crops. If water cannot be given to lucerne fields for six or eight months, no harm results. In the case of cereal crops they would be destroyed. When, after six or eight months' drought, water is again available for lucerne, this accommodating crop is ready to commence yielding enormous quantities of valuable fodder at once. With lucerne there are no yearly or half-yearly ploughings and sowings, as in the case of cereal crops. With the small area of 50 acres of lucerne at his command, no Karroo farmer need lose a single head of stock in the severest drought. With a mower and a horse rake he can cut from his 58 acres, *during one year*, fully 250 tons of the most nutritious fodder for feeding his stock during droughts. One ton of lucerne hay would often be the means of saving £100 worth of stock in a drought, and this 1 ton would only cost 5s. to cut, cure and stack! £100 return for a 5s. investment ought to be, in mining phrase, a payable proposition.

Lucerne hay does not deteriorate if not used at once. Professor Wallace gives an instance in Australia where a stack of lucerne hay was perfectly good more than seven years after it was put up. Lucerne hay is not eaten and destroyed by mice and rats, as is the case with oat hay. The nutritive value of lucerne hay is, besides, much higher than that of oat hay. There is a curious notion among most Karroo farmers that lucerne hay is "no good *alone*" for feeding to horses in hard work. They fancy that there *must* be oat hay, barley, or mealies added to the lucerne hay to give "substance."

On this point we quote the following remarks recently appearing in an American agricultural paper, the *Louisiana Planter:*—"Alfalfa hay is one of the richest foods for stock; it takes the place, in the farm dietary, of wheat, bran, cotton-seed meal, etc. It is suitable *alone* for young growing animals and *horses at heavy work*." The italics are ours, and we trust that this quotation of American opinion and experience will dispel from their minds the erroneous idea prevailing amongst most Karroo farmers as to the want of "substance" in lucerne hay. We may here remark that the high nutritive value of lucerne itself has been clearly demonstrated at the well-known scientific experimental fields at Rothamsted, in England, where over a period of six years lucerne yielded an average of about 153 lb. of nitrogen per acre per annum; whereas over a period of eight years vetches gave an average of only 84 lb., Bokhara clover only 70 lb., and red clover only 14 lb. of nitrogen per acre per annum, as against 153 lb. per acre from lucerne.

RESTING THE VELD.

And, lastly, we would draw special attention to this very important advantage of lucerne-growing to the Karroo farmer. It enables him to relieve and *rest* portions of his stock-tramped veld by grazing most or all of his stock upon his lucerne fields during the growing and rainy seasons, and thus allow the useful grasses and bushes to grow out and to seed for the much-needed improvement and renewal of his pasturage.

He thus enabled to put into practice the highly beneficial "paddocking system" of grazing pastures, as practised in Australia and elsewhere. This system of alternate *rest* and use has been found to quadruple the carrying capacity of pastures. Thus does lucerne-growing not alone yield in itself a far better yearly return per acre than cereal-growing, but it is also the means of bringing about a steadily increased stock-carrying capacity of the whole farm.

In conclusion, we wish it to be distinctly understood that we do not recommend lucerne to be sown on "dry lands" in the Karroo. By "dry lands" we mean ground that cannot be flooded at any rate, on an average, five times during the year, and well flooded, too.

There is no denying the statement that drought is the one great drawback to the Karroo—the main leakage through which the Karroo farmer's profits filter away from time to time. Drought may, in fact, be said to be the great consuming dragon of the Karroo farmer's profits; there are few Karroo farmers, indeed, who have not felt his terrible fangs. Surely the drawing of this dragon's fangs should be worth the doing! The providing of artificial fodder for stock against drought is the only forceps that will draw them. The man who allows his stock to perish for want of providing water would be looked upon as mad by the very man who allows his stock to die by thousands for want of providing food. It is, however, difficult here to distinguish between the sane and the insane. It would seem that a man is mad only when he behaves differently to his neighbours.

Finally, then, we come to the

Disadvantages of Lucerne-growing.

There is no doubt that the initial outlay required for properly laying down permanent lucerne fields of any extent is considerably heavier than that required for ordinary cereal-growing. This feature about lucerne-growing is perhaps, in the strict sense of the term, not a disadvantage, yet it would have the effect of deterring the farmer of limited means from taking up lucerne-growing. As in the case of fruit orchards, the lucerne-grower who has just started must be prepared to wait a year or two for a return upon his outlay.

Lucerne fields yield very little the first year, and not much the second. From the second year onward lucerne becomes profitable, although it is said not to be fully matured until about the fifth year. Most Karroo farmers cannot afford to wait for a year or two for a return upon outlay, and prefer to continue ploughing for cereals year after year, even if five out of ten years they are only feeding locusts and rust spores.

Yet it is precisely the farmer of limited means who stands most in need of utilising to the very best advantage the means at his disposal for extending his limited capital. The advantages of lucerne-growing are, therefore, of more importance to the farmer of limited capital than the well-to-do farmer.—*First Prize Essay*, E. and O. Evans.

WHEAT CULTURE IN CALIFORNIA.

Every operation connected with the wheat industry in America is done on an enormous scale and almost entirely by machinery. There are immense areas under wheat in the Pacific States, California, Washington, Oregon, and Idaho (between 5,000,000 and 6,000,000 acres, producing from 70,000,000 to 80,000,000 bushels). The fields are ploughed by ploughs set in gangs of from four to fourteen drawn by traction engines or by teams of mules, to a depth of 3 inches. The broadcast seeder is attached to the plough and the harrow to the rear of the seeder, so that where the Queensland farmer goes three times over his field before completing the work, the Californian does the whole in one operation, and, instead of 2 or 3 acres a day, he gets over from 10 to 15 acres, and only one man is required for the work.

In Bulletin 20, Miscellaneous Series, issued by the United States Department of Agriculture, the wheat-growing in the Pacific States is graphically described.

The period of growth for crops in California is during the winter season, and the months in which the crop ordinarily grows in the eastern States are in this region the months of suspended animation. There is a long, mild winter, during which the plant has ample chance to grow, and the plant is practically mature before the hot sun of June has an opportunity of doing more than adding the final touches to the ripening and drying of the grain. It is this peculiar hot drying effect of June and July which makes it possible to use the combined harvester and thresher, which could not be used successfully on a grain which was not perfectly dry as well as ripe.

The use of machinery of great capacity, which means an economy of human labour, but often a waste of grain, is another distinctive feature, particularly of the great Californian valleys. Ploughs are set in gangs, reapers and headers are built with cutting bars of unusual length, and every effort is made to combine several operations in one, thus enabling one man to plough and cultivate the greatest possible area with as many horses as he can control.

Probably two-thirds of the entire wheat crop of California is gathered with the combined harvester-thresher. The great level fields of the central valley favour the use of the most ponderous machinery. The machine sweeps through miles of grain, cutting swaths from 16 to 42 feet in width, and leaving behind a long trail of sacked wheat ready to be hauled to the warehouse, railroad, or mill. This combined harvester and thresher is usually drawn by twenty-four to forty horses, and sacks from 25 to 45 acres of wheat per day, with four men to operate it; and larger machines will do even more. By its use the grain is threshed directly from the field and left piled in sacks containing about 2½ bushels each. They are left in the field sometimes for weeks without fear of material damage from the weather.

The varieties of wheat sown in the Pacific section are also different to those in the east, their peculiar characteristic being a white grain, with a soft and starchy content; and it is said that other wheats imported for seed lose their individuality in a season or two. The principal factor in this change is thought to be the lack of humus in the soil. A large proportion of the more common varieties of the region are the Club Wheat type, so called on account of the peculiar club-like formation of the head. This formation is of considerable advantage there, on account of its ability to hold the grain—a very desirable point in this region of very long summers, where the grain, after becoming fully ripe, is frequently left standing for a month or so before being harvested.

WHEAT.

The New Zealand Loan and Mercantile Agency, Company, Limited, Melbourne, under date, 6th February, make the following interesting report on the wheat market:—

Cabled information from Europe contains little of interest to growers here. The market is steady, 29s. 9d. to 30s. being the average quotations for forward shipments of Australian wheat. The market in America is now said to rule the entire world, and on Chicago movements our prices of wheat will be partly dependent. We say partly advisedly, as recent advances show that the local market is being ruled just as much by local surroundings as by foreign movements in values. The American yield was an enormous one, but it has had to meet much increased demands, not only for export, but for home consumption, as the maize and potato crops were materially less. The Argentine crop is only turning out 17,000,000 bushels for export, against about 22,000,000 bushels in the season just closed. The Indian crop is not reported on very favourably. The area is much below the average, and, owing to unfavourable weather, it is just possible that the eastern country, usually one of the largest producers in the world, will be an importer, and not an exporter. We still fail to see any sign of a fall in the home markets, and must continue to support the belief that the position will remain a steady one, with a tendency towards higher levels.

The freight market is unsettled; 23s. 3d. to 23s. 6d. is about the range of existing freights for full sailer cargoes, but there is no disposition to purchase. The amount of chartering done is astonishing. No less than 55,000 tons of wheat and flour have been shipped since the opening of the year, and there are vessels in port engaged to load or loading with space for about another 32,000 tons, or a total of 87,000 tons, exclusive of the vessels chartered to arrive. This total represents over 3,000,000 bushels of our exportable surplus, estimated at the most at 5,000,000 bushels to be shipped within ten weeks of the opening of the year. Such a record has not been attained even in our most prolific seasons. Shippers' engagements have been taken to a dangerous point, and this opinion is supported by the extremely sensitive state of the market. We would not be surprised to see wheat imported from Sydney and Adelaide to complete local engagements.

The three wheat-exporting States have fixed their standards of wheat for the current season. The levels compare thus with those of the previous season:—

	1901-02. Lb.	1900-01. Lb.
Victoria	61 ...	62½
South Australia	62 ...	63
New South Wales	61½ ...	61¼

The weight is in lb. per Imperial bushel. It is interesting to note that the South Australian crop is only estimated at 8,250,000 bushels, with a total available for export of but 4,250,000 bushels. Taking recent estimates, the Australian wheat exports will suffer a diminution of about 8,000,000 bushels during the current year. Higher prices will partly compensate for the loss, which will, however, be a severe one to producers.

Harvesting is now practically completed throughout the States, and the results, apart from wheat, have been moderately satisfactory. The crop of oats has not yielded up to expectations, and the result of this fact, coupled with shippers' demands, has been the extraordinary market now ruling, which yields handsome profits to growers. The crop of barley is small, and importations are necessary. Victorian maltsters are bringing supplies from Sydney (a fair quantity of good barley is grown in one or two centres), New Zealand, Tasmania, and, lastly, California, the latter for March delivery. In other grains the production is small.

AGRICULTURAL SCHOOLS IN GERMANY.

The British Consul at Stuttgart, Dr. Frederick Rose, has furnished a report to the Foreign Office on the technical, agricultural, industrial, commercial, and art schools of Würtemberg. Of the agricultural schools, Mr. Rose says there are various types of them, such as agricultural, farming, winter schools, improvement schools, rural housekeeping schools for women, and a wine-making school.

The three Farm Schools which exist in Wurtemberg are intended for the instruction of small peasants, farmers, and tenants in practical agricultural work. Their organisation is quite different from that of other agricultural training institutes. Each school is managed by a director, who must be a farmer. He rents the estate attached to the school and cultivates it at his own risk. He gives instruction in agriculture and subsidiary subjects, and is assisted by an instructor, a farming inspector, and a veterinary surgeon.

The course of instruction lasts three years, and the number of pupil-labourers is generally limited to twelve. The director is not entitled to any compensation from the State if there are less than twelve, nor is he allowed to exceed this number without special permission. Particular attention is paid to practical instruction, which includes almost every branch of farm work. The pupil-labourers do not pay any fees, and receive board and lodging free of cost. The working hours are fixed at ten in summer and eight in winter; theoretical instruction is suspended during harvest, when two hours more per day are required. The areas of the three schools are respectively 292, 310, and 480 acres.

The Würtemberg agricultural winter schools are open from November to March. They are intended for peasants' sons who have left school and wish to become farm labourers or small farmers. The various courses are carefully framed with a view to consolidate and extend the education acquired at school, and to give instruction in agricultural work so as to enable the pupils to manage small peasant farms. Two courses are held annually, but the first course provides complete agricultural elementary instruction. The fees amount to about 25s. per course. The number of pupils attending these schools in 1898 was 226.

There are now only two agricultural improvement schools in the kingdom. There are six female rural housekeeping schools, which were founded for the purpose of instructing peasants and workmen's daughters in simple domestic economy, cleanliness, order, hygiene, and nursing.

The wine-making school is intended to instruct young peasants to cultivate their vineyards in a rational manner.

Courses of lectures are also given in Würtemberg by travelling lecturers and experts.—Extract from the *Journal of the Board of Agriculture*, England.

REPORT ON WORK, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1902.

Farm.—Owing to the prevailing dry weather and the want of moisture in the soil, maize and potato planting had to be deferred until the end of the month, when fifteen varieties of maize were planted in three 5-acre plots. Six varieties of pumpkin were planted in another 5-acre plot. The season is late for planting such crops; but, should the maize fail to yield grain, it will be utilised to advantage for the silo and live stock feeding. During the month the ploughs were kept busy, and there are now 120 acres in fallow. The experimental crops were harvested—mangolds, swedes, and potatoes (seventy-six varieties); the results from these are being forwarded. A great deal of other work has been carried out—clearing ridges near piggery of dead timber, cutting and carting wood, cutting burr and other noxious weeds, chaffcutting, &c. The rainfall for the month was 2·27 inches, the heaviest falls being 12th January (·24) and 27th January (1·78).

Dairy.—During the month 1,460 gallons of milk were converted into butter for a yield of 611 lb., and 135 gallons gave a return of 144 lb. of cheese; 514 gallons were supplied to dining-hall, and 240 gallons were fed to calves. The increase in dairy stock was as follows:—Ayrshires, 2 (1 male, 1 female); Holstein, 1 female; Jerseys, 1 female; Shorthorns, 1 female; Grades, 3 (1 male, 2 females). The dairy cattle were grazed for one hour daily on a lucerne paddock, and were also fed each evening on green maize which owing to the dry weather did not yield any grain.

Piggery.—The increase during the month was as follows:—Berkshires, 5 boars, 9 gilts; Middle Yorkshire, 8 boars, 2 gilts; Grades, 4. Experiments were carried out in pig-feeding. The pigs are now in the hands of J. C. Hutton and Co., who have kindly consented to let us know the results, also the value of the different breeds for bacon purposes.

Garden.—This branch of the College has not escaped the dry weather. The vegetables have been kept growing by the aid of water applied on dull days during the early morning and late in the evening. A quantity of seeds have been planted, and plants are now ready for setting out when the rain comes. The figs have yielded an extraordinary heavy crop, and have in no way suffered from the effects of the dry weather. The orchards and vineyards have been kept in a good state of cultivation; they are now free from weeds, and the soil in good tilth.

Mechanical Department.—The work done during the month was as follows:—Assistance was given in dismantling the chemical laboratory. Forms and tables were made, and the asphalt footpath between the buildings was repaired. In the blacksmith's shop and machinery department, now under the charge of Mr. A. Dennis, a great deal of work was done, and rapid progress is being made by the students, many of whom are now able to shoe horses and repair the implements used on the farm in a creditable manner.

General.—The month closed with sixty-nine students on the roll. Everything is now working smoothly, and good progress is being made both in the field and classroom.

THE CHAMBER OF AGRICULTURE.

By WILL. McILWRAITH, Rockhampton.

There are few farmers who will not agree as to all Mr. F. W. Peek has to say about the advantages of co-operation and union among farmers. Many illustrations of these may be found by referring to the social and industrial organisations which exist in Europe, America, and Australia. The most powerful of these was the Grangers, which produced a revolution in the relationships of the producers and dealers in the United States. Mr. Peek makes an appeal on behalf of the Queensland Chamber of Agriculture, and tacitly invites suggestions by which its popularity may be increased, and it is in the interests of the chamber and the agricultural industry the following are offered.

It was a mistake to introduce politics into the constitution of the chamber in the manner stated in the General Objects of the Rules. Experience may show that in the working of the chamber it may be impossible to avoid touching political points, but the positive form in which the political objects are stated makes the chamber a political association; it places it on a level with the Workers' Political Association. It should suffice to state the objects of the chamber in some such form as the following:—

"To assist, stimulate, and promote the agricultural industry in all its branches; and to advance the interests of all connected with it."

The objects should be stated as simply yet as comprehensively as possible. Reference to the manner in which they are stated in connection with the British or other Chambers of Agriculture may suggest a better form than that submitted.

With respect to the organisation of the Queensland Chamber of Agriculture, it is to be feared the financial conditions are prohibitive. "The subscription of each affiliated body shall be the sum of £2 2s. per annum" (Rule 11). It is further provided a person subscribing not less than 5s. annually may become connected with the chamber. Mr. Peek calls attention to the fact that at the Bundaberg Conference 120 societies were represented. How many of these societies have paid £2 2s. for affiliation with the chamber? In South Australia the cost of connection with the Agricultural Bureau is half-a-crown, and Queensland societies should not be called upon to pay an extravagant subscription. If the 140 societies registered in the *Queensland Agricultural Journal* paid £1 each, there should be adequate funds. All members of such societies should thereby be connected with the chamber, and only in that way should members be recognised. There should not be any "direct subscribers," as provided in the rules.

There is no use for a General Council and Central Executive. It would be much better to have only a Council of Agriculture. Such a board could do all the work necessary with the assistance of an active and enthusiastic secretary. Instead of being composed as at present of gentlemen generally resident in Brisbane, the council should include besides them residents in Ipswich, Toowoomba, Maryborough, Bundaberg, Rockhampton, Mackay, Townsville, &c. Gentlemen in the towns named could act as representatives and correspondents of the districts; and could attend the council meetings when attention to the interests of the districts demanded their presence. It would be of immense advantage to the council were the principal permanent officials of the Department of Agriculture members of it. It is impossible to overlook the benefit it would be to have the assistance of Messrs. McLean, Benson, Mahon, Rainford, Nevill, Brünnich, and Dr. Maxwell, though they were present merely in an advisory capacity. Such a council would possess a power and an influence which the executive as at present constituted is not likely to acquire. This council could be elected annually by a plebiscite of the societies forming the chamber. Under its direction and advice and with its co-operation and aid, such combinations as the recently formed citrus-growers' union would be encouraged and invigorated. The council should be the direct representative of the farmers' societies. The more immediate and intimate the connection and the intercourse between them, the greater will be the harmony and unity of action.

Dairying.

THE DAIRY HERD.—QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST JANUARY, 1902.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie ...	Ayrshire... ...	19 Nov., 1901	497	4·0	22·28	
Amy ...	,, ...	7 Nov. ,,	603	3·4	22·96	With first calf
Isabelle ...	,, ...	7 Sept. ,,	622	4·0	27·86	
Jeannie ...	,, ...	7 Oct. ,,	599	3·5	23·48	With first calf
Laura ...	,, ...	28 Aug., 1900	305	4·0	13·66	
Linnet ...	,, ...	7 May, 1901	565	3·6	22·78	
Lavina ...	,, ...	11 Sept. ,,	888	3·9	38·78	
Lass ...	,, ...	24 Aug. ,,	618	3·9	26·99	With first calf
Lena ...	,, ...	3 Dec. ,,	744	3·6	29·99	With first calf
Lowla ...	,, ...	3 Dec. ,,	562	3·5	22·06	With first calf
Rosebud ...	,, ...	13 Nov. ,,	870	3·7	36·05	
Ruth ...	,, ...	12 Dec. ,,	555	3·6	22·37	
Ream ...	,, ...	9 Nov. ,,	619	3·8	26·34	
ReamRouthie	,, ...	13 Dec. ,,	878	3·7	36·38	
Leesome ...	,, ...	15 Jan., 1902	468	3·5	18·34	
Lonesome ...	,, ...	22 Jan. 1901	88	3·7	3·64	With first calf
Molly ...	Grade Ayrshire...	5 Oct., ,,	485	3·8	20·64	With first calf
Bell ...	Jersey	15 Sept. ,,	387	4·9	21·23	With first calf
Connie ...	,, ...	8 Sept., 1900	320	5·0	17·92	
Carrie ...	,, ...	31 Aug., 1901	492	4·8	26·44	
Effie ...	,, ...	18 Nov. ,,	645	4·2	30·34	
Eileen ...	,, ...	2 Sept., 1900	499	5·0	27·94	
Ivy ...	,, ...	24 Oct., 1901	527	4·5	36·56	
Speck ...	,, ...	27 Aug. ,,	394	4·2	18·53	
Tiney ...	,, ...	5 Oct. ,,	354	4·4	17·44	With first calf
Jersey Bell...	,, ...	17 Jan., 1902	212	4·8	11·39	
Blaze ...	Grade Jersey ...	27 Sept., 1901	222	3·8	9·44	With first calf; dry, 31-1-02
Bluey ...	,, ,, ...	9 Oct. ,,	414	4·2	19·37	With first calf
Pansy ...	,, ,, ...	28 Oct. ,,	587	3·9	25·64	
Countess ...	Shorthorn ...	18 June ,,	530	4·4	26·11	
Empress ...	,, ...	27 Dec. ,,	814	3·6	32·82	
Dott ...	,, ...	31 May ,,	462	3·5	18·11	
Frizzy ...	,, ...	29 Nov. ,,	720	3·6	29·03	
Lady Vixen	,, ...	13 July ,,	415	3·5	16·26	With first calf
May ...	,, ...	16 July ,,	495	3·9	21·31	
Nestor ...	,, ...	3 July ,,	633	3·8	26·93	
Queenie ..	,, ...	19 May ,,	201	4·2	9·45	Dry, 27-1-02
Kit ...	,, ...	14 Jan., 1902	345	3·5	13·52	
Louisa ...	,, ...	23 Dec., 1901	714	3·7	29·58	
Violet ...	,, ...	20 Jan., 1902	301	3·6	12·13	
Curly ...	Grade Shorthorn	12 Nov., 1901	761	3·6	30·68	
Clara ...	,, ,, ...	14 June ,,	108	4·4	5·31	With first calf; dry, 31-1-02
Eva ...	,, ,, ...	26 Oct. ,,	604	3·5	23·67	
Esma ...	,, ,, ...	29 Nov. ,,	385	3·8	16·38	With first calf
Laurel ...	,, ,, ...	22 Aug. ,,	560	3·7	23·20	
Leopard ...	,, ,, ...	6 Oct. ,,	514	3·6	20·72	
Lucy ...	,, ,, ...	9 Sept. ,,	617	3·7	25·56	
Peggie ...	,, ,, ...	26 May ,,	426	4·0	19·08	
Redmond ...	,, ,, ...	22 Aug. ,,	322	3·8	13·74	
Russet ...	,, ,, ...	25 Dec. ,,	492	3·7	20·38	
Stranger ...	,, ,, ...	6 Nov. ,,	617	3·6	24·87	
Alice ...	,, ,, ...	1 Jan., 1902	595	3·9	25·98	
Poly Red ...	,, ,, ...	3 Jan. ,,	548	3·6	22·09	
Rosella ...	,, ,, ...	18 Jan. ,,	268	3·8	11·40	
Ada ...	South Coast ...	16 July, 1901	531	4·0	23·78	With first calf
Grace ...	,, ,, ...	15 June ,,	415	4·0	18·59	With first calf
Trixie ...	,, ,, ...	4 July ,,	461	3·9	20·13	With first calf
Topsy ...	,, ,, ...	4 Oct. ,,	616	3·7	25·51	With first calf
Fancy ...	,, ...	19 Jan., 1902	207	3·8	8·80	
Damsel ...	Holstein	16 Jan. ,,	288	3·4	10·96	
Angel ...	Holstein & Devon	5 Dec., 1901	542	3·8	23·06	With first calf
Devon ...	Devon	2 Nov. ,,	380	3·8	16·17	With first calf

The herd was allowed to graze on lucerne plot for one hour daily, and were fed in addition some green maize.

A FACTOR IN VICTORIAN DAIRYING.

By DANIEL JONES,
Department of Agriculture.

The observations I am about to record are but a few facts gleaned while enjoying the cordial hospitality of some friends who are, fortunately for themselves, located in a noted dairying centre of Victoria. This region, known as the western country, including as it does such fertile districts as Colac, Pomperneet, and Camperdown, stands pre-eminent as a dairying centre. My investigations, arising only from personal interest, were chiefly centred in comparing what, for many reasons, may rightly be regarded as improved systems with those of a local character such as I had hitherto been acquainted with. Despite the fact that the nature of the comparisons may seem to show our newer and smaller industry at a disadvantage, our latent possibilities only require stimulating by such means as proved so useful in the sister State, and we shall, in the near future, if, indeed, we do not at present, hold by comparison no discreditable position.

For the benefit, then, of my many co-workers in the past in the principles of co-operative dairying, I will discuss those matters which, to my mind, stand prominently forth as the prime factors in the development of these southern districts. I trust I shall be able to show that what I have there learned will emphasise the advantages demonstrated in such a signal manner as the sequence of co-operative effort.

The story of rural co-operation in its early stages is ever the same. A few pushing or perhaps over-sanguine settlers try and fail, and try again to infuse some energy into apathetic farmers, and, by degrees and after much delay and no little loss to themselves in time and money, they at last succeed in making a start in a very small way, perhaps co-operating in the erection of a creamery, and ultimately in the complete establishment of a first-rate factory, which soon gains a reputation in every sense flattering to the shareholders and creditable to the district. Such I found was the genesis of the Camperdown Cheese and Butter Factory Company, Limited. A few items from the balance-sheet of this company, as issued in July last, may be of some interest to our dairymen. That document showed a capital of £5,000 paid up in 20s. shares, a dividend upon which is paid at 7 per cent., in addition to which, after paying 4·03d. per gallon of 10 lb. of milk, a bonus is paid to suppliers at ⅝d. per lb. as per butter test, and all separated milk is returned to the suppliers. It shows, also, a cash turnover of £71,867 1s. 7d., as against £70,297 7s. 10d. for the previous year, leaving a net profit of £5,078 0s. 3d., as against £3,765 5s. 11d. in the previous year, the increased profit resulting mainly from the enhanced value of butter. It goes without saying that so successful an achievement means something more than intelligent co-operation in the manufacture of dairy products. Success in this industry depends on more than the careful preparation of these products, however important these may be. Nature of soil, seasons, character of grasses, selection of cows, and intelligent recognition of all that goes to improve the milking qualities—each of these factors stands in more or less direct relation to the success of the enterprise. Undoubtedly the initiation of the system of butter factories on a large scale, coupled with the facilities for cold storage and quick over-sea transit of butter, has rendered land in Victoria, which, under other conditions, would have been of little value or use, productive and profitable. These western lands are a case in point. The whole aspect of the country indicates a volcanic origin. In many parts of the district under review evidence of former internal disturbances are seen in the numerous low hills and ridges obtruding from otherwise level lands thickly strewn with basaltic rocks, in boulders great and small that give you the impression that in the remote past the subterranean fires, by direction of Pluto, were preparing battlements for some coming Titans. Such is the nature of a great deal of this country, so covered is it with basalt boulders that scarce a blade of grass, in places, is seen on its surface. The comparative absence of fencing material has compelled the farmer to utilise the boulders for walls, and possibly in no other place in Australia can be seen more permanent field enclosures than those built of this eruptive material, so well adapted both by reason of durability, cheapness, and accessibility. At the foot of these hills the lands spread out into great level plains sparsely timbered with a species of eucalyptus, some of the lower areas forming themselves into extensive lakes and in some instances well-grassed marshes and extensive plains. Looking over these magnificent areas from the summits of Mount Leura and Mount Pordon, a good idea of their nature and value is obtained.

The view from Mount Leura is especially fascinating. In the immediate vicinity of your eyrie, evidence of volcanic action is visible in the numerous crater formations seen in the many hills nestling around what must once have been the prime active centre of eruption. Then in the far distance the eye scans lake and plain intersected here and there by plantations of wattle and pine trees running in symmetrical lines, evidence of the farmers' desire to minimise as far as possible the bleak winter weather conditions to which his dairy stock is too often exposed. In all directions, as far as the eye can see, lies splendid country dotted with prosperous homesteads, some nestling near the foot of a sheltering hill, others isolated on what in winter time must be a bleak plain. Other houses, again, are snugly located on a lake shore whose huge expanse affords many aquatic advantages and pastimes. So happily is this district situated with respect to its advantages of soil, climatic conditions, and nearness to market, that it would be very strange if it did not above all others demonstrate fully the importance of the dairying industry. In describing what came under my notice, I must, in justice to my readers, mention that at the period of my visit—the early part of December—the country is seen at its best. The seasons in Victoria and with us differ in a remarkable degree. Here in Queensland our period of scarcity of forage extends from the end of winter to the early spring months. In Victoria the dearth period occurs during the summer time. In those western districts they have, owing to a moist autumn and winter, practically eight months of favourable growing weather. This, taking the nature and variety of their natural and artificial grasses into consideration, accounts materially for the very prosperous condition of the dairying interests in this part of the State. The comparison between the grasses indigenous to our Queensland soils and those so very luxuriant in their growth and excellent in their fattening and milk-producing qualities of Victoria point conclusively to the very important factor this is in the success of Victorian dairymen. This matter of the acclimatisation of new grasses has not in our State been given the attention it merits. Save the little effort of the Acclimatisation Society during the past few years, no sustained attempt has been made in this direction. However, good progress is now being made by the society, and no doubt valuable results will accrue from the experiments now carried on under considerable difficulties at Bowen Park, owing chiefly to the very restricted area available for conducting these very valuable experiments. Too much stress cannot be laid on the value of improved grasses, more especially after observation of the luxuriance and quality of grasses introduced into Victoria—a value which is abundantly demonstrated by the results shown at the milking-pail, the Babcock tester, and the butcher's block. That many of these grasses can be successfully introduced into Queensland and prove the same success that they are in Victoria, there is no reason to doubt. The grasses native to Victoria, so I was informed, and this was borne out by my personal observation, were of a character vastly inferior to those which now, through introduction, serve such a useful purpose in Victorian dairying and grazing pursuits. Whether it is possible to grow these varieties in our State must be largely a question of experiment. That such experiments are justified and likely to prove valuable, the record of Victorian success amply illustrates. This is, perhaps, patent more in the eagerness displayed by farmers to secure leases and freeholds in these favoured districts at prices that would in the ordinary sense be deemed prohibitive to prosperity. Farms are here eagerly sought for at annual rentals of from 10s. to £1 5s. per acre, while freeholds are bought in large areas at from £10 to £40 per acre. An estate comprising 2,700 acres was disposed of during my visit, and the average price obtained was £19 10s. per acre. This indicates to us Queenslanders the vast possibilities before us in the matter of dairying if the pursuit is carried out with due attention to those phases that have made the industry so popular and profitable in the sister State.

As the object of this article is to give prominence to the value of the herbage growing on these farms, I will here enumerate a number of varieties which I was shown growing on the farm of Mr. George Harrison, of Pomperneet, whom I was particularly favoured in meeting, as he is an acknowledged authority on this subject. Mr. Harrison is a dairyman, and one who has proved that there is more money in the production of milk than in growing ordinary farm crops, which class of farming he, in common with others, was glad to abandon on the inauguration of the creamery and factory system. In this connection it came upon me as a surprise that, owing to the profusion of herbage obtainable during the most of the year, no crops of any kind were grown for cattle food. On the farm of Mr. C. T. Lucas, where I pleasantly spent a few days, this phase of dairying pursuit so very essential in our State was very conspicuous by its absence. Here, on a farm where they milk from fifty to sixty cows twice a day, not an acre of cow feed was grown, and its absence did not apparently diminish the owner's income, nor affect the condition of his herd. This was the case generally on all the farms I visited. I certainly expected to find some provision in either field, barn, or stack to meet contingencies of drought or fire, but nothing of the kind appeared to be necessary. Hence dairying in this matter of forage crops alone shows the value of the land and the confidence the people have in its carrying capacity in reliance on the herbage alone.

It may prove of interest to Queensland dairymen if I enumerate a number of grasses shown to me growing on the farm owned by Mr. Harrison. Some of these grasses were only in small plots; others were the staple grasses of the field, all of which were at their several periods of more or less value according to the season, or whether maturing early or late according to the altitude of the land, some of which, like the grasses it produces, is recognised as late or early land, and have a distinct bearing on the season's profit and the farmer's adjustment of his plans in the grazing of his herd.

The grasses pointed out were—Yorkshire fog, bird's-eye trefoil, rye grass (English), spotted burr clover, spear grass, barley grass, common white clover, common clover, oat grass, Alsike clover, red clover, cocksfoot, sweet-scented vernal grass, yellow trefoil.

In addition to these, I noticed vetches, lucerne, buffalo grass, and couch growing in small patches through the garden. The mainstays of the pastures appear to be spotted burr clover, spear grass, rye, cocksfoot, vernal grass, and the others more or less interspersed as the fastidiousness of the owner seemed to favour them. I found it very difficult to obtain authentic information as to how and when these grasses, now so widely spread, were introduced. The answer given by most was that they were sown by the old squatters, which, no doubt, appears was the case. Mr. Harrison now writes me that the "grasses were introduced by the pioneer squatters and have been spread in the dung of cattle, horses, and sheep. The spear, barley, and spotted burr trefoil are an exception, these having come in packing-cases and in straw and grain imported, and so have gradually been spread over the country. I found that an imported grass, to succeed, must be as robust as, or rather more robust than, the matured grasses of the country, otherwise they will be smothered and die out." This is evidently the story of the introduction of these grasses in a nutshell. If I appear to unduly praise the merit of these pastures, I can but say that only those who have really seen them in all their freshness and luxuriance can really appreciate them as I did. I do not in any way wish to infer that our Queensland lands in point of fertility are a whit behind them, but I do most sincerely hold that, until we have our pasture lands sown in like manner, dairying will not be, with us, the pleasant prosperous pursuit I found my Victorian friends enjoying. I was very much surprised to note that no provision had been made by anyone to use the superabundant herbage for ensilage purposes to meet the adverse conditions occurring in their dry summer period. This is a contingency these fortunate farmers have not, so far, deemed necessary to provide for; nevertheless, I think it a grave oversight that, with their grand opportunities, they do not make this provision for summer needs. The grasses are now spread by the simple operation of cutting, threshing out seed, and scattering it over the sward, leaving it to germinate or not, as the season or the weather may permit. Thus all of the areas are sown without any tillage operations being necessary. As may be expected, in daries where as many as 100 cows are daily milked, appliances for drafting and handling cows are very complete. Sheds are so constructed as to give the cows access and egress by mechanical devices of the most improved kind. Sheds and floors must be well constructed and drained to comply with the Dairying Act in force, for which supervision inspectors are appointed by the shire council, and who are also, in this instance, retained by the Camperdown Dairy Company to report, on their behalf, on the condition of the sheds, yards, utensils, &c., of the shareholders supplying the company's factories. Thus every precaution is taken to secure cleanliness. For the information of our dairy farmers, I give a remedy which Mr. C. T. Lucas has invariably used with success for hoven, which may be new to some. The remedy is half-a-cup of kerosene—nothing more; and the result is immediate relief. Many of the dairymen employ families on the share system. I visited one of Mr. Lucas's out-farms where this system was in vogue, and it struck me as being a solution of the labour question as far as milking was concerned. The practice is to pay the family, generally comprising the parents and several children, at the rate of 7s. in the £1 on the gross proceeds obtained for milk and pigs sold. A bonus is also added for the calves reared This method naturally relieves the owner of the farm of anxiety and supervision, as the incentive of a *pro rata* payment assures every reasonable care being taken of cows and stock, and is, after all, an example of a share principle in production which is of advantage to capitalist and worker alike. This is borne out by the fact that the emoluments of a family often reach as much as £200 per annum. This may appear a large sum to pay out of the profit of a dairy farm, but when it is considered that cows in those districts are claimed to give a yearly profit of £9 per head there appears room for good emoluments for all concerned. Reverting again to the question of grasses, those who follow dairy and pastoral pursuits will, perhaps, think I have held before them a rather rose-tinted picture of rural felicity. My colonial experience of forty years has enabled me to judge the character of much that relates to successful husbandry in these States, and whilst I here unreservedly give it as my opinion that, for the greater part of the year, there is no region that I have as yet seen which can excel the district in question as the fittest for carrying on the manufacture of dairy products, due, to a large extent, to prevailing climatic conditions and the fertile nature of the soil, I hold that these are but secondary factors, and that the main factor of success is the marvellous herbage these lands are carpeted with. The point I would most like to emphasise is, that in the early pioneering days previous to the introduction of these grasses the country had not nearly the stock-carrying capacity it now has. The number of cows now depastured is given at one beast to 3 acres. This, taken into consideration with the fact that as a general practice no provision whatever is made for conserving fodder for the summer scarcity, shows the good carrying capacity of the farms. The question then is—Why cannot we improve our grazing areas as has been so well done in Victoria? Granted, for argument's sake, that the moister weather conditions prevailing on those western lands are responsible for much that I relate, there is—taking into consideration that very many of our coastal districts, but not our interior lands, get a rainfall little less than that in Victoria—no reason why we cannot do so. Again, climatic conditions in each case do not vary so very much. I have endured in the southern State extremes of heat and cold equally as great as, if not greater, than I have experienced here. Thus the element of climate should be no bar to our making the pastures here as serviceable as those in Victoria. It thus remains for some one entrusted, beginning for preference on our coastal lands, to experiment on these lines. I am well aware that some of these grasses have from time to time been introduced into this State, and in some instances have given promise of substantial value. Nevertheless, no success in this direction, as far as I am personally aware of, has resulted to equal the result it was my good fortune to observe elsewhere. Judging from what I saw, I have come to the conclusion that only by slow processes of acclimatisation can we ever hope to permanently improve our pastures. It is beyond question that an imported grass may, and often does, promise well for a time, and then will inexplicably languish and perhaps die.

Such dying out is due to many causes, chiefly to the want of constitution or adaptability to its new environment. For this reason I hold that to successfully acclimatise foreign grasses we should bear in mind the fact that essential conditions to success lie in the importation of those species whose former habitat most nearly accords with its new surroundings. Thus there will, in all probability, be better hope of ultimate gain in the improvement of our local pastures through the introduction of grasses grown under conditions more in harmony with our own. English or American seed, coming as it does from countries in some respects the antipodes of our own, could not be expected to flourish with the same vitality as seed procured from these Victorian pastures, where conditions more nearly resemble those here. In the absence of experiment, it is scarcely possible to single out which of the grasses introduced is likely to adapt itself to our climate. One fact looms out conspicuously, and that is, until we in Queensland can, by artificial means, improve our herbage, our Southern neighbours, more particularly in the sections here referred to, will ever have a substantial advantage over us in this very important matter of dairy competition. Although there is much to learn and much to admire in a visit to this noted dairying centre, one cannot help wondering at the absence of winter shelter for stock. As a matter of general practice this protection, which, in the bleakness of Victorian winters, one would think so necessary, is absolutely neglected. In comparison with our own practice of providing green fodder or hay for seasons of scarcity, the absence of such provision came to me as a matter of surprise. This, however, is but another tribute to the excellence of the pastures, and shows that the industry can be carried on with profit, the excellent herbage being to the Victorian dairymen the co-efficient of what to us represents the preparation at much cost of land and fodder for the due care of the cattle. Perhaps my purpose has by these few remarks been fulfilled—that is, to call attention to the fact that in the improvement of our dairy pastures lie great possibilities which are in themselves obvious. The prosperity of the Victorian dairy farmer here outlined has not been the work of a short period, but it has been the slow evolution of years. Grasses which on their first introduction showed little vitality seem in the course of time to have evolved qualities indicative of the survival of the fittest, and now rank through natural processes as the established grasses of the districts.

Many matters of a technical character that I have made mental notes of regarding the manipulation of butter and cheese and general factory work I must leave in abeyance for the present. To the Queensland farmer a visit to these districts would be productive of much valuable experience, either as a lesson in co-operation, the management of dairy herds, or manipulation of dairy produce. Personally I much admire the quality of the stock kept by the Victorians, the character of their soil, and the general method of handling their business, but if asked to what I should ascribe their success I would say that primarily it is due to the nature of the grasses, upon which the results so very largely depend. Some seeds I brought with me have been handed to the Acclimatisation Society, and are now being tried by them, as this work is now a special object of the society's operations. It is to be expected that many of these southern grasses will be sown by them, and our farmers will have the results of the society's experiments.

I would like to call attention to the fact, that in the introduction of grass seed from the districts named, there is serious danger of introducing such pests as the various thistles. One of the star thistles is a most formidable enemy to the grazier. The Cape weed, with its pretty attractive yellow flower, is also looked upon with some degree of dread, though by some landowners its presence is not much feared. Very great care should be taken in the introduction of new seed lest these pernicious pests be brought along to the general detriment of our own pastures. I am sure that, by the successful establishment of herbage on our farms such as I here describe common to the districts visited, the carrying capacity of our grazing regions can be greatly augmented, and enhanced prosperity both in dairying and pastoral pursuits must be the result.

FOOT NOTE.—On many of our dairy farms, artificial grasses are largely sown. Oat grass, prairie grass, *Paspalum dilatatum*, lucerne, &c., are everywhere in evidence. It is questionable whether cocksfoot or red clover or sweet scented vernal would succeed, at all events below the Range.—Ed. *Q.A.J.*

DANISH *V.* COLONIAL BUTTER.

In a report on a visit paid to Denmark by members of the Committee on Food Preservatives, says the *Journal of the Board of Agriculture*, Dr. Bulstrode and Mr. Huddart state that year by year the manufacture of butter from pasteurised cream, prepared for the churn by the use of pure cultures, has been practised in an ever-increasing degree in Denmark. In connection with the subject of pasteurisation, it is pointed out that cleanliness is regarded as a very necessary precedent to the process. If once the bacterial products have conferred upon the milk or cream any unsatisfactory flavour, Danish experts hold that no process of pasteurisation can remove such flavour. By such pasteurisation the Danes have aimed at destroying what may be termed *the unknown* in the bacterial flora of cream, in order that, by the use of "pure cultures" of bacteria, they may be able to substitute *the known*. Their position is that without such precautions the production of a butter having a characteristic aroma is more or less a matter of chance, and hence cannot be absolutely relied upon.

The essence of the usual method of butter-making is to endeavour to bring about conditions which are favourable to the development of certain species of bacteria; the essence of the Danish method is to kill or inhibit the growth of all the bacteria concerned in the process of "ripening" and to promote the necessary souring of such cream by the introduction of a starter prepared from "pure cultures." By this means butter is manufactured which can be safely exported to England without the use of preservatives. It is of interest, in relation to the bacterial flora of cream, to note that there would appear to be a tendency to pasteurise at an increasingly high temperature, and experience indicates that, within certain limits, the higher the temperature at which the cream is pasteurised the better is the resulting butter likely to be.

The writers of the report state that the progress of the practice of pasteurisation in Denmark has been remarkable, and at the present time the vast bulk of Danish butter is made from cream thus treated. The passing of the law of 26th March, 1898, which renders the pasteurisation of milk used for the food of cattle compulsory, has doubtless been a force in the diffusion of the custom of cream pasteurisation, but the practice seems to have become general mainly owing to the satisfactory results which, in the opinion and experience of the Danes, have accrued therefrom. Moreover, the fact that the process is calculated to destroy most, if not all, the pathogenic bacteria has not been without its influence in a country where the care of the public health is made a matter of considerable concern.

ANGORA GOATS.

We live in hopes of some day interesting farmers who own hilly, stony, scrubby country in the subject of Angora goats. We have given them a fund of information about these valuable animals; but, beyond half-a-dozen inquiries, little interest has as yet been aroused in them. One man puts all his eggs into the wheat basket, another into the corn and potato basket, whilst a third will have nothing to do with anything but lucerne, yet keeps no sheep, and does not rear lambs for the home market. England is crying out for cotton. The English papers publish articles in which they impress on Queensland the advantage of growing cotton. Sisal hemp, grown here like a weed, fetches from £23 to £25 per ton in the British market, thriving on soil that will only grow stringy-bark trees and lantana, but not ten farmers grow sisal hemp. Here is an extract from the report of the Kansas Agricultural Society on Angora goats:—"They are a profitable animal in the feed lot; give them like conditions and the same amount of grain, they will take on flesh very rapidly, and fatten in one-fourth less time than the sheep. They respond very quickly to good care. At the final test of all domestic animals—the butcher's block—the Angora goat is not found wanting. Their flesh in summer, when browsing, has a very delightful flavour, between venison and mutton, which gives the name 'venison' to their meat. Being a browser, like the deer, it is right that it should assume the name of its meat. In winter, when fattened on grain, it loses that flavour, but acquires a mutton flavour. It has none of that 'woolly' taste of mutton, which is so objectionable to many people. Thousands of them are killed in all our packing-houses, and sold as 'well-dressed mutton.' Only an expert can tell the difference, as their carcasses appear the same when dressed and hanging in the meat market. They will dress out a larger per cent. of meat than sheep; hence it is that they are much more valuable. Its meat is more juicy than mutton, and a finer flavour. Then you know what you are eating is absolutely healthy and free from disease. Thus we find a new and profitable animal for the farm, which will thrive and fatten on that which curses the land, and it will take its place among the leading industries of the country."

DRIVING *V.* LEADING PIGS.

A correspondent of the *Scottish Farmer* furnishes pig-drovers with a new idea. Instead of driving pigs, lead them. This is his experience:—

"A cloud of dust in the distance. It rose as if from a smoking fire. As you came nearer a horse between the shafts of a dray could be seen, and then the dray itself, the wheels helping to create some of the smother we were approaching. A bit of hard road intervened, and the wind coming up swept to the east the heavy cloud, and then the cause came to view: hundreds of pigs in all sizes of fatness rolled, pushed, screamed, squealed, grunted, and struggled to reach the tail of the dray. Every now and then one, two, or three, never more, stopped, arched their backs, and brought their snouts with a jerk to the ground. No driver was at the rear, and yet this great mob of squealers pressed steadily onward. We passed alongside, and turned to look for the cause, for the driver of the dray appeared a modern version of the Pied Piper of Hamelin, and there from beneath the tailboard of the dray trickled slowly, methodically, a broken stream of maize. My companion laughed; I roared, and then on we went along a track marked by the thousand footmarks of these latter-day votaries of the worship of the donkey and his bunch of carrots. We had learned a new way of driving pigs—lead them, and it's 'amaizingly' easy."

The Horse.

THE PONY: ITS BREEDING FOR ARMY PURPOSES.

By Sir RICHARD D. GREEN PRICE, Bart.

The pony, beloved in our boyhood and worthily esteemed in our middle age, disdained in our youth, tolerated in later life, has suddenly sprung into an importance such as, when I penned an article many years ago in the pages of *Baily's Magazine* on its virtues, was quite unexpected. His admirers are now many, his historians are great, and his value has increased; so much so that the preservation of his breed by the registration of pedigrees in a stud-book has been undertaken, and is progressing most satisfactorily, and a strong society has been formed for his improvement.

No doubt we have to thank the advance of the game of polo as an aristrocratic national game for this boom in ponies. And yet this is not all. It has been discovered (as I contend it ought to have been long ago) that ponies are an essential factor in modern warfare. The subject of small horses in warfare has lately been so ably handled by Sir Walter Gilbey that I need not venture to quote better authorities than he gives to strengthen our arguments in favour of ponies in warfare.

In addition to this I have many personal assurances from officers in the army, and men fresh from South Africa itself, that without their ponies the Boers would long ago have been conquered, and that those in our colonial and Lovatt's Scouts' ranks have been of the greatest value to our service. It was only a few weeks since that I had the testimony of my son, an Imperial Yeoman, who has been through the whole campaign, and who, writing home, said:—"You are doing good work in strongly advocating the use of ponies in our army service; they have fairly outlasted the bigger horses in this campaign, and without the aid of our mounted men the infantry would have been unable to tackle the Boers. They (the infantry) have been marched to death in the impossible task of cornering a well-mounted enemy, and in this the Yeomanry and colonials have been invaluable."

It would have been well for us had we purchased in the first instance Basuto ponies instead of leaving them for the Boers to become possessed of. The authorities have imported to South Africa some 20,000 small horses from South America, besides a large number from Texas, but, according to the best opinions that I have been able to glean, they have proved soft beasts, and not satisfactory remounts in the great majority of cases.

So many reforms are likely to follow in the wake of this great Boer war that it is perfectly safe to expect that our heavy cavalry will be almost done away with, and that lightness, quickness, and smartness will be the points of efficiency to be aimed at. Beyond this it would not surprise me to see one or more companies of mounted men attached to every regiment of infantry, and to these the pony will be essential. Easy to mount and dismount. easy of carriage, of good constitution, of less target for the enemy, and easier obtainable in foreign countries than the larger horse, it needs little argument to prove that that the pony, not overweighted, will be the exact requirement of our mounted infantry. Indeed, I may state as a fact that the War Office have already approved the formation of a pony regiment for the district adjoining the New Forest in Hampshire.

Taking all these circumstances into consideration, it stands to reason, as every reader of the *Live Stock Journal Almanac* must see, that the future breeding of our ponies is worthy of much thought, that the supply should keep pace with the demand, and, above and beyond this, that quality and excellence should go hand in hand with quantity.

There are so many parts of Great Britain that are eminently fitted for breeding ponies that we have a vast field for our exercise of this enterprise. By way of illustration let me take my own country of Radnor, with almost every acre of which I am intimately acquainted. Here there are at least 100,000 acres of hill land that hitherto have been given up to sheep pasturing, and have had only a sprinkling of ponies on them (and those, I regret to say, of a very inferior quality). During the last few years, owing to the lowness in the price of wool, these sheep have decreased at least by one-half, as it is now well known that it does not pay to keep old wether sheep for the mere sake of their wool. Therefore, why should not the pony (improved) take the place of the sheep? Thousands of ponies could thus be bred in Radnorshire alone, in a highly remunerative way, and yet this little county forms but a small spot on the pony-breeding area of our country. And let me here point out that it is on the highlands of South Africa—viz., in Basutoland—where the hardy ponies are bred.

The idea of raising what I may call the nucleus of pony battalions in Great Britain may sound a crude one, and no doubt it is so at the present moment, and yet there are many far-seeing men who would fain agree with me, and have already begun to pave the way by breeding to a type of improved riding pony. Here the thoroughbred or the best type of Arab, on the sire's side, is the one most likely to succeed, and the height to be aimed at is from 14 hands to 14 hands 2 inches. This may seem a difficulty at first, but it is proverbial of the Welsh pony at least that it breeds animals bigger than itself, if they are not absolutely starved in their youth, and no doubt the same can be said of other notable pony breeds.

Let me beg pony-breeders on a large scale in hilly countries to eschew the hackney or mere half-bred trotting cob, if they intend to build up a herd of ponies fitted for riding purposes. By the use of hackney sires they will be defeating some of the finest attributes that Nature has moulded in the real hill pony—viz., stamina, tractability, and sure-footedness, which can never be attained in a rough hilly country by an animal that tosses his legs about, and tires after going a few miles.

The Polo Pony Society has a great future before it—as great, I venture to think, as that of any of the other distinctive breed societies in their own particular line; and I am convinced that the type of pony which we are endeavouring to set up and encourage in our stud-book is the one most likely to succeed—viz., the thoroughbred, or the first cross from it on the sire's side, also the Arab on the sire's side, and the polo pony mares, or their dams, or the likeness of their dams and the best Welsh or Moorland mares, as well as Irish pony mares, on the dam's side.

Our agricultural societies and horse show societies (and their name is legion now) are beginning to recognise the importance of including ponies in their prize lists, and in this they are clearly marching with the times. It needs but a word of encouragement from the War Office to set the pony ball rolling in earnest, and, with Lord Roberts at the head of this great department of State, I do not think we need fear for what his vote will be, for there is no one in the army who, from his Indian and sporting experience, has had more reason to prove the efficacy and efficiency of the pony in India or throughout the world. Hence it is that in being a humble follower and believer in the sound sense and judgment of Sir Walter Gilbey in what pertains especially to horses, I unhesitatingly advocate pony-breeding of the best type, as not only conducing to the assistance and popularising the game of polo, but also of giving us better riding ponies and battalions of mounted infantry such as will be in a few years the admiration and envy of every nation in the world.

It may seem presumptuous to point out to such of the readers of your *Almanac* what sort of a horse the small war-horse of the future should be. We can only picture him in our mind's eye as an animal of about 14 hands 2 inches, with courage written on his countenance and docility in his eye, strong neck, with shoulders well set into a short powerful back and loins, wide in the hips, and thick-set in the buttocks, a full well-set-on tail (undocked), his legs short and straight, with clean bone and sinew throughout and feet to match—in fact, a diminutive dray-horse, with the activity of a high-class hunter. Breed such a one as this, dear friends, not by tens, but by hundreds, and even thousands, and you will be rendering a service to your country, and may I not also venture to think that there will be a considerable addition to your pocket?

Here again we have to thank sport and sportsmen for setting the fashion in polo ponies, in the purchase of which in the future I trust that there will be little or no occasion to go so far afield as the Argentine or Texas for ponies suitable for their purpose. Home breeding and home consumption should be our watchword, and thus soon exportation will take the place of importation, and cause the flow of money to be inwards, as regards breeders, instead of outwards to foreigners and strangers.—*Live Stock Journal Almanac.*

TO PLACE POWDER IN A HORSE'S EYES.

Mr. F. Herbert, Cloncurry, gives directions for powdering the eye of the horse, which may be new to many. Some people blow the stuff into the eye. The best plan is to moisten the point of the second finger, and dip it into the powder. Then with that hand gently rub the eye, open the eyelid with the first and third fingers, and touch the corners of the eye with the powdered finger. Many horses at the Cloncurry get cattle blight in one or both eyes when the flies are bad, and there are a good many cases on which our correspondent practices. His method does not make a horse touchy about the head as when any substance is blown into the eye. He finds sulphate of zinc the best remedy for blight and also for removing any slight scum.

BOTTLING FRUITS.

In bottling fruits ready for table or dessert use, a full syrup should be used. In other cases half syrup is used, when sugar would have to be added in taking the fruit as a dessert. There is another process of preserving in water alone, the fruit in this case being intended for cooking. A full syrup is made by mixing white sugar and water at the rate of 1 lb. of sugar to 1 pint of water, and boiling for five minutes. The fruit is put into this syrup in a preserving pan, and boiled till cooked, but not broken. Each kind of fruit requires a different length of time to cook, but in practice the operator can always judge by using a darning-needle to pierce the fruit and indicate when the softening process has been carried far enough. The fruit is then quickly lifted out of the pan with a large spoon, and put into the glass jars, the lids being immediately closed. The jars or bottles are provided with air-tight lids. This process is quite effective, but the fruit is apt to get somewhat broken, so that for show purposes a modification is often introduced. Under this modified system the fruit is put direct into the jars before being cooked. The jars are then set in a boiler of water, and the boiling is continued until the cooking process is complete. Care must be taken in either case to close the lids while the syrup is hot. In the canning factories the latter process is followed, the fruit being put into the cans, which are filled with syrup and soldered up. The cans are next dipped into a boiler, and after remaining long enough to be cooked are taken out and pierced with an awl to allow the expanded gases to escape. The awl holes are immediately soldered up, and the tins are thus ready for labelling. In bottling it is found that the fruit shrinks on cooking it. If, therefore, the method of cooking in the bottles is adopted, it will be necessary to have a reserve quantity of fruit at hand in syrup from which to fill up the bottles before putting on the lid.—*Garden and Field.*

Poultry.

PRESERVING EGGS.

The preserving of eggs by various means continues to receive great attention in Europe, the United States, and Canada. We have also received many inquiries from various parts of Queensland as to the best preservative to use, and have always recommended lime-water as the best, having practically proved it by keeping eggs perfectly fresh for nine months in the solution. Several experiments have been made in Canada by Mr. F. T. Shutt, chemist to the Canadian Experimental Farm during the last three years. In the experiments of 1898-99 some of the eggs were placed in various solutions in the first week of October, and tested at the beginning of the following March, and others were retained under experiment until December, 1899, a period of fourteen months. The preservatives were of various kinds, and after careful examination of the eggs, including poaching, it was concluded that saturated lime-water gave by far the best results.

The experiments were renewed during the past year on 5th June, and the eggs were examined on 10th December. Three eggs of each batch were poached.

The *Journal of the Board of Agriculture*, writing on the subject, continues thus:—

Briefly stated, the results were as follows:—

1. Eggs immersed continuously in saturated lime-water. Outward appearance, excellent; yolks, non-adherent, of good colour and fairly globular; albumen somewhat more limpid than in fresh eggs and slightly discoloured; a very slight "stale" odour; air space normal; poached eggs free from all objectionable taste and of good appearance.

2. Eggs first smeared with vaseline and immersed continuously in lime-water. Externally somewhat darker than the foregoing, and rather greasy; yolk globular and of good colour; albumen a very faint yellowish tint and somewhat limpid; a very slight "stale" odour; air space normal; poached egg very similar to that in 1.

3. Eggs continuously immersed in 2 per cent. silicate of soda. External appearance good, and very similar to that of eggs in lime-water; yolk globular and of good colour; albumen but very slightly discoloured, almost normal; marked odour of a "soapy" character, which is further developed in poaching; air space normal; poached egg of very good appearance, but with faint "stale" flavour.

4. Eggs continuously immersed in solution of 5 per cent. gum arabic and 1 per cent. formalin. Outward appearance inferior to those in foregoing tests; yolks attached to shell; albumen decidedly discoloured; odour not marked; air space normal; appearance of broken egg much inferior to those in preceding test; developing marked flavour on poaching.

5. Eggs continuously immersed in 5 per cent. gum arabic plus 5 per cent. salicylic acid. Preserving solution quite mouldy, and with a very bad smell. Egg-shells quite soft. The broken egg, though not unsightly, had a most nauseating odour, and was quite unfit for food.

6. Eggs continuously immersed in 5 per cent. dextrim plus 5 per cent. salicylic acid. Preserving solution very mouldy, and smelling badly. Egg-shells soft, and contents unfit for food.

7. Eggs dipped momentarily in dilute sulphuric acid, then washed and stored in a large bottle. All exceedingly bad; contents very offensive.

8. Eggs dipped momentarily in sulphuric acid, washed and dipped in alkaline ammonium oxalate, then stored in large bottle. All the eggs very bad, and contents offensive.

These experiments corroborate many of the results obtained in the previous year, and are held to afford further proof of the excellence of the eggs preserved in saturated lime-water. Mr. Shutt thinks that, on the whole, 2 per cent. sodium silicate gives better results than the 10 per cent. solution, but he is also of the opinion that lime-water is superior to both as an egg preservative. "Moreover, it is cheaper and pleasanter to handle."

TESTING THE AGE OF EGGS.

The *Deutsche Landwirtschaftliche Presse* of the 28th September last publishes an account of a method of determining the age of eggs, which has been tested and awarded a medal by the Society of Saxon Poultry-breeders at Halle, and has also received prizes elsewhere.

The apparatus is based on the physiological property that the air-bubble at the blunt end of the egg increases in size with the growth of the embryo. When the egg is placed in liquid it has consequently an increasing tendency to become vertical, with the blunt end uppermost. The apparatus itself consists of a glass vessel, bearing at the back lines drawn at various angles, each line being marked with the age. The vessel is filled with some harmless liquid, in which the eggs to be tested are laid. Each egg will take up a certain position, and, according to its age, its longer axis will be more or less inclined to the horizon. The direction of this axis is compared with the lines at the back of the vessel, and the age of the egg read off at the line to which its axis is parallel.

A new-laid egg lies horizontally at the bottom of the vessel. An egg three to five days old raises itself from the horizontal, so that its axis makes an angle of about 20 degrees. At eight days old this angle has increased to about 45 degrees, at fourteen days it is 60 degrees, at about three weeks it is 75 degrees, and after four weeks it stands upright on the pointed end. A bad egg, or one more than five weeks old, floats. With practice it is stated that the age can be told to a day.

POULTRY NOTES.

OLD HENS.—It is no wonder that many people say their hens don't pay. One common reason for this is that, as eggs are the paying item, their hens are kept until they are too old, and are all the time eating their heads off. Indeed, most people do not know the ages of their fowls, and they may take for table a young fowl in full lay, while a four-year-old that may lay twenty eggs in the year is walking about, a daily loss to the owner. A strict note of each year's hens should be kept where too many fowls are kept for the memory to be relied upon. Another source of loss is the allowing a hen to go three or four months with two or three chickens, sometimes one. It ought to be a maxim always to set two or three fowls at once; then if hatchings are poor, one hen may take the lot, and the other two may be set for the second time, if so, taking care to take them off the nest every day for about half-an-hour and feeding them as much corn as they can eat, or sent back to the yard and well fed, when they will lay in two or three weeks. Again, no watch is kept on the layers to find the best, these to be kept over the second year, while the poor layers are eaten or sold. Many a time very poor layers are kept over for a second year that have not paid their way the first season. When the best layers are known, too, their eggs can be used for sitting. When there are a good many hens kept, say over a dozen, there is usually an outstanding good layer; her eggs should as far as possible be used for hatching. There is no type of good layer—that is, there is no particular shape of body by which we can recognise that a hen ought to be a good layer. Good layers are of all shapes, but they are invariably the hens that are always busy looking for something; the scratchers and searchers are usually the good layers; the hen that looks dull, hangs about the house, and refuses to go afield and find something for itself should not be kept.—*Journal of the Jamaica Agricultural Society.*

CAMPINES.

In continuation of what we published in the February issue of the *Journal* on the subject of the Campine breed of poultry, we are pleased to add the remarks of Mr. Joseph Pettipher, which the *Garden and Field* reprints from *Poultry Monthly*, together with an illustration of three Campines (pronounced Kampeens). He says:—

They are a breed that has become deservedly popular in England during the last year or two; and when their appearance and economic virtues become better known, there is every prospect of this popularity being largely increased.

There are three varieties—Silvers, Golds, and Whites. At the present time the Silver variety is much more largely kept in England than the Gold or White.

The illustration shows three Silvers, the centre bird being the father of the other two. This old cock is a good size, weighing close upon 6 lb., and is a grand breeder. He is probably the only bird of any variety in England to-day who has distinguished himself by breeding the winners of cup first, second, and third, Crystal Palace, in the same year (1900); and this in strong competition, including imported Belgian winners. The remaining cock and hen are typical birds, the hen being the best Silver Campine out last year. Neither of these two birds were exhibited at the Crystal Palace, but they ho:

came into competition with my first Palace winners at the last Liverpool show, where the hen illustrated took first and the cock second. In addition to this, they have won a number of first and special prizes at leading English shows.

The old cock has never been exhibited until a few weeks ago, when he took first against 1900 and 1901 birds of excellent quality at Bentham.

When allowed a free range, the Campines are wonderful foragers, ranging over a large extent of ground, and practically earning their own living. They are very alert, and, when alarmed, can fly to a great height. I have, however, found in practice that, in ordinary circumstances, a 6-foot wire fence is sufficient to keep them within bounds. They are a very "friendly" breed, and on short acquaintance will eat out of the attendant's hand. They are non-sitters, lay a good-sized white egg, ranging from 2 to $2\frac{1}{4}$ oz., and are the most prolific race I have ever kept.

My interest in the breed was first aroused in 1897 on reading an account of a tour through Belgium undertaken by Mr. A. F. Hunter, late editor of your contemporary, *Farm Poultry*, and our Mr. Brown, F.L.S., secretary of the Nation Poultry Organisation Society, with the object of ascertaining the position of the Belgian poultry industry, in which they referred to the wonderful laying properties of the Campine.

* * * *

My request to the artist was to draw the actual birds, not imaginary ideals, and I must say the lady has succeeded in producing a most faithful and lifelike drawing.

The Campine is an old Belgian breed, and derives its name from the "Campine District" in that country, where it has earned for itself the soubriquet "poules pond tous le jours," or "every-day" layers.

The breed has been developed by the Belgians on utility lines with a view to quantity any size of eggs, and they have paid very little attention to plumage and fancy points.

When hatched both Gold and Silver chicks are a golden brown colour, the Golds being a darker shade. The chickens are hardy, feather quickly, and are extremely precocious, the cockerels crowing in many cases under five weeks old. At six to eight weeks they are as plump as a partridge, with plenty of meat on the breast.

The weight of adults runs about $5\frac{1}{2}$ lb. for cocks and $4\frac{1}{2}$ lb. for hens, and these were the standard weights originally fixed; but as it was found the size was rapidly increasing the weight was left open when revising the standard.

It will be seen from the illustration that the plumage of the Silver hen somewhat resembles a pencilled Hamburg, being white-barred, with broad greenish-black markings, except the neck hackle, which is white. The cock, unlike the Hamburg, has a pencilled breast, and most adult specimens have at present more or less white on shoulder or wing and saddle. In order to avoid that bane of many otherwise good breeds, "double mating," the Campine Club has now made the English standard for plumage of cocks the same as for hens. They have blue legs, white lobes, and single combs, the latter upright in cocks, falling over in hens. They have a very smart and graceful appearance, with a lull, prominent dark eye, and command admiration from the most casual observer.

For information as to the Campine standard, general characteristics, colour, scale of points for the guidance of judges, and disqualification, we refer our readers to the February issue of the *Journal*, page 102.

Viticulture.

A SECOND EXPERIMENT IN TOPPING.

By E. H. RAINFORD, Instructor in Viticulture.

In the *Agricultural Journal* for March, 1901, there appeared a short article by the present writer descriptive of the results of an experiment in topping, to show the injurious effects upon the quality of grapes which short topping has. The vines selected for the experiment were Mataros or Espars, the topping was effected at a height of 1 foot from the spurs, with the result that whereas the grapes from the untopped vines gave 20 per cent. of sugar, those from the topped vines gave only 16·5 per cent. of sugar.

As, however, a single experiment is not always conclusive, further and more extended trials were made this season at the Westbrook Experimental Farm, and with the same result. The vines selected for the experiment were:—

12	Mataro vines topped to	1 foot
12	,, ,, ,,	2 feet 6 inches
12	,, ,, ,,	5 feet
12	Mauzac vines ,,	1 foot
12	,, ,, ,,	2 feet 6 inches
12	,, ,, ,,	5 feet

The latter variety is, in Queensland, improperly called W. Salvino and W. Solferino. The vines experimented upon were in continuation, so that they were grown under exactly similar conditions of soil, cultivation, moisture, &c. When the grapes from the bulk of the Mataro and Mauzac vines were ripe and ready for picking, those from the experimental vines were tested with the following results:—

				Per cent.		Per cent.
Mataro	topped to	1 ft.	gave sugar	16	tartaric acid	7·3
,,	,,	2 ft. 6 in.	,,	17·5	,,	6·7
,,	,,	5 ft.	,,	20	,,	6·5
Mauzac	,,	1 ft.	,,	21·75	,,	5·3
,,	,,	2 ft. 6 in.	,,	22·50	,,	4·9
,,	,,	5 ft.	,,	24	,,	4·6

There was less colour in the short-topped Mataros. An examination of the above figures shows that there is a steady increase of sugar and decrease of acidity in proportion as the topping decreases in both varieties. Moreover, the difference in sugar between the Mataros topped to 1 foot and 5 feet is almost exactly the same as last year—*i.e.*, 4 per cent. Surely the strongest partisans of the short-topping system must, after this, be convinced of its ill effects on the quality of grapes.

A NEW USE FOR THE ONION.

The onion has been recommended as a beneficent remedy for diseases in poultry on account of the essential oil, which causes tears to flow from the eyes; hence therapeutic qualities of great value are attributed to it in the case of throat affections in said poultry, which, as we well know, is the disease which decimates our poultry yards. The administration is very simple: Once or twice a week cut up the onion into very small pieces, and feed it to the poultry. It will keep them in excellent condition for fattening and producing plenty of eggs.—*La Industria*, Nicaragua.

Apiculture.

THE NEW PROCESS WEED FOUNDATION.

By H. R. STEPHENS, Toowoomba Apiaries.

As the above improved bee-comb foundation is finding favour with apiarists in preference to the ordinary hand-roller process, it may be asked: How is it better? Well, the advantages claimed for it are—

1. It is tougher, and for that reason the bees take to it more readily, as it is more easily worked by them.

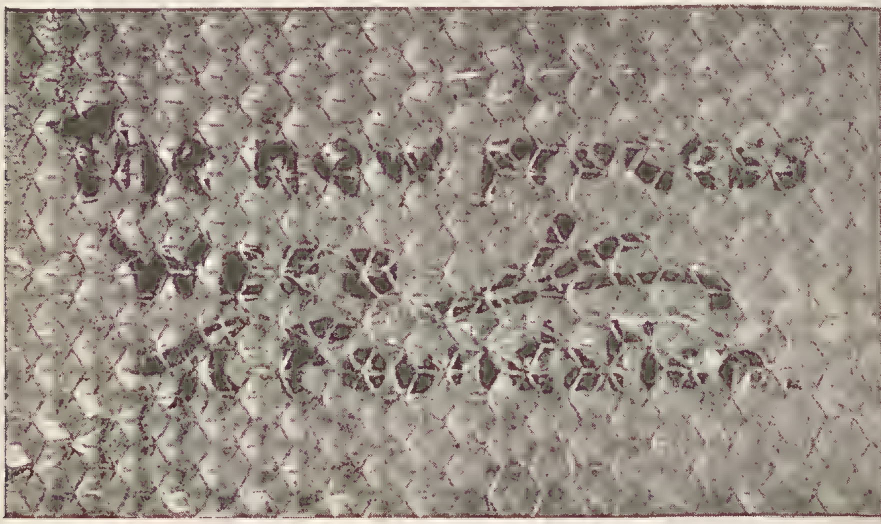
2. It does not stretch or sag like the ordinary, which is of great importance when extracting.

3. The certainty of its purity, as the machine will not work it up if adulterated with even a small quantity of foreign matter.

4. There are more square feet to the lb.; hence the number of sheets in 1 lb. will be greater.

5. There is said to be about 800 cells more in a Langstroth frame than with ordinary foundation.

6. The New Process foundation is very clear and transparent. If laid on a sheet of writing-paper, it is possible to read through it. This transparency is due to the method of making the sheets, as they are forced through dies under heavy pressure in continuous sheets and reeled on large bobbins. This



process of manufacture presses out all air cells, making a product that is perfectly homogeneous. After leaving the bobbins the foundation is automatically cut to the required size for insertion in the frames of a beehive. Foundation is made in three grades, as follow:—

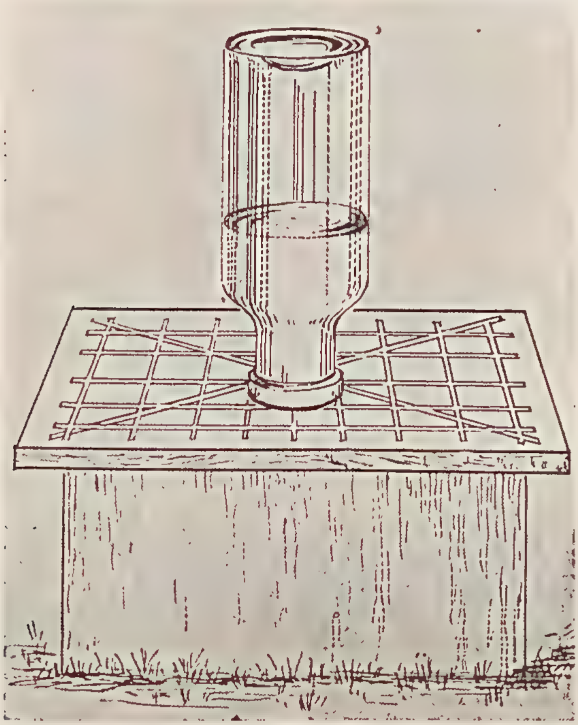
		Sizes are—
Medium brood, 6 to 7 sheets to the lb.	...	$16\frac{3}{4}$ in. by 8 in.
Light brood, 8 to 9 sheets to the lb.	...	$16\frac{3}{4}$ in. by 8 in.
Thin super for sections, 24 to 26 sheets to the lb.		$15\frac{1}{4}$ in. by 4 in.

BEE NOTES.

From the A B C of Bee Culture.

Best temperature for a beehive-house, 45 degrees Fahr.

To supply bees with water, get a piece of board about 1 foot square, and with a grooving-saw plough grooves from one end to the other, taking care they do not run out. Then cut a groove from each corner to the opposite one, and a couple more across the grain of the wood, near the middle. Make the grooves about ¼-inch deep. Invert a jar of water on the centre of the board, and the



grooves will just keep full of water as long as there is any in the jar, and yet they will never run over. The bees stand on the walls of wood separating the grooves, and are in no danger of drowning or even of getting a wetting. This also makes the best "feeder" ever invented, using sweetened water instead of water only.

When a bee has inserted its sting into your face or hand, and you drag the insect off, sting and poison-bag are left behind, and the bee is done for. The sting is barbed, and the barbs prevent its withdrawal from the flesh. How would the bee extract the sting? Let him show you. Allow him to sting you deeply on the hand. Don't disturb him. Grin and bear the pain. You will see that he first gives a little pull to see if the sting will come out. Then he starts walking round in a circle, and turns it out like a screw auger, and flies off happy.

To open a hive without being stung, take off the top and remove the sheet. Decide then which frame will come out easiest, and slide the rest a little way from it. By sliding two or three on each side you will get all the room you want to lift out the frame without pinching a single bee. After making room in this way, draw out the frame very slowly. You may do this, if the bees are fairly quiet, without using smoke and without being stung.

To discover the hive that robbers belong to, sprinkle them with flour as they come out of the hive being robbed. Now watch what hives they go into. If the robbers are going in and out rapidly and running over the sentinels, shut up the robbed hive at once and keep it shut. If it is standing in the sun and full of bees, they would probably smother; therefore air must be given to them. One way of doing this is to make an opening and close it with wire gauze, but then again, like the prisoners in the Black Hole of Calcutta, they will pack densely against it, and so exclude the air. You might put on an upper story and cover it with wire cloth, but the robbers inside make such a fuss that they call the robbers outside to them, and they keep up a disturbance in the apiary all day long. Worse still, the outside robbers make an arrangement with the imprisoned ones, by which the latter pass the honey out to them, and thus clean out the hive effectually. Now a double wire cloth prevents this sharp practice.

The best plan is to brush away all the bees round the entrance, and keep them away till all get out that wish to. You may then close the hive with very little danger. If you have got all the robbers out, you may give the others their liberty next day. If they will not then defend themselves, shut them up for three days. By that time even the robbers will adhere to the stand as if it had always been their own.

Horticulture

WATERING YOUNG TREES AND SHRUBS.

Amateur gardeners as a rule do not understand the art of watering in dry weather. When they see that the flowers and shrubs are drooping, they attach a hose to a stand pipe and thoroughly wet the—surface. They rarely think of looking to see how deep the water has penetrated, and would be astonished to find that after half-an-hour's hose play the soil is only wetted to the depth of less than a quarter of an inch. Such watering is worse than useless. Far better to mulch the soil, and trust to that for the preservation of moisture than to form a thin layer of damp soil, which only attracts the roots upwards to it that they may be parboiled by the hot morning sun.

A good way to water shrubs is one which we adopted with perfect success in the case of some valuable coffee-trees during a very dry season. We took a number of beer bottles, and, with a tap of a pick on the bottom knob, drove the bottom neatly out. These bottles were then buried neck downwards close to the tree. Every night they were filled with water, which slowly drained away beneath the surface—1 foot below. The rootlets then sought the needful moisture downwards instead of upwards, and the plants grew luxuriantly. The surface was never watered, but by capillary attraction it was kept fairly moist.

In India, gardeners bury a porous jar like a water monkey unglazed. They are filled as soon as empty, and a plug on the neck serves to keep out insects and dirt. If gardeners would try this plan they would save many a plant which would die under the ordinary hose treatment.

Tropical Industries.

HOW TO SECURE AND RETAIN A GOOD MARKET FOR QUEENSLAND TOBACCO.

By R. S. NEVILL, Instructor in Tobacco Culture.

Now that federation is accomplished, and the demand for tobacco from Queensland by the other States is assured, it is well for us to take into consideration how we are to increase the demand and supply it. If we fail to sustain the reputation that our product has acquired, this demand will cease as quickly as it came; but if we use our best efforts to improve the quality, and to meet the requirements of the manufacturers, the results will be satisfactory to both growers and buyers; and if we do not make this effort, and give them the very best the country will produce, they will be unable to produce an article satisfactory to the public, and will be forced to seek elsewhere for something that will give this satisfaction. It will not do for us to be satisfied because the present margin of profit is good: we must seek to make it better, by making our product indispensable to the buyer; and only in this way can we be assured of a permanent and profitable market. Rubbish can be grown anywhere, but good tobacco cannot. The question then is, how to accomplish this—

1st. By building better sheds and taking more care in curing the crop.

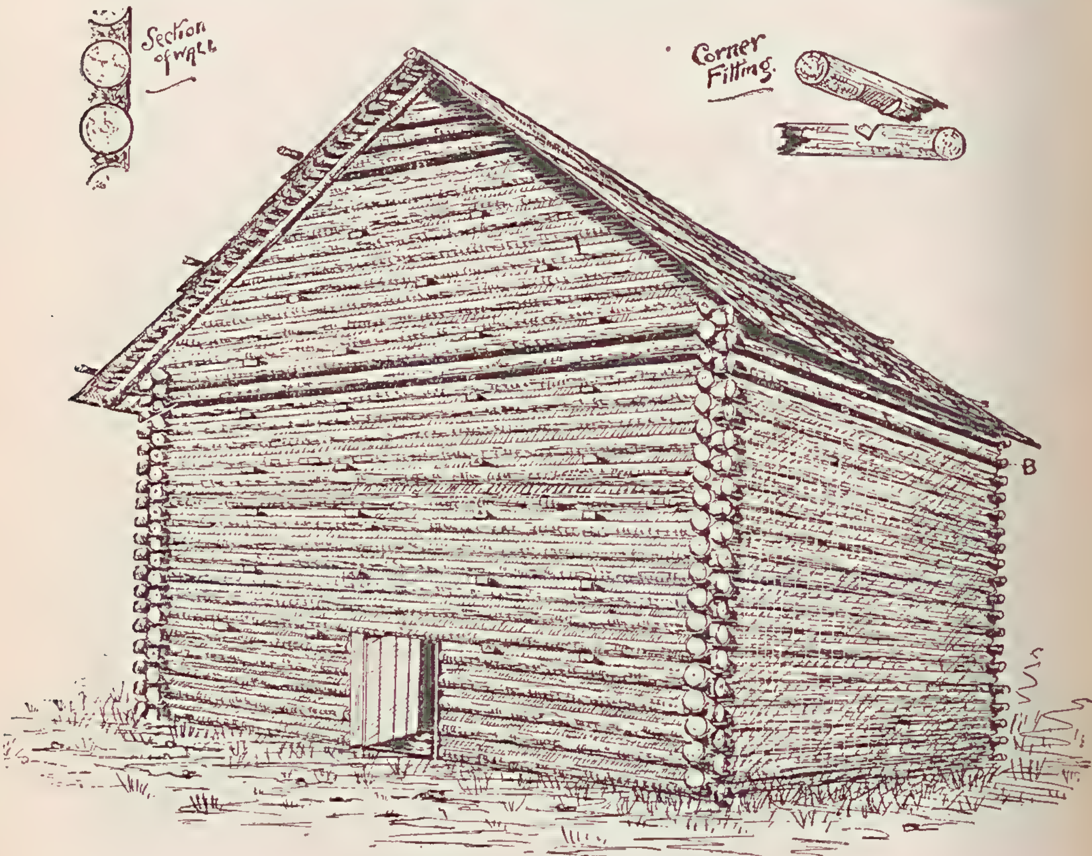
2nd. By properly handling it after it is cured.

After four years' experience in this State, I recognise there are difficulties here to contend with in tobacco-curing not met with in America, chief of which is the getting rid of the green colouring matter (chlorophyl) in the leaf. The causes of this I believe to be the exceeding dryness of the climate, high winds, open sheds, an almost entire absence of dews that prevents softening of the leaf after the curing has commenced, and thus prevents bleaching or rectification of any errors if artificial processes are used. As shown heretofore in articles on tobacco-curing, the process should be uniform, and the sheds so constructed as not only to have uniform conditions prevailing, but in a *measure* be able to create artificially conditions that are required; this cannot be done in open sheds. Whether tobacco is cured by air or artificial means, the best results are to be obtained, ordinarily, in a closed-in shed with wooden roof.

I have found, with the greatest care and with well-constructed sheds, there will be a goodly amount of green tobacco in ordinary seasons, and this must be cleaned up, for in this green state it is almost valueless: how to do this is very simple.

This green tobacco should be tied in very small bundles or hands, not more than six to ten leaves; a low scaffold should be built near the shed, and the green hung out in the open air and remain there until the green disappears, taking it in if it rains. The scaffold should be low, so that the tails of the tobacco will be 18 inches or 2 feet off the ground. If the bundles are made large the centre cannot get the benefit of the bleaching process. In fact, all the bundles should be tied of moderate size, say ten to fourteen leaves, that they may get the full benefit of the light and air. It is a mistake to suppose that tobacco is cured as soon as it is dry enough to strip or hand up; after handing it up it should be rehung and allowed to hang five or six weeks at least, that the objectionable matter may be thrown off, which cannot be done if put in the bulk at once. In prizing (*i.e.*, pressing), hogsheads are much more desirable than Hessian, as they protect the tobacco from breakage, preserve its condition, and allow it to sweat uniformly. The timber from which the hogsheads are made should be perfectly dry; they cost no more than the Hessian, and, if farmers will make them themselves, cost a great deal less. Many farmers say they cannot afford to put up good sheds. They do not take into consideration that the good sheds will pay for themselves; that tobacco properly cured in properly constructed sheds will always bring the top market prices, and be first sought by the buyers, and, if there is more tobacco in the country than buyers want, the well-cured and well-handled tobaccos will be given the preference.

Further, a good shed can be built with but little cost besides the work in building. Such a barn is here shown in the illustration, and is known as the log



TOBACCO-CURING SHED BUILT OF LOGS.

barn, is used by thousands of American tobacco-growers, and in which some of the finest tobacco is cured. The only trouble is putting up the walls, and we usually overcome that by inviting our neighbours to a barn-raising; we give them a good dinner of roast pig and roast mutton with trimmings and a wee drop to encourage, and the barn is raised in one day.

Now that we have all the States for a market, there will be a demand for more than we can supply for many years to come, if we will only give them the best that careful work will produce.

I would advise every selector in the Texas and Inglewood districts to construct such a barn as is here given, and grow as much tobacco as the home force can look after without neglecting the other crops of the farm. If he can only grow a couple of acres it is £50 or £60 in his pocket, and sometimes it will be much more to him.

If we will supply the manufacturer with what he wants—and we can if we will only try—there will be a demand for more than can be supplied for the next six or eight years, with plenty of competition in the buying. If the growers will do their duty, the tobacco industry, in a few years, will be one of the most profitable to the farmer and as valuable to the State as any we now have.

QUEENSLAND CHILLIES.

The ease with which chillies and capsicums can be grown in this State of diversified climates is amply demonstrated in all the Northern districts, where chillies of various kinds have become a weed, and may be seen growing on the roadsides for miles, loaded with red chillies which would be received in London and elsewhere with a responsive cheque. The plant thrives admirably all about the South Coast districts. It even grows in parts of the Southern tableland where heavy frosts occur. What use do we make of our chillies? Practically, none. Commercially, certainly none. Now, let us see what trade in these spices we are throwing away. An officer of the Department of Agriculture, in response to a letter of inquiry from a person at Cairns, made inquiries at Messrs. J. H. Harrison and Co. and Messrs. Robert Harper and Co., of Brisbane, relative to the market for chillies. The former are pickle-makers, are large buyers of fresh chillies, and give 3d. per lb. for good, plump berries 1½ inches long.

Messrs. Robert Harper and Co. import, in connection with their business as pepper manufacturers, Bird's-eye chillies and a few capsicums from the West Indies in a dried state, and pay 6½d. per lb. for them, or at the rate of £60 13s. 4d. per ton. It strikes us as a most extraordinary thing that we hear of people struggling with large families to make both ends meet in some parts of the North, who are yet at the same time in the midst of a crop which requires no cultivation, and only demands picking and packing to bring grist to the mill. Meanwhile our local manufacturers have to import chillies from the West Indies. Twelve months ago we put up a quantity of chillies in a jar of salt and water to test their keeping qualities. They have retained their plump, fresh, red appearance and all their pungent qualities to the present day, thus proving that they can be exported to any distance in a fresh state.

It seems impossible for us to get beyond the old groove. With the wonderful climate and soil of Queensland, there should be no difficulty in growing many products which are in great demand both in the Southern States and in European countries, and they could be grown at a profit. Let us hope that intelligent farmers will try to add a few of these products to their general output, and so make a considerable addition to their incomes.

CANE-FARMING IN TRINIDAD.

From a report to Mr. Chamberlain by the Acting Colonial Secretary of Trinidad, Mr. H. Clarence Bourne, we extract the following item on cane-farming in that island:—

Sugar, if not the chief product, is the chief manufacture of the colony. A hundred years ago the boiling-house was a mere adjunct to the canefields; but the modern usine represents an amount of capital exceeding the value of the land from which it is supplied with canes. To give an illustration: The usine of St. Augustine with its groups of estates, comprising about 4,500 acres, lying near the old capital of St. Joseph, was closed last year; and though the usine contained machinery which had cost, apart from buildings and tramways, £30,000, yet, as there was no demand for it as a going concern, the Government was able to acquire the whole property for £9,100. Improvements in the process of manufacture and the development of machinery have led to concentration of capital, a reduction in the number of factories, and the consolidation of estates. Though last year sugar was made at twenty-six factories, thirteen manufactured less than 1,000 tons. One usine was closed last year, and one this. Though the so-called planter has long been primarily a manufacturer, his factory has, until recent years, been fed entirely from his own estates. Under this system the losses suffered in bad seasons have fallen on a small number of owners, and their capital and credit have been often insufficient for the heavy calls upon them. Lately, however, the cane farmer has come into existence, and has grown rapidly.

In the present year the quantity of farmers' canes ground has been nearly 170,000 tons.

Many of the cane-farmers are small peasants owning or renting only a few acres, which they and their families can cultivate without additional labour. They are generally dependent upon advances from the manufacturer, and the weak point in the system, from their point of view, is that, owing partly to geographical position, and partly to indebtedness, they have generally only one market to which they can take their canes. A sliding scale, however, regulating the payment for canes, is generally adopted by the parties, the price paid being determined by that ruling in the London or New York market at the time of delivery. Movements, moreover, are on foot in two parts of the island—one in the north, and one in the south—for the establishment of small co-operative societies to supply the farmers with the requisite advances. Of these, one is proceeding on the well-known lines of the Raffeisen Banks, the other will allow the division of profits. Co-operation not only gives hope for greater stability to the sugar industry, by making the labourer share profits or losses with the capitalist, but it probably operates to cheapen labour, as Creole and Indian alike prefer growing canes in their own plot to working as labourers on the estates; and they are willing to sell the canes at a price that is below that of which the estates can, at any rate with free labour, produce them. It is interesting to record that since the closing of St. Augustine, which it was feared would lead to much local loss of employment and consequent distress, the land has been readily let in small holdings to farmers, and it is possible that within a few years as large an acreage will be under canes as was the case when the estate was worked as a whole. One drawback to cane-farming must, however, be pointed out. The farmer is less alive than the estate-owner to the advantages to be derived from economic cultivation, the use of manure, the adoption of improvements, and the selection of canes.

The following is an estimate of the average cost of production and net price realised per ton:—

—	Cost.	Price.	Profit.
	£ s. d.	£ s. d.	£ s. d.
Yellow sugars (for London markets)	10 5 0	11 0 0	0 15 0
Grey sugars (for American markets)	9 0 0	10 0 0	1 0 0

GROWING MANGOES FROM SEED.

Mr. C. Acutt, writing from Warren, Rockhampton, suggests a rather unusual method of sprouting mango seeds, a method which has perfectly succeeded with him, and which he discovered by mere accident.

Take an empty glass pickle bottle, place two or three mango seeds inside, cork the bottle up and put it away in the storeroom. In less than four weeks the bottle will be nearly full of beautiful shoots and roots. When well shot, take them out and plant them in the ordinary way.

This should be a good plan to adopt in the importation of different varieties of mangoes from other countries, as a voyage of three or four weeks would mean a number of beautiful little trees ready for planting out on arrival in Queensland.

Try it, somebody, and let us know the result. We have five seeds in two bottles.

Forestry.

INTERIOR LAND CHANGES.

Those of our readers who dwell in the neighbourhood of sand-dunes and inland sand-drifts will doubtless have been impressed with the illustrations and article we presented in our February issue, describing the progress of some of the coastal sand dunes of Southern Queensland. We have been unable to obtain photographs of the sand-drifts in our Western country, but, by the courtesy of the Hon. the Secretary for Mines and Agriculture of New South Wales, we are enabled to reproduce some graphic illustrations of the Interior Land Changes in New South Wales due to drifting sand, which will serve to give some idea of what is happening in parts of Western Queensland. We also print the very readable article on the subject by Mr. C. A. Benbow, which appeared, together with the illustrations, in the October issue of the *New South Wales Agricultural Gazette* (Vol. XII. Part 10, 1901). Mr. Benbow writes:—

The purpose of this paper will be better served if descriptions are given of what has taken place in other regions of the world, and then compare with what appears to be happening in our own portion of Australia, and before our eyes, and illustrated by photographs herewith.

In Africa, cities and towns to the west of the River Nile, flourishing in the times of the Pharaohs, and even of the Ptolemies, have been buried by sand-drifts, and more modern ones as well, leaving the summits of minarets and mosques above the surface, having buried the fertile lands from which the inhabitants obtained the means of trade and sustenance.

Various writers have spoken of the wealth buried under the sands of the Great Sahara Desert, supposed to have been a lake or inland sea, and the flooding from the Mediterranean has been suggested as practicable by reason of its being below the waters of that sea. The desert was formerly remote from Egypt, the oases or habitable spots still appearing in it being the remains of the soil formerly extending the whole way to the Nile, which the sands, transported hither by the westerly winds, have overwhelmed and thus doomed to sterility, a land which was once remarkable for its fruitfulness. The desert has invaded Egypt, and the moderns are at this date digging out the sands and exposing her buried cities, and reclaiming their archæological treasures. Illustrations of these works are appearing in the *Scientific American* of present and recent dates, more especially of the Mesopotamian deserts, as instanced by the ruins of Nippur, from which has been recently obtained a library of 3,000 most valuable records. In the heart of the Syrian desert are the relics of the mysterious cities of antiquity—the Tadmor in the wilderness of a remote time, the Palmyra of a more modern time (named from the masses of palms which grew in such abundance as to stamp the name upon the place). This city defied the power of Rome for, I think, eight years, which fact could only have been the result of wealth and power in men and food supplies, for it is spoken of as being a granary. It is now represented by a few marble columns amidst a plain of yellow sand, these only visible now because they were built, like all the ancient temples, upon a hill or eminence. Once rich and blooming territories, celebrated by the Persian poets as Paradisiacal—the theatre of heroic deeds, the seat of political power and intellectual culture, the site of cities which in size and splendour were second to none in Asia—have been visited by the movable sand, leaving but few evidences of former grandeur and fertility apparent. Even rivers have been choked and their courses turned (Dr. Milner, p. 229).

These are in brief given as evidence of what has taken place in the northern hemisphere of the earth and of what is still going on, for these forces are operating now.

In Australia there have been vast changes wrought by drifting or blown sand, for it has been asserted by Rev. Tennison Woods that what is known as the Hawkesbury sandstone is composed of blown sand carried from the western

TRAVELLING SAND NEAR MILPARINKA.

interior; this sand, ere it became stone, buried our ancient forests of huge carbonaceous plants which were growing to form our coal measures. On a small scale this is taking place out west, and threatens the total destruction of land to an extent no one can define

The sands are set in motion originally by many and often slight occurrences, but certainly by the destruction of wind breaks or belts of scrub by bush-fires or the axe, overstocking, and the loosening of ancient sand-hills (themselves the remains of more ancient sand-drifts which have taken place

DRY LAKE HOTEL, SHOWING THE SAND ENCROACHING.

during other dry times) by destruction of the vegetable-growth which checked the working of a sand-dune; anything which causes the soil to be loosened in a drought time (which is just the time when a great destruction of weeds and scrubby undergrowth takes place) will set the surface free to travel, because a *drought season is always a windy season.*

Let no one suppose that that this travelling sand is a false alarm, or a light matter, or unimportant, for it is really a very, very great evil, already serious, and likely to become greater, because on a large scale only a mountain range can stop it. It appears to be advancing with a front of 300 miles, and the lighter particles have fallen on ships at sea.

The illustrations from photographs in this paper depict travelling sand, and others the removal of the surface soil, leaving the hard clay or subsoil exposed and the trees in the air. What are called burnt or scalded plains mark the site of previous removal by droughty wind-storms—all showing that in this class of country these things recur, and must be stopped if permanent settlement is to be assured.

Tree left in the Air by reason of the Soil being Blown Away.

The opening passages lay before us what unchecked drift-sand will do; leading, then, to a mention of what it has done in Australia in the past and is doing at present. We are to consider whether this devastation shall be allowed to proceed, or is to be mastered and the land reclaimed? No one can tell where or when it will stop, that is certain. Obstacles in its way cause dunes to form until the thing obstructing is surmounted, and then the sand travels on. The house shown in the illustration is doomed, so is the lake beyond. There will be a sand-hill here until the wood has rotted; then the sand will disperse onward unless checked by vegetation, and then only possibly for a time; but in the meantime the sand goes onward over the obstruction and on either side.

House in Process of Burial by Sand-drift, Cobham Lake Homestead.

There is only one means at the disposal of men to fight this, and it is Nature's own—namely, *plant wind-breaks* to windward of the sand districts and at distances down the course of the prevailing winds; if necessary, across, chess-board plan, and form large paddocks by belts of vegetation.

This is, of course, a national work. So is the property to be saved national property—so is the question. Shall we safeguard the land in the line of advance of the sand? If it be good to do anything, do that good with as little delay as possible, lest greater difficulties present themselves with a far greater loss.

This country (in which the evil is so apparent) has a rainfall as low as 5 inches. That restricts us with the heat and the nature of the ground to a special kind of vegetation, but fortunately Nature provides it, and uses it (apparently for the especial purposes for which it is wanted here) in South Africa, South America, Tropical America, the Brazils, and Mexico, in which countries some varieties are used as fences. They come in the form of numerous useful fodder plants under the natural order *Cactaceæ.* They are mostly leafless and thorny, live in sand soils, sending roots after moisture like many growths, some varieties for many yards.

It must be mentioned that there is less evaporation from sandy soil than from any other. All moisture that falls upon sand is, in the main, absorbed and held, gradually falling, the extreme surface sand preventing its evaporation. This was shown practically a few years back, when the Sydney Press advertised that the Botany sand could only yield three weeks' further water, whereas it went on giving water for months, and was not exhausted, although repeated warnings were given. Hence 5 inches of rain retained in the sand is better than 20 inches that run off.

Should the sand blow up against the growths mentioned, they will grow and conquer if only an inch is left above ground after being nearly covered by a sand or dust storm, and the nucleus of a long sand-hill is formed which will lie across the course of the prevailing wind; however it grows in height, the growth will appear above until it reaches a height to cause the drifting sand to lie and rest on the windward side. A cross-section of the country would be rolling downs ultimately, with 5, 7, 8 miles of flats between, upon which the wind would not act, nor could not, because succulent growths would make themselves felt. After a time these long sand-dunes would carry acacias. Rolley polley against wire fences has done the above on a small scale. Possibly creeks would result along the flats from water out of the sand-hills.

Cobham Lake Horse Paddock.—Netting Fence Covered by Drift-sand, and New One Above.

We here reproduce the Botany water supply. The cacti looked to for this result would not branch until in the free air, the portion covered up would throw out roots from the angles on its sides; but in free air there would be branches. They are not alone by any means in this; it is a trick well known to botanists as belonging to many plants; even our well-known *Ficus*, the Moreton Bay fig, like the banyan of India, sends roots down from their limbs in the air to seek moisture. Once beat the power of the wind, and there are many grasses and shrub growths which, given a start, will hold their own and spread over the face of the country, and hold the surface soil and sand.

The nopal cactus (*Opuntia cochinellifera*) is the cochineal insect's food-plant, but whether labour conditions in this State would enable its cultivation to be profitable is not for the writer of this paper to decide. They can all resist a dry atmosphere and powerful sunshine; they occupy arid soils, or sand districts, and resist long droughts, because they dive down through the sand for moisture; have no pores, so waste no moisture (like the eland and desert animals generally, have no pores in their skins), and are spoken of as *preparing the soil for other plants* (see "Cactaceæ," Chambers' Encyclopædia, or any other), which might be vegetation from the South American pampas, as many of them are great fodder plants. Here is a vast level country, the pampas, which only wants the harmony of Nature to be interfered with in the greed for wealth to become another great sand desert.

For the Western districts Nature's plans must be copied, and new methods adopted, or a very severe penalty will be meted out, and perhaps the proud civilised (?) man will be conquered, instead of conquering, and be driven off the land.

Let no one suppose that there is any suggestion conveyed that objectionable species of plants are necessary; like any species of animal or vegetable life proposed for introduction, there is here the power of choice, which leads to the selection of the best of the classes. To sum up—New South Wales and Australia generally has been for 100 years, or nearly, trying to force old-world methods upon a new world, land, and climate. The process has partly killed the West, and created conditions which threaten to bury the land to the foot of the mountains. Old-world methods need not be totally ignored, nor should they be, but new are distinctly called for, or disaster to the whole country must follow. Make a new system for the West which will be distinctly Australian, conforming to Australian conditions.

Drifting sand will contain vegetable remains, which, rotting in the region of moisture below the surface, will furnish food for dividing wind breaks or fences of the cactus-like growths before mentioned, placed at any distance from each other which may be decided on; put in the clear spaces or paddocks plants of the *Mesembryaceæ*, *Portulacaceæ*, *Chenopodiceæ*, and *Acacia* tribes of vegetation, with some of our own indigenous drought-resisting grasses, or those of America or elsewhere. We have the free choice, and from the world's supply can pick the best of each order of vegetable life, and place there the best of the world's animals which feed upon them, selected from the ruminants of Africa or any other country.

PARTICULARS OF PLANTS.

Cactaceæ.—There are 500 species of cacti; some are noxious and useless, but many make splendid fences or hedges and so break winds. Men and cattle can obtain moisture from many.

Mesembryaceæ.—Mesembryanthemums furnish moisture. Seeds of *M. ecrystallinum*, *M. geniculiflorum*, are ground into flour to make bread. *M. edule* yields a fruit which is eaten and called Hottentot fig. *M. emarcidum* (Kou of Hottentots) is rolled up, dried and chewed like tobacco; all bring up moisture from below.

Portulacaceæ, succulent class, furnishes a running weed, and some are bushes, like the spekboom of Africa, are foods for the elands and sheep; are, in fact, excellent fodder plants, which send down roots through the sand for moisture.

Chenopodiaceæ include our salt-bushes of all kinds, and the African kanna bosch or elands' food plant, all-round fodder plants, and accustomed to heat and dry country.

Leguminosæ, suborder Mimosæ-Acacia, our dry country wattles and scrubs, all of which are the elands' and other African antelopes' foods, as well as being valuable for other purposes.

Here is foreshadowed a new industry growing out of necessity. Nothing is wanted but resolute action. There is no doubt whatever to suppose other than that should the dry seasons now prevailing change to a humid time it will be followed by a still worse drought at no distant date, by reason of the denudation of timber and the clear sweep the dry winds have of the country. Therefore, use the first fair sign of a coming wet time to give a start to the new order of things. Australia need have no deserts, because there is some rainfall, however little, everywhere and at one time or another. Nor need there be any obstruction to settlement on good country because of the existence of what are called impassable stock-routes, if succulent, drought-resisting plants are put down in good or fair seasons, and the avaricious wish to feed off to extinction is prevented when they appear above ground. The more especially if a new animal be added to our list of stock, as recommended in the paper, "Elands for the Western districts of New South Wales and Central Australia," which which appeared in the May number of this *Gazette*.

THE SIAMESE TEAK TRADE.

The total export in 1900 was 38,332 tons; the bulk of the business in teak, both in the forests and in Bangkok, remains in the hands of British subjects. The value of teak intended for Europe was about £10 per ton f.o.b. Prospects of a large export in 1902 are good, the floating season during the past year having been an exceptional one, and the logs arriving at their duty station at Paknampho during the season reached the unprecedented number of 119,931. The highest number previously recorded was 76,493 in the season 1898-99, and the average for the past ten years is 54,899. This large production (as well as, it is said, the inferior quality of some of the timber) has brought prices down very rapidly. The measures which the Government are adopting for the preservation of forests have now taken more definite shape. Forest leases are being renewed only on the condition that no fresh "girdling" is to be allowed, except with special sanction of the forest officer, and only trees which are already "girdled" are to be extracted. Half the areas of the forests only are to be opened to work, the other half being held in reserve, and the forest royalty on full-sized trees is increased from 4¼ Rs. to 10 Rs. The Forest Department is administered by British officials borrowed by the Siamese Government from India and Burma.—*Indian Engineering.*

UTILISATION OF SAWDUST.

In Prussia much use is made of a fuel made from pure sawdust without any binding substance. The dust is simply subjected to enormous hydraulic pressure, and made into bricks 6½ inches long, 3½ inches wide, and three-quarters of an inch thick. Each brick weighs half-a-pound. They are burnt in air-tight stoves, and no smoke is produced, and very little ash is left. Thus, it is the most cleanly of all fuels. One of these bricks is heavier than a piece of hardwood of the same size, and the edges look like polished oak. In consequence of the great popularity of this fuel, sawdust, which at one time was worth nothing, has now a regular market value, and, as the supply in the neighbourhood of the factory is insufficient, quantities are imported from Sweden.

If we are not careful with our forests, the time will come when Queenslanders will have to burn sawdust bricks, only the question then arises: If we have no timber, where will the sawdust come from?

Another use for sawdust has been found by ingenious Europeans. Chemists have analysed sawdust—presumably, pine dust—and have found that it contains more nutritious matter than straw. The residue of beets contains about 50 per cent. of uncrystallisable raw sugar; 75,000 tons of this residue are used in Europe for stock feeding. Now a patent has been applied for in Berlin providing for the utilisation of sawdust with melasse as food for animals.

HONDURAS MAHOGANY.

In British Honduras or Belize, a colony east of the peninsula of Yucatan, the different timber belts are most clearly defined. First, there is the coast timber—mangroves and tropical jungle or scrub. Next comes a narrow belt, one mile wide, of rich alluvial land. Beyond this lie large tracts of sandy, arid land called pine ridges, owing to the vast quantities of red pine trees it produces. Further inland are the "cahoon" ridges, with a deep rich soil covered with myriads of palm-trees. Then come broad savannahs or plains covered with clumps of trees, and beyond these high wooded mountains. From the tropical jungles comes the well-known dye-wood, called log-wood, and from the inland forests the equally well-known and valuable mahogany; 15,000 tons of log-wood and 20,000 tons of mahogany are annually exported. We learn from a report by the Colonial Secretary of British Honduras last year, that it would appear that the supply of real "Honduras" mahogany is beginning to fail—that is, that our exporters find it difficult to turn out that fine article which has hitherto stood so high in the estimation of the timber trade. The good wood that can be brought to the coast in existing conditions is no doubt comparatively scarce, and this condition of things must remain until improved methods of transportation render it possible to draw from the more inaccessible forests. Meanwhile the projects for a railway are apparently still in abeyance.

SPARE THE YOUNG CEDARS.

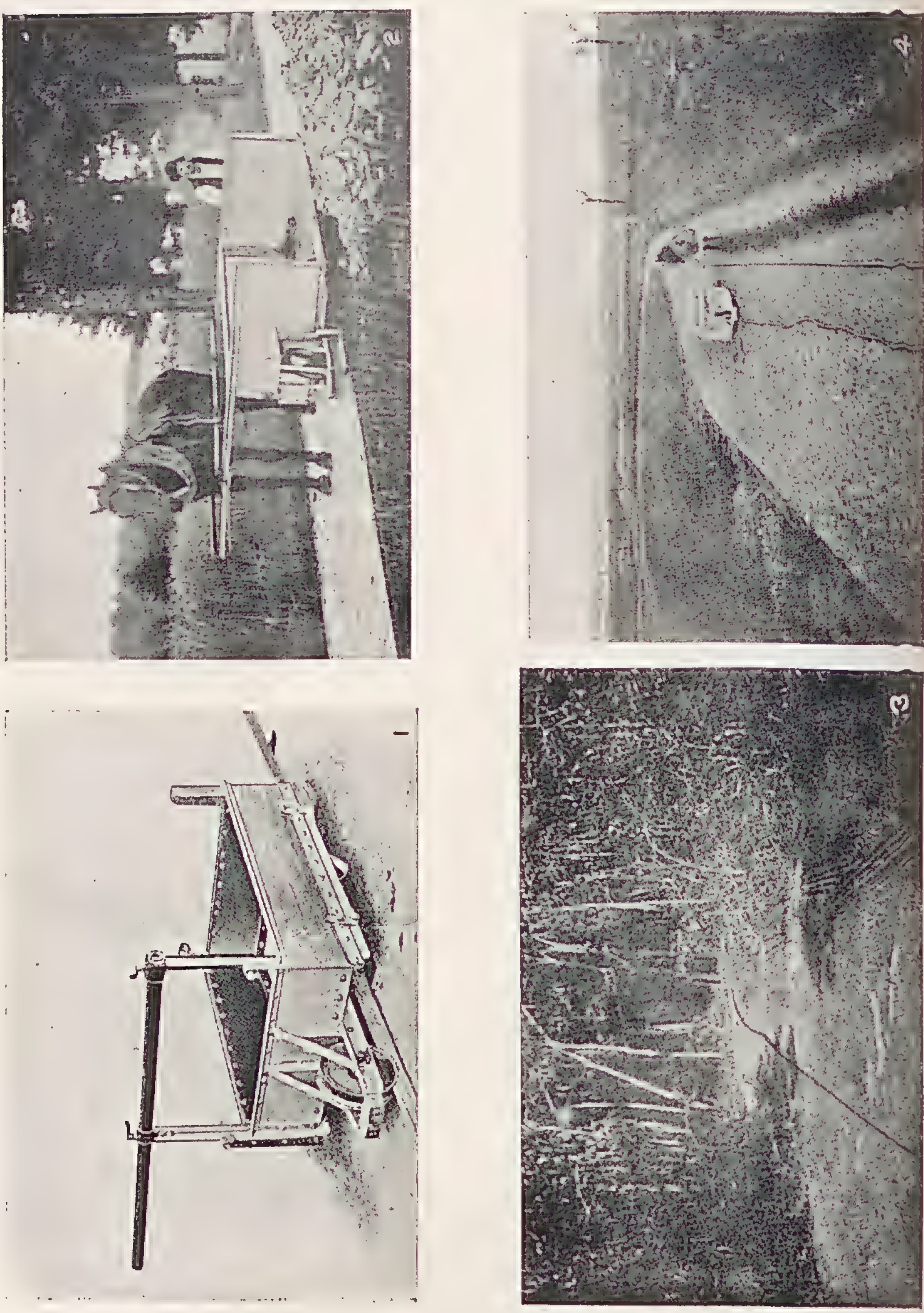
We have repeatedly deplored the wholesale destruction of young cedar, pine, and silky oak trees now going on in the Northern portion of the State, yet the practice has not been discontinued. Perhaps, in the event of a slacking off in clearing new scrubs for the purpose of sugar-planting, the young trees may have a chance to reach maturity, or at anyrate to attain such dimensions as may give pause to the selector in the matter of destroying what it must be obvious to an intelligent man will prove a most remunerative asset to his children and to his children's children, if the trees are carefully looked after and the scrub systematically worked. Mr. T. T. Pentzcke, of Hohenufer, Daintree River, to whom we are indebted for much valuable information on the present condition and on the possibilities of various industries on that river, gives a further instance of the growth of the cedar. He says that, in 1880, a cedar-tree 8 feet in girth was left standing on a clearing. Trees of this size, not having much value in the timber-getters' eyes, are seldom cut down, except by selectors blind to their own interests. This particular tree had at that time a diameter of over 2 feet at 8 feet from the ground. At present it measures over 16 feet in girth or over 5 feet in diameter, and is just suitable for mill purposes. It grows amongst masses of rock near a gushing spring, on soil quite useless for ordinary agriculture. The increase of 36 inches in diameter in 21 years is equal to nearly $1\frac{3}{4}$ inches per annum. It was shown in our articles on forest conservancy (*Agricultural Journal*, Vol. II., p. 68) that the cedar makes three growths, equivalent to an increased diameter of 2 inches, every three years. Yet here we have an instance of a tree growing on rough, rocky soil, containing abundance of lime, showing an increase of $5\frac{1}{4}$ inches every three years.

Mr. Pentzcke considers that it would pay well to plant cedar groves on such land as is here described, which is useless for any other purpose. Such a tree as the above, supposing the trunk to be 60 feet long, would square 45 inches and yield about 10,000 feet superficial board measurement.

We leave it to the selectors to figure out for themselves the future value of 10 or 20 acres of such trees.

The wholesale destruction of silky oaks for making banana crates is strongly in evidence in Brisbane, when the weekly cargoes of bananas arrive from the North. Silky oak is a timber valuable for stave-making, and for cabinet-making as it takes a good polish, yet the principal use it is put to is as stated, the making of banana crates, which ultimately find their way to the fireplace.

Plate XVIII.



1. A Car. 2. Farm Wor

Plate XIX.

6. TRANSPORTING TIMBER.

5. CROSSING A SWAMP.

Science.

CAILLET'S MONO-RAIL SYSTEM.

Every month brings out some new idea for the saving of labour, reduction of expense in construction and working of machinery for simple and effective road traction, &c. At the Bendigo (Victoria) Exhibition this year, a single-rail system of road traction was exhibited which excited much attention from visitors, especially farmers, sugar-planters, mine-owners and others who have to deal with the hauling of produce, ore, timber, &c., for considerable distances to a railway station or a port.

The Caillot mono-rail system which we here illustrate seems to be exactly what is required in this State for the haulage of farm produce, particularly in wet weather. It would also prove of great advantage to timber-getters for drawing logs from a distance to a railway.

Briefly described, it consists of a single rail of light section supported by steel sole-plates at intervals of a few feet, and is laid down direct on the surface of the ground without sleepers, ballasting, or other special preparation. The rolling-stock, which is of various forms and sizes according to the uses for which it is intended, is designed on the principle of enabling a man or an animal to always transport the maximum load.

The system shows, it is claimed, an economy of from 50 to 60 per cent. on the cost of ordinary cartage, with an equivalent saving of wear and tear to the animals employed. One horse is required for each truck, and can draw a load of from 1½ to 2 tons over a line where the grades do not exceed about 5 per cent. Several trucks can be coupled together, thereby reducing the number of drivers. The cars for hand-traction are light and easily manipulated, and one man can work ten hours per day transporting loads of 6 cwt. The bottom of the cars being only a few inches above the rail, it is impossible for them to run away or to overturn. If dumping is required, the end rail has to be raised a few inches in order to give the necessary elevation for clearance. An extremely light section of rail is used, a 9-lb. rail being sufficient for all cars on two wheels with a load up to 15 cwt., and for bogie cars with a load of about 20 cwt. As the weight of the load presses directly down on the top of the rail, only sufficient strength is required to resist any permanent bending of the rail. For trucks loaded up to 30 cwt., a 12-lb. or 14-lb. section is employed, according to the amount of traffic per day. The 14-lb. section is also strong enough for bogie trucks carrying a 4-ton load. The Mono-rail is intended as an intermediary between carts and the lightest of double-rail systems It would appear to be essentially a system for small traffic, and the limit of its economical working varies from 75 to 125 tons per day, according to local conditions. Its chief value and economy are found where long distances have to be traversed and the traffic only amounts to a few thousand tons per annum. In such cases, the cost of transport, where effected by native porters or mules, can be reduced as much as 80 per cent. The average cost of transport varies from 1d. to 1½d. per ton per mile.

This system is already working in many parts of the world, and favourable reports have been received of its working and the economy effected.

The longest line, 70 miles, is in Brazil, where the system is employed for connecting a new mining district with the coast.

It is stated that sharp curves and rough alignment do not interfere with its efficiency or ease of running. No skilled labour is required.

Such a line would doubtless prove of great value, if laid, say, between Gatton and the Queensland Agricultural College, or from the College station to the College itself. Judging from the simplicity of the whole affair, the cars and trucks could be made locally as cheaply as cane-trucks on a sugar plantation, whilst old rails could be utilised for the line. We understand that a short line can be seen working on a sugar plantation at Yeppoon, near Rockhampton. The trucks used are hand trucks, and are worked by kanakas.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1901.											1902.	
	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
North.													
Bowen	6·23	8·26	4·75	0·94	0·19	0·10	6·36	0·18	0·93	0·92	0·71	0·19	2·19
Cairns	22·09	14·93	8·87	13·18	0·57	0·89	2·53	1·82	2·34	5·23	2·78	3·79	12·90
Geraldton	32·93	37·64	26·10	26·72	1·21	2·58	11·77	3·37	3·85	6·45	1·60	3·78	16·87
Herberton	4·16	10·95	2·87	3·80	0·18	0·64	2·53	1·04	4·92	1·13	1·30	0·57	5·77
Hughenden	1·41	2·82	1·74	3·48	0·03	Nil.	0·33	Nil.	0·31	0·29	1·43	1·57	2·02
Kamerunga	22·36	13·09	9·57	13·18	2·09	2·60	1·94	1·72	1·19	5·74	2·16	2·58	10·59
Longreach	0·22	3·09	2·56	5·95	0·09	Nil.	0·37	0·58	Nil.	Nil.	1·71	0·87	0·27
Lucinda	24·76	15·78	9·16	8·63	2·89	2·17	5·89	0·30	2·59	Nil.	0·32	3·55	11·38
Mackay	8·99	10·13	6·80	1·32	0·25	1·07	5·14	2·29	1·35	1·85	0·71	3·78	8·43
Rockhampton	8·26	5·53	2·84	0·79	0·24	2·29	3·04	1·78	0·51	0·41	0·19	4·79	1·36
Townsville	12·94	4·95	3·13	0·74	0·32	0·19	1·87	0·14	0·90	0·16	0·61	2·24	3·14
South.													
Barcaldine	1·17	3·70	1·90	2·21	0·82	0·63	0·25	0·51	0·54	0·55	0·09	2·39	0·07
Beenleigh	4·30	11·44	4·17	4·55	4·15	1·34	4·49	0·70	3·35	1·35	0·14	2·41	1·82
Biggenden	2·55	6·19	6·35	1·47	1·56	0·74	2·81	2·11	1·35	0·47	0·92	2·12	0·83
Blackall	0·90	2·28	3·96	3·80	0·90	0·55	0·44	0·88	0·60	0·97	0·32	1·68	0·34
Brisbane	2·96	11·70	3·10	2·29	3·29	1 31	3·71	1·30	3·25	1·41	0·75	1·38	2·67
Bundaberg	2·61	3·17	10·27	1·14	0·74	2·01	5·59	1·80	2·18	1·28	Nil.	6·33	0·75
Caboolture	5·51	11·53	4·64	3·34	2·27	3·70	3·18	1·55	5·01	3·17	3·45	2·29	2·66
Charleville	0·22	1·10	2·61	3·28	0·93	1·27	0·92	0·32	0·04	0·65	0·96	0·47	0·22
Dalby	0·44	4·77	3·12	1·12	3·59	2·83	1·66	1·11	4·09	0·15	0·42	1·65	0·20
Emerald	4·43	3·25	0·88	1·31	0·63	0·90	1·74	1·11	Nil.	0·09	0·63	3·28	1·11
Esk	3·15	8·36	4·11	1·78	2·45	3·01	3·03	1·72	4·87	1·08	2·20	1·81	1·06
Gatton College ...	1·54	6·73	3·86	1·55	2·93	1·53	3·23	1·06	3·02	0·86	0·26	2·27	1·58
Gayndah	2·10	4·22	3·97	0·97	2·32	2·29	Nil.	1·91	2·39	0·04	0·38	2·54	0·51
Gindie	1·62	2·07	0·44	1·21	0·84	1·34	1·77	1·81	0·53	0·02	0·57	1·35	1·46
Goondiwindi	0·25	3·53	1·82	1·90	1·73	2·30	1·55	0·67	2·83	0·21	0·20	2·06	0·75
Gympie	3·10	18·56	3·89	3·38	2·82	3·40	3·39	1·34	1·91	1·34	1·25	1·49	1·65
Ipswich	2·88	7·01	3·38	1·43	3·16	0·97	2·47	3·54	3·98	1·17	0·35	1·45	2·80
Laidley	1·58	6·94	3·81	1·47	2·54	2·00	5·32	1·22	3·37	1·10	1·65	1·79	1·94
Maryborough	5·51	11·76	5·58	4·09	2·22	3·07	5·02	1·05	1·54	1·84	1·54	1·29	0·75
Nambour	9·13	18·01	3·33	7·25	3·33	6·80	4·42	0·98	3·89	2·85	3·89	1·30	2·06
Nerang	4·22	14·91	5·12	5·42	5·34	0·79	5·41	0·88	4·57	2·70	0·46	3·98	4·54
Roma	0·11	1·77	1·11	1·11	2·66	2·26	0·98	0·43	0·71	0·54	0·83	2·72	1·11
Stanthorpe	0·80	3·95	2·13	0·77	2·74	1·52	4·22	1·42	2·93	2·22	1·67	3·17	0·51
Taroom	0·10	3·15	1·88	1·70	2·19	2·74	2·34	2·11	0·92	0·42	0·31	0·53	1·82
Tambo	0·51	1·66	2·75	2·85	1·47	0·73	0·74	1·47	0·51	Nil.	0·16	1·73	0·35
Tewantin	14·18	20·33	11·70	12·20	5·45	8·34	4·61	2·71	3·26	1·66	2·70	3·09	1·13
Texas	1·35	4·58	1·46	1·10	1·87	1·00	3·06	1·47	1·47	0·26	0·43	1·95	1·62
Toowoomba	1·76	6·84	6·59	1·04	3·57	2·22	5·57	1·85	4·45	1·10	0·87	3·46	1·20
Warwick	0·26	5·56	2·91	0·82	3·47	1·57	5·74	2·05	3·12	1·19	0·71	3·48	0·65
Westbrook	0·73	4·37	3·38	0·74	3·48	1·64	6·50	1·75	2·27	0·59	0·31	*	1·04

* The figures for Westbrook were not available when the *Journal* went to press.—ED. Q.A.J.

CLEMENT L. WRAGGE,
Government Meteorologist.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—The demand for Australian and New Zealand butter remains good, but not brisk, and prices have not fallen as some expected. On the contrary, there is, if anything, a hardening tendency, and values look as if they would shortly take an upward turn. "Choicest" brands make 104s. to 106s., with 107s. for strictly "choicest" lots, "finest" remains at 98s. to 102s.

The Colonial Consignment and Distributing Company, reporting on London butter market, under date 24th January, call attention to the continued tendency already alluded to in the *Courier* towards the removal of the disparity in price between Danish and Australasian butter. The report states:—

Market has had a most erratic course since our last issue. Colonial has remained firm at last quotations, while Danish, on the other hand, has gradually receded in price until a few days ago, when both descriptions were selling practically on the same basis. At no period since the commencement of the colonial business have the Danes found the competition with colonial so severe. The Danes themselves are at a loss to understand the position, and while they have been lowering their prices the colonial market has gradually become firmer. We think the situation has been brought about largely owing to the displacement by New Zealand butter of Danish on the Liverpool and Manchester markets, thus showing that the colonial article is gradually getting a firmer grip of our markets.

Australian.—Since our last advice the following steamers have arrived—namely, "Omrah," 32,000 boxes; "Britannia," 24,000 boxes; "Ortona," 22,000 boxes; total, 78,000 boxes; which quantity has gone steadily into consumption. Prices have been too high for a speculative business, and now that shipments have practically ceased from Australia, and the quantity afloat very much lighter than last year, the position looks undoubtedly healthy. Unsalted lots, which were at a discount as compared with salted, are now practically on the same basis—namely, choicest, 106s. to 108s.; fine to finest, 98s. to 104s. Unsalted is always a little risky and uncertain, being at the best a somewhat limited trade.

Cheese (duty free).—American, 49s. to 50s.; Canadian, 51s. to 52s.; New Zealand, 50s. to 51s.; Australian, 47s. to 49s. per cwt.

Condensed Milk.—18s. 6d. to 20s. 5d. per case in 20-case lots.

Sugar (duties, raw, 2s. to 3s. 10d.; refined, 4s. 2d. and ¼ per cent.).—Refined, £16 to £18 per ton; German beet, 88 per cent., 6s. 7¾d. per cwt.

Syrups (duty, 2s. per cwt. and ¼ per cent.).—Finest, 14s. per cwt.

Molasses (duty, 2s. per cwt. and ¼ per cent.).—5s. 9d. to 8s. per cwt.

Rice (duty free).—Rangoon, £10 to £13; Japan, £13 to £14; Java, £15 to £17; Patna, £18 to £21 per ton; Queensland (Pimpama Island), valued at £18 10s. in the London market.

Coffee (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, small to good middling, 45s. to 105s.; peaberry, 75s. to 125s.; Santos, 32s. to 65s.; Mocha, 65s. to 100s.; Jamaica, finest, 100s. to 120s. per cwt.

Arrowroot.—St. Vincent, 1¾d. to 2½d.; Natal, 5½d. to 6¼d.; Bermuda, 1s. 8d. to 1s. 10d. per lb.

Wheat.—Australian, white, 31s.; New Zealand, white, 29s. 9d. to 30s.; Duluth, red, 31s. 3d.; Manitoba, red, 31s. per 480 lb.

Flour.—Australian, 20s. 9d. per 280 lb.

Malting Barley.—English, 25s. 6d. to 28s. per 448 lb.

Oats.—New Zealand, 25s. to 27s. per 384 lb.; Canadian, 16s. to 28s. per 320 lb.

Split Peas.—48s. per 504 lb.

Ginger (duty free).—Calicut, good medium, 80s. to 100s.; medium, cut rough, 39s.; small, cut rough, 30s. to 34s.; Japan, rough, 44s. to 45s.; Jamaica, good bright, 60s. to 70s.; middling to fair, 40s. to 56s. per cwt.

Pepper.—Capsicums, 16s. to 80s.; chillies, 35s. to 38s. per cwt.

Tobacco.—American. Messrs. Thomas H. Edwards and Co., Liverpool, report as follows on the Tobacco Trade:—

STRIPS.	1902.	LEAF.	1902.
Western—		Western—	
Fillers	4½ @ —	Common export	— @ —
Rather short	5¼ „ 6	African export	— @ 5 @ 6½
Very middling to middling	6¼ „ 6¾	Short trade	@ 4
Good to fine	7 „ 8	Medium to good trade ...	4½ „ 6
Burley	6 @ 9 @ —	Burley	7 @ 7½ @ 8
Virginia Dark—		Virginia Dark—	
Fillers	5 @ —	Common export	— @ —
Rather short	„ 6	Short trade	— „ —
Very middling to middling	6½ „ 7½	Medium trade	4 „ 5
Good to fine	8 „ —	Good to fine trade	5½ „
Virginina afd Canolina Bright—		Virginia and Carolina Bright—	
Semi-dark	— @ 7½	Common or semi-bright ...	6 @ 7
Semi-bright	8 @ 9 @ —	Medium or mixed	8½ @ 10 @ —
Medium or mixed	10 @ 11	Good to fine	11 @ 12 @ 15
Good to fine	11¼ @ 12½ @ 14		

The strong buying of brights and semi-brights continued on our market during December, being especially noticeable towards the end of the month, and a further rise in prices has been established. Some business also was done in darks, both of Western and Virginia growth, the Admiralty making their usual purchases of the latter.

The year which has just closed has been quite a noteworthy one. During the early part of it the market dragged, excepting for the cheaper classes, the trade fearing a further alteration in the duty, but in April the announcement was made that the present rate of 3s. per lb. and 30 per cent. limit of moisture was to continue, and manufacturers, who had been hoping for relief in some way, more or less avoided the market until about August, being depressed by the unsatisfactory condition of their trade in the ordinary run of the manufactured article. In the month referred to, however, Western filler strips, of which only a small import was expected, began to rise, and the following month semi-bright Virginias followed suit. This period of the year also witnessed the advent of the American tobacco trust as manufacturers on this side, and the formation of a strong British combination to fight them. Thence onwards a period of unexampled activity set in on this market, chiefly in Virginia and North Carolina brights and semi-brights, and, as showing the trend of the trade, it will be interesting to note the following changes in prices as compared with 31st December, 1900, viz.:—A rise of 2d. to 2½d. per lb. in semi-bright and medium brights, 1d. to 1½d. in colory brights and Western filler strips, ½d. to 1d. in dark Virginia filler strips and cheap Western mediums, and on the other hand a fall of about ½d. per lb. in good dark Western and Virginia strips and the better grades of Owensboros.

As regards the future, the position looks very strong, as few more brights can be expected here from the 1900 crop, and dark Westerns and Virginias are selling high in the States—in fact, the next movement over here looks likely to occur in the latter sorts.

Wine.—Australian Burgundy: Wotonga 13s., Waratah 18s., per dozen.

Green Fruit.—Oranges, Valencia, from 6s. 3d. to 8s. for common sorts to 21s. to 30s. for finest selected per 420; lemons, finest selected, 15s. to 22s. per case of 420; bananas, 8s. to 14s. per bunch.

Cotton.—Clean upland, 5½d. per lb. In America, seed cotton, 2½d.; lint, 9d. per lb.

Cotton Seed.—£6 12s. 6d. per ton.

Cotton-seed Oil Cake (decorticated).—£6 15s. to £4 17s. 6d. per ton.

Cotton-seed Oil.—Crude, £21 10s. per ton.

Linseed.—54s. to 57s. per 416 lb.

Linseed Oil.—£28 15s. to £29 5s. per ton.

Linseed Oil Cake.—£8 2s. 6d. to £8 7s. 6d. per ton.

Manila Hemp.—£25 to £30 per ton.

New Zealand Hemp.—£33 10s. per ton.

Wool.—The first series of the London wool sales closed on 5th February very firmly. Bidding was active, and competition brisk. Prices for merinos and fine crossbreds were 5 per cent. higher than on the previous day.

Frozen Meat.—The following are the latest quotations for the various descriptions of frozen meat mentioned (last week's prices being also given for comparison) :—

	Feb. 22.	March 15.
New Zealand Mutton. (Crossbred Wethers and Merino Ewes.)		
Canterbury	$3\frac{9}{16}$d.	$3\frac{9}{16}$d.
Dunedin and Southland	$3\frac{5}{16}$d.	$3\frac{5}{16}$d.
North Island	$3\frac{3}{16}$d.	$3\frac{3}{16}$d.
Australian Mutton. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$2\frac{15}{16}$d.	$2\frac{15}{16}$d.
Light (under 50 lb.)	$3\frac{1}{8}$d.	$3\frac{3}{16}$d.
River Plate Mutton. (Crossbred and Merino Wethers.)		
Heavy	$2\frac{15}{16}$d.	$2\frac{15}{16}$d.
Light	$3\frac{3}{16}$d.	$3\frac{3}{16}$d.
New Zealand Lambs.		
Prime Canterbury (32 lb. to 42 lb.)	$4\frac{7}{8}$d.	$5\frac{1}{2}$d.
Fair average	$4\frac{5}{8}$d.	$5\frac{1}{8}$d.
(The quotations for New Zealand lambs are for old season's.)		
Australian Lambs.		
Prime (32 lb. to 40 lb.)	$4\frac{2}{3}$d.	$4\frac{3}{8}$d.
Fair average	$3\frac{3}{4}$d.	$3\frac{3}{4}$d.
New Zealand Frozen Beef. (Fair Average Quality.)		
Ox, fores (100 lb. to 200 lb.) ...	$3\frac{1}{8}$d.	3d.
Ox, hinds (180 lb. to 200 lb.) ...	$4\frac{5}{8}$d.	$4\frac{1}{2}$d.
Australian Frozen Beef. (Fair Average Quality.)		
Ox, fores (100 lb. to 200 lb.) ...	$2\frac{13}{16}$d.	$2\frac{13}{16}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$3\frac{1}{4}$d.	$3\frac{3}{8}$d.

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations for New Zealand and Australian lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 9s. to 12s.; Danish, 9s. to 14s. per 120.

BACON.—Irish, 54s. to 61s.; American, 47s. to 50s.; Canadian, 46s. to 55s. per cwt.

HAMS.—Irish, 100s. to 112s.; American, 46s. to 50s. per cwt.

HIDES.—During the past month Queensland hides were quoted in England at 5⅛d. per lb., and New South Wales hides at 5d.

TALLOW.—Beef, fine, £34; medium, £31; mutton, fine, £38 6s.; medium, £33 6s. per ton.

MARSUPIAL SKINS IN THE LONDON MARKET.—It may be of interest to kangaroo-shooters and other dealers in marsupial skins generally to compare the values of such skins in the British market with those ruling here. Messrs. Anning and Co., London, reporting on their January sale of Australian opossum and other skins, write:—There was a good supply of all classes, except bearskins, which were very short. With a strong demand, practically everything was cleared. Opossums realised 5 per cent. advance on the closing prices of October, while bears were 30 per cent. and wallaby 15 to 20 per cent. higher on average. For good parcels of Sydney the demand was especially keen, and they sold relatively better than the commoner descriptions. Victorians and Tasmanians also realised high prices. The best lots of silver bearskins sold at the highest prices that have been touched for many years, while the commoner selections were also considerably dearer. Swamp wallaby advanced 10 per cent., and Tasmanian sorts 20 to 25 per cent. Furriers' kangaroo also sold to advantage. Offered.—Opossum, 934,675; bear, 31,687; wallaby, &c., 166,746; kangaroo, &c., 3,066; fox, 6,394; emu, 319; total, 1,142,887 skins. Sold.—Opossum, 934,675; bear, 31,687; wallaby, &c., 166,746; kangaroo, &c., 3,066; fox, 6,394; emu, 319; total, 1,142,887 skins. The prices realised are as follow:—First extra large blue, 1s. 4d. to 1s. 10d. per skin; second ditto, 10¾d. to 1s. 2d.; first blue, 10½d. to 1s. 4¼d.; second blue, 8¼d. to 1s.; small ditto, 7½d. to 10½d.; first extra large red, 1s. 1d. to 1s. 8½d.; second ditto, 8¼d. to 1s. 3½d.; first red, 9¼d. to 1s. 0¾d.; second red, 6½d. to 9½d.; small red, 5¾d. to 8¼d.; thirds, 3d. to 7d.; first Victorian, 2s. 9d. to 3s. 7d.; second and small Victorian, 1s. 1d. to 2s. 5d.; third Victorian, 9d. to 1s.; grey Tasmanian, 1s. 4d. to 3s.; black Tasmanian, 2s. 11d. to 6s. 9d.; bear, silver large, 11d. to 1s. 11d.; ditto, red, large, 8d. to 1s. 3d.; ditto, small, 3¾d. to 4¼d.; swamp wallaby, large, 1s. 1d. to 2s. 7d.; ditto, middling, 8d. to 2s. 1d.; ditto, small, 8d. to 1s. 9d.; rock wallaby, 1½d. to 6½d.; Tasmanian wallaby, 2d. to 2s. 3d.; kangaroo, 6½d. to 1s. 7d.; ringtails, 1d. to 4d.; native cat, 4d. to 1s. 2d.; house cat, 2d. to 8d.; wallaby, 1d. to 8½d.; emu, 1s. 7d. to 3s. 6d.; fox, 6d. to 3s. 6d.

A SAFE NIGHT LIGHT.

Take a clear glass bottle, such as a small vial, and put a small piece of phosphorus about the size of a pea into it. Then get a little of the clearest olive oil, such as that sold for table use. Heat to boiling point, and then pour in on top of phosphorus. Fill the bottle about one-third full, and then cork tightly. When requiring a light, remove the cork to allow air to enter, and then cork up again, and the whole of the empty space in the bottle will now become luminous, giving sufficient light to see the time or for other purposes when a night light is required. As the light becomes dim it is only necessary to withdraw the cork again to allow a fresh supply of air to enter. A bottle used like this will continue to give light for some months, but it should be kept warm during the winter time, for should the oil become solid through the cold the vial will have to be held in the hand for some time to warm it sufficiently to act, but in warm weather it will give no trouble, and a safe light is always at hand.

Animal Pathology.

TEXAS FEVER.

Much as has been written in these pages on the subject of Tick or Texas fever, there is always something to be learned from the experience in other countries of this disease. Hence the following statement, which the *Florida Agriculturist* takes from a contemporary, will doubtless prove of interest:—

Texas Cattle Fever.

A recent outbreak of Texas fever in cattle brought into Florida for breeding purposes has caused considerable apprehension upon the part of our cattle-men, and in response to several requests for information upon the subject the following statement has been prepared by Dr. Chas. F. Dawson, the Experiment Station Veterinarian. The necessary space restrictions preclude all but a bare statement of the facts as now known to veterinary scientists.

Texas fever is known in the United States under various names, such as Southern cattle fever, Spanish fever, red-water disease, bloody murrain, acclimation fever, town-cow disease, pasture poisoning, splenic fever, cattle distemper. It is not confined entirely to the United States, but exists in other countries under various names. The disease occurs in its most virulent form during the summer months when heat and other devitalising conditions are prevalent. In the fall of the year it is milder and exists in the chronic form. In the acute form the symptoms are about as follows:—A fever, which may reach to 108 degrees Fahr., appears in all adult animals which have been herded together, several days before they are noticeably sick. During the first two or three days the temperature will be a degree or two higher in the evening; then the morning temperature will gradually rise, and the fever remain permanent for seven or eight days, when the animal either dies or recovery begins. In either case the fall of the temperature to normal, or even below normal, is as sudden as was the onset. The respirations are increased from 20 or more, the normal, to 75, and the pulse from 60 or more to 100 per minute. There is a loss of appetite, and emaciation is rapid, even continuing after the fever has ceased. In severe cases, and in most cases that will terminate fatally, the urine is wine-coloured or blackish from the presence in it of the colouring matter of the blood—a condition known as hæmoglobinuria or "red-water." The bowels are usually constipated during the fever, but when this subsides a diarrhœa may set in, the feces being of yellowish colour. During the fever there is partial loss of vision, some delirium and staggering gait from weakness, which may be so great that the animal is unable to rise, when down. The blood is very thin and pale in colour. In some instances it is with considerable difficulty that a drop can be obtained from incisions made into the skin for purposes of microscopic examination.

In the chronic form of the disease all the symptoms described above as occurring in the acute attacks are milder in character and are prolonged. The temperature rarely goes above 105 degrees Fahr. in the evening, while it is about normal in the morning. "Redwater" is not present as a symptom. The blood disease goes on, but it is less rapid in its effects. In fact, the chronic form of the disease could hardly be diagnosed during life without the aid of the microscope, and not even then in some cases. It is not fatal as a rule, and the animal makes a slow recovery, after being "out of condition" for a month or two. Frequently after an acute attack has subsided a relapse may occur, but it is generally mild in character.

Texas fever being a blood disease, we find upon opening a dead animal alterations in blood and blood-elaborating glands as being the most noticeable features; the liver being enlarged and stagnated with bile, which gives it a yellow colour. The spleen is very much larger than is normal, and is filled with a dark, tarry substance. If held up by the end for some time its contents may gravitate. The heart and kidneys will show upon their surfaces the effects of the intense fever in the presence of blood spots. The lungs, stomach, and bowels, in acute cases, are generally somewhat reddened. The manyplies will be impacted, and the lining will peel off. The bladder in these cases contains a cherry or wine coloured liquid. The blood will be thin, but will coagulate. There will be no disease of the skin or swellings on the body as occur in some other diseases—notably as in anthrax, which has some symptoms resembling those of Texas fever. The gall-bladder will contain, instead of the usual green, free-flowing liquid, a dark, semi-coloured mass.

The presence of the foregoing symptoms and *post-mortem* appearance in animals dying or dead of a mysterious disease is sufficient to cause one to suspect Texas fever. Additional evidence would be had, if, at the same time, the cattle-tick were found upon the animal, or if close examination of the skin of the udder, escutcheon, or dew-lap showed little reddened, rough areas caused by the tick bites.

If more scientific methods can be applied, a microscopic examination of the blood will show an enormous decrease of the red-blood corpuscles, from 5,000,000 per cubic millimeter, the normal number, to as low as 2,000,000 per cubic millimeter. The corpuscle will also exhibit great changes in size and shape. They will appear shrivelled and crenated. If a drop of the blood be smeared upon a piece of glass, allowed to dry, subsequently wetted with methylene blue and examined with a microscope of 1,000 diameters, the real cause of the disease can be observed. The larger white corpuscles will be stained blue, as will also any bacteria which may be present. The red cells will not have taken up the stain, but will appear as round, yellowish, transparent bodies much smaller than the white corpuscles. Frequently inside the red corpuscles will be noted very small blue-stained points; sometimes they may be larger, pear-shaped, and in pairs. The same bodies are also found outside the red corpuscles. This little body is the cause of the fever. It lives inside the red cells, destroys them, and finally kills the animal. It is its destruction of the red cells of the blood, and the efforts of the kidneys to eliminate the débris thus formed from the blood, that causes the red water contained in the bladder, and gives rise to the name "red-water disease" used by some persons. The little speck mentioned above is an animal—the lowest form of animal—and consists of a single cell. It is a member of the group of protozoa, and has been named by Professor Smith, its discoverer, *Pyrosoma bigeminum.* This parasite is harboured and transported by the ordinary cattle tick whose ancestors passed their lives upon a cattle infected with the germ of Texas fever. Whether or not the tick is the only carrier of Texas fever is not known; but there seems to be no reason why any insect which had bitten infected cattle could not carry the disease to a susceptible animal. It is now known that the cattle tick can be deprived of its power to produce Texas fever by being reared upon animals which are insusceptible to the disease. Our ordinary cattle tick is found also upon Porto Rican cattle. Experiments made by Dr. E. C. Shroder, of Washington, D.C., show that the Porto Rican cattle-tick, although the same specifically as ours, is incapable of causing Texas fever. This being the case, a single ticky animal arriving in Porto Rico from the United States would probably start up the disease in that island and destroy its cattle industry.

The cattle tick has a very large geographical distribution in the United States. The federal quarantine laws define as being permanently infested with the tick all those States or portions of States in which the cattle tick is found—*i.e.*, Virginia, North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Indian Territory, Oklahoma, Texas, California, portions of the States through which the line runs may be exempt, and it is changed slightly from year to year; for instance, sixteen counties in Western North Carolina are placed north of the line, the tick not being found in them. In other words, the distribution of the tick is limited to those regions where the winters are not severe enough to freeze the eggs. It will be thus readily seen that no hard-and-fast line can be drawn, and the location of the quarantine will always be a source of contention between the Federal and State Governments in those States through which the line is run. Although the quarantine maintained by the Federal authorities may work hardships in individual cases, there can be no doubt that it is absolutely necessary to preserve the cattle industry of the United States. Were southern cattle allowed unrestricted movement north and west during the spring, summer, and fall, these regions would be annually decimated in cattle, and the industry ruined. Under the quarantine regulations, southern cattle must be shipped by rail or steamer direct to the slaughtering-places, or be held in quarantine till all ticks drop off. The cars or boats must be thoroughly cleaned or disinfected after the ticky cattle are discharged. Were the cattle driven, as in the olden times, the ticks would be scattered along the trail and infect any and all cattle passing by, unless the weather were sufficiently cold to kill them by freezing. All cattle raised in the country lying south of the so-called Texas fever line, or, in other words, all cattle which from birth, have supported successive crops of ticks, possess a certain amount of immunity against the fever. Therefore, southern cattle are generally immune to Texas fever. However, Texas fever probably kills more southern cattle than any other disease, because, when the acquired immunity is not backed up by a strong constitution, or when the animal gets "out of condition," it loses the power to withstand the infection, and then succumbs to the disease when a heavy infestation of ticks occur. Experiments have shown that two or three hundred ticks are a sufficient number to cause the disease. Our stockmen know that many times this number can be counted on animals which are considered only moderately infested. It has been noticed that the first crop of ticks in the spring is not as virulent as succeeding crops. This would indicate that the crop of ticks hatched from the egg which wintered over from the previous season either carry the parasite in a weakened condition, or in an undeveloped stage, or that it is necessary for the ticks themselves to become reinfested by sucking the blood of southern animals which are permanently infected with the germ of Texas fever. Experiments made by the Bureau of Animal Industry show a southern animal may be carried north and kept there, free of ticks for many years, and yet be capable of producing Texas fever, if some of its blood be injected into a northern susceptible animal.

The life history of the cattle tick is briefly as follows, according to Dr. Cooper Curtice:—The ripe female falls off the cattle and lays eggs for two weeks, when hatching begins, which occupies three weeks, more or less, according to the temperature. The young ticks, if opportunity occur, attach themselves to passing cattle and remain on them for three or four weeks, by which time, they in turn have reached the adult stage, or are ripe, and fall off. The young ticks may live for nearly a year under favourable conditions of warmth and moisture, or the eggs may not hatch out for three months in the absence of these. They finally die, however, of starvation if they can find no cattle, as they cannot live upon vegetable food, nor can they grow to the adult size except when nourished by the blood of cattle. When first hatched out ticks are almost too small to be seen by the unaided eye. Certainly it would be difficult to find them. Therefore, when the ticks have developed in size sufficiently to be found, even upon rather close inspection, they have probably infected the animal. Ticks are carried from place to place by cattle; they never crawl far away from the place where they are hatched. Bunches sometimes may be found upon the end of a blade of grass, and be blown some distance, or be carried by other means. They have never been known to cross a fence where the bottom rail rested upon the ground. One field may, therefore, be infested and the other not. Only the young ticks can attach themselves to animals, the old ones being unable to crawl against the hair.

After the foregoing statement concerning Texas fever and its cause, the question of most importance to the stockman of Florida is what means can be adopted in order to safely and profitably bring the improved cattle from the north and west here for breeding purposes. Probably no southern State is more dangerous to such animals than Florida, because the climate is rarely cold enough to kill off the ticks. The infective agent is then with us at all times.

It is known that young calves, while they may take the disease, have it in a mild form. This applies to the southern as well as the northern calf, and it is the successive infestations of the southern animal from birth with the cattle tick which confers a degree of immunity sufficient to prevent them from contracting a fatal case of the disease, if well cared for. It must be then plain to the reader that the safest age at which northern cattle (and by northern cattle is meant those cattle coming from any part of the United States where the cattle tick is not found) can be brought south is as soon as they can be weaned, or at the age of six months or less. Weaning should be commenced earlier, however, in order to accustom the calf's stomach to the herbaceous diet. A calf partly weaned could, after its arrival south, be allowed to nurse a southern cow, receive its first natural infestation with ticks, and thus acquire immunity the same as the southern-born animal by subsequent infestations. It should be distinctly understood that no bovine, be it southern or northern, is safe against Texas fever unless it has been infested with ticks or immunised by artificial means to be described. Southern cattle reared upon tick-free pastures are as liable to take the disease and die as the northern animals. Hence it is better to allow a moderate infestation with ticks of all cattle from birth, since an infestation occurring for the first time, in adult life, would very likely kill the animal.

The other method of immunising susceptible cattle against Texas fever was first suggested and practised by Drs. Smith and Kilborne, as shown in their report upon the disease in 1892. It consists of the injection under the skin, or into the jugular vein of a northern animal, a small quantity of blood from a southern animal. This method, or slight modifications of it, has been employed with success in Australia, and in the United States by several of the State Experiment Stations. Until more experience has been gained upon the subject the operation should only be performed by a skilful veterinarian or layman who realises the forces he is dealing with. In particular, the method as now employed is as follows:—The animal which is to supply the blood should be healthy, three or four years old, and must have supported successive crops of ticks from birth. Such an animal is easily found in Florida. The hair is shaven from the neck over the jugular vein; the neck is washed with soap, 5 per cent. solution of carbolic acid, and then with water which has been boiled. Put a strap round the neck and draw it tight. Place under it and over the jugular vein a block about an inch square. This will cause the vein to swell. Insert into the jugular a large hypodermic needle to which is attached a small peice of rubber tubing, both of which have been previously boiled. The needle must point towards the head. Blood will now flow, and is to be caught in a clean tumbler and stirred with a small bundle of wires or other material. After stirring for a minute or two fibrin will collect upon the stirrer, and the blood will have lost its coagulability. Then strain the blood through a piece of cheese-cloth tied on to the top of a second tumbler. The blood is now ready for infection. A 1cc. syringe with hypodermic needles of sufficient strength for the work is filled with the blood and the contents are injected under the skin of the shoulder of the animal to be inoculated. The place of inoculation should be cleaned in the same manner as that from which the blood was obtained. It is also of paramount importance that the blood be kept milk-warm during the process. This is best accomplished by standing the tumblers in a pan of warm water. The syringe and all utensils should be thoroughly freed of blood and washed in 2 per cent. of carbolic acid solution after the work is over with. The operation must, on no account, be delayed after the blood is drawn. Sixty days after the first dose a second dose of 2cc. should be given in the same manner as the first; although some have given only a single dose, it stands to reason that a second one would fortify the initial immunity. The second dose is indicated in animals whose temperature did not rise to 105 Fahr. In a typical case of the fever produced by this means, the fever commences in a week, showing a rise to 106 Fahr., which continues for from five to fifteen days more, when it falls to the normal, but 102 Fahr. About the thirtieth day after injection a secondary milder fever lasting several days will occur.

According to Dr. Cary, of the Alabama Station, the best time for the work in the south is between 1st November and the following 1st March; never during hot weather. He also advises allowing a mild infestation with ticks two months after inoculation, and keeping off an excess of ticks during the hot summer months. This can be done by pasturing in fields where ticks are known not to be plentiful, or by applying, once weekly, to the dewlap, udder, and escutcheon, crude Beaumont oil, or 20 per cent. kerosene oil emulsion.

The statistics of Dr. Francis of the Texas Experiment Station, given by Dr. Cary, show that out of 1,500 animals inoculated by him, only 3½ per cent. died from inoculation fever, and less than 7 per cent. by exposure, and less than that proportion after they had recovered from the blood inoculation, a loss of about 10 per cent.

In Texas, the animals were placed in large pastures, where no attempt was made to keep down excessive infestation. At the same time, northern animals placed upon the same pastures, without being immunised, had a mortality of 50 to 90 per cent. It is possible that where the infestation, subsequent to inoculation, can be governed, a still smaller percentage of loss would occur. In Texas the ages of the animals ranged from a few months to two years; yearlings being preferred. As regards the medicinal treatment of Texas fever, there is unfortunately little to be said. Such havoc is played with the blood that the animal has very little chance of recovering. Being a blood disease, one would naturally turn to the medical agents which are known as blood medicines. Foremost among these is iron. Then the stomach tonics should be added to promote the appetite, a good one being gentian. The addition of quinine to combat the fever, and nux vomica for its general effect as a tonic, would be a rational addition. Some prescribe saline purges, but, personally, I cannot agree unless a purge is urgently required, as we have a disease which is wasting the blood, and such purges only promote the waste. At the first opportunity, I shall try the injection of large quantities, say a half-gallon, of 0·6 per cent. solution of warm sodium chloride directly into the jugular vein with the expectation of beneficial results. Were it possible to transfuse a considerable quantity of blood from a healthy immune southern animal into the veins of the sick one, it is probable that a beneficial effect or even a cure and thorough immunisation would result. The above is entirely practicable and should be given a trial.

A remedy which combines the above indicates that medicinal agents might tide an animal over a critical period and help to bring about a recovery; it could be prescribed and used as follows:—Take of sulphate of iron and powdered gentian, 3 oz. each; sulphate of quinine, 6 drams; and of nux vomica, 1 oz. Mix and divide into twelve powders. Give each animal one powder three times a day, made into a paste with syrup, placing upon the tongue by the means of a small paddle. House the animals at night. Provide plenty of fresh water, and give soft feed. If constipated, give rectal injections of oil, or castile soap water. If bloating occurs, give half-ounce chloride of lime, dissolved in half-pint of tepid water, every half-hour till relieved. It may be well to state here also that Texas cattle fever never attacks any other animals than cattle. Carcasses are absolutely harmless so far as the power to perpetuate the disease is concerned. The virus is not carried to other cattle by means of carnivorous birds or animals. In order for the dead animals to become a source of infection some of its blood would have to be carried by biting insects and inoculated into the skin of a susceptible bovine. Cattle have been drenched with the blood of an animal dead from the disease, and no harm resulted.

A recent inquiry from a correspondent is, "How are we to distinguish the cattle tick?" Curtice says, "Cattle ticks are called 'oldfield ticks,' 'shingle ticks,' 'blue ticks,' 'fever ticks,' 'dog ticks,' and many other names. All large female ticks look much alike. They are harmful and live upon blood. The three most common kinds of ticks are the cattle tick, which has a chestnut-brown head; the 'lone-star' tick, which has a bright metallic spot on the back of its head; and the 'dog tick' (also called the deer tick, bear tick, or terrapin tick), which has a whitish border around its head."—*Kissimmee Valley Gazette.*

Agricultural Patents.

PATENTS ACCEPTED.

MAIZE HUSKER AND DRESSER.—Class 29—(3 Figures)—5739: Robert Gustav Münchow, of Templin, near Boonah, Queensland, farmer and mechanic. "An Improved Corn Sheller, Husker, Winnower, and Bagger." Dated 29th October, 1900. (Drawings, 10s.; specification, 4s.) The corn-cobs are fed into a shoot and fall revolving between a spiked drum and spiked base-plate, where the husking takes place; the base-plate having a hinged spring adjustment provides for the irregularity of the size of the cobs; the crushed cobs and the husked corn fall on to a jigger or shaking table, the corn and dust pass through the upper screen to the lower screen thereof, and the crushed cobs are discharged at the mouth of the jigger from the upper screen, whilst the corn is discharged from the mouth of the jigger from the lower screen, after which it is raised by elevator buckets into a storage receptacle and thence discharged into bags or other desired receiving agent; whilst the corn is falling from the jigger to the elevator the dust is blown away by a fan. (2 claims.)

FILTER PRESS AND PROCESS FOR GRAPE SUGAR.—Classes 23, 24, 25, 30 31—(8 Figures)—6217: Cereal Sugar Company. 17th September, 1901.—Instead of refining grape sugar by moistening in a centrifugal, the dry non-pasty crude sugar is cut up by a revolving drum shredder, and re-compacted into suitably shaped cakes by a preliminary pressing in canvas wrappers. These cakes (with the wrappers) are then sandwiched with iron plates in an hydraulic press, each plate having rubber borders to prevent lateral spreading. Under a pressure of 2,500 to 5,000 lb. per square inch at a temperature of 90 degrees Fah., the impurities are expressed in a liquid form, and a superior marketable product is obtained in about one-twelfth of the time required for the centrifugal process. (6 claims.)

TWO-WHEEL TUMBLING EARTH-SCOOP.—Class 85—(6 Figures)—6103: William Henry Moore Cameron, of Kensington Downs, Muttaburra, Queensland, Australia, grazier. "An Improved Earth-scoop." Dated 11th July, 1901. (Drawings, 30s.; specification, 7s. 6d.) The shafts for three horses abreast are attached to the wheels by upward bowled axle, and extend backwards for the attachment of the scoop slings; the driver sits above the axle. The scoop is a rectangular box between the wheels, which can rotate on gudgeons near its centre of gravity when full; the gudgeons are pivoted in a hanging frame slung by two chains to the back of the straps, and raised or lowered in front by chains attached to arms on a rock-shaft that may be locked in "up" or "down" position by a pedal and bolt. The draft-bar extends across the arms of this rock-shaft, and the pull of the animals raises it (when unlocked) to the upper or travelling position. The scoop door is hinged at the top of the mouth, and is so connected to a balance-beam that the lowering of the scoop opens the door, and *vice versa.* The scoop is locked in its cutting position by a hand-rod which operates bell-cranks and catches on the swinging frame. On releasing these catches the scoop is emptied by turning over on tumbler bars attached to its top. (4 claims.)

CANE HARVESTER.—Classes 30, 60—(3 Figures)—6119: Sören Bonet Lorentsen Faldt, of Metropolitan Hotel, Bundaberg, Queensland, contractor. "A Sugar-cane Harvester." Dated 18th July, 1901. (Drawings, 22s. 6d.; specification, 11s. 6d.) This machine is carried on two wheels and steered by a follower on a hinged frame so that the working part can be raised during idle travelling. It is intended to be propelled by horses or otherwise, and the power for harvesting is provided by a motor carried on the main frame; but the means of traction and of distributing the power to the various operating parts are not particularised. The forward part has a forked guide leading the base of the canes to stumpy, scythe-like cutters revolving on a vertical axis past fixed fingers; at each side are spiked travelling chains and guide-bars which gather the canes and guide them over the body of the machine into a horizontal position and carry the longest canes past a first topping-knife (rotating on a horizontal axis) which removes the tops of the longest canes; the canes then slide down a mould-board (assisted by three travelling chains and rollers) whereby the tops are brought adjacent to a second topping-knife on a horizontal axis; the topped canes fall on a friction-controlled rotating collector, which drops them in suitable bundles, when the accumulated weight causes slipping. An additional travelling chain rake at the front may be used for trashing. (8 claims.)

Unloading Sugar-cane.—Classes 30, 60—(8 Figures)—6219: William Cephas Gregg, of 108 Washington avenue north, Minneapolis, Hennepin, Minnesota, United States of America, wholesale merchant. "Improvements in Machines for Unloading Sugar-cane and the like." Dated 20th September, 1901. (Drawings, 30s.; specification, 11s. 6d.) The trucks are run alongside the travelling conveyor which leads to the mill, and a ramp is provided from the car floors to the conveyor. From the roof a triangular frame (pivoted at one corner on a driving wall-shaft) carries a pair of travelling rake chains which move round sprocket wheels at the corners of the triangle. The free end of the triangle is nearly counterbalanced by a rope and weight; another rope and winch are provided for lifting the rake above the load on the cars; the rakes move transversely to the trucks and drag the cane off the truck down the ramp and on to the conveyor; in its lowest position the lower side of the triangle is parallel to the truck floor. The corners of the triangle are provided with necessary adjustments for tightening the chain and maintaining the parallelism to the truck bottom. (7 claims.)

Guillotine Cane-cutter.—Class 30—(3 Figures)—6125: James Augustus Edwards, of Mackay, Queensland, Australia, cane-farmer. "An Improved Cane-cutter." Dated 22nd July, 1901. (Drawings, 17s. 6d.; specification, 4s. 6d.) The guillotine knife moves nearly horizontally on a flat plate provided with a front comb and suspended to a wheeled carriage. In Figs. 1 and 2 there are two wheels, side-handles at the rear being provided for human propulsion; the knife-plate is coupled to a hand-lever on the axle and is impelled forwards by a compression spring; the operator pushes the cart against the cane, then pulls and suddenly releases the knife-handle. Fig. 3 shows a cam-wheel that may be employed for retracting the knife in a machine for power. (2 claims.)

DOES SUGAR-CANE AFFECT HORSES' TEETH?

Mr. R. J. Wilson, of Logan Water, writes:—

Re the question of sugar-cane giving horses toothache, I cannot, of course, assert that it does not, but I lived for over three years with the late Mr. Robert, of Eagle Farm. He grew cane and sweet potatoes in large quantities to feed his cows and horses.

The cane was chaffed and mixed with pulped potatoes. This was fed to the animals, and they never showed, either by refusing their food or by restlessness, that anything was wrong with their teeth. Both cattle and horses showed by their condition that the food suited them. The only thing noticeable was this—the more sweet potatoes the cattle got, the more milk they gave. I think the chaffed sugar-cane was meant for putting on flesh.

General Notes.

THE LAWTON PROCESS OF FRUIT-PRESERVING.

Last month we stated that a shipment of fruit loaded in Jamaica and in Central America had left for London, preserved by the Lawton process, on board the R.M.S. "Para." The sequel to the trial has proved tragic, as, when nearing Barbados, an explosion occurred by which Mr. Lawton, the inventor, an American, Mr. Astwood, the representative of the United Fruit Company, a Jamaican, and Mr. Hamilton, the engineer in connection with the experiment, were all killed. This terrible accident is very regrettable, not only for the loss of valued lives, but for the suspicion of danger that will now attach to the preservative process; and, possibly, some important details may have been only in the possession of the inventor. Our information as to the mishap is derived from the Journal of the Jamaica Agricultural Society.

A SIMPLE BARBED WIRE STRETCHER.

A very handy tool with which one man can stretch a barbed wire fence may be made by any blacksmith. Take a stout piece of steel, about 1 inch wide and five-eighths of an inch thick, and let one end be forged after the fashion of a

jemmy, but with claws similar to those found on hammers. To stretch a wire the claws are caught behind a barb in the wire, and the tool is plied around the post, as will be seen in the accompanying illustration.

TO MAKE GINGER BEER.

That most refreshing drink, ginger beer, should be made in every farm-house. When we ran a farm, we were never without it and hop beer. Both are easy to make and cheap, and are an agreeable change from the everlasting tea during the summer.

First Recipe.—White sugar, 5 lb.; lemon juice, 1 gill; honey, ¼-lb.; ginger (bruised), 5 oz.; water, 4½ gallons. Boil the ginger 30 minutes in 3 quarts of water; then add the other ingredients and strain. When cold, put in the white of an egg well beaten with 1 teaspoonful of lemon essence. Let stand for 4 days and bottle. It will keep for months—much longer than if yeast were used. The honey, however, operates mildly in place of yeast.

Second Recipe.—Water, 20 gallons; brown sugar, 20 lb.; ginger (bruised), 1¼ lb.; cream of tartar, ¼-lb.; supercarbonate of soda, 3 oz.; oil of lemon. Put in a little alcohol (1 teaspoonful); whites of ten eggs well beaten; hops, 2 oz.; yeast, I quart. The ginger root and hops should be boiled 20 or 30 minutes in enough of the water to make all milk warm; then strain into the rest and add the yeast; let work over night; skim and bottle in beer bottles.

SEEDLING SUGAR-CANE.

At a meeting of the Barbados Agricultural Society held on 4th October last, Professor D'Albuquerque (the Acting Commissioner of Agriculture for the West Indies) had some interesting remarks to make concerning the B 147 cane from which so much was expected, and so little has resulted. The yield of juice from this cane proved fair, 6,787 lb., but the purity was very low, only 86½, while on some estates it was only 84·32. Then the glucose ratio was very large, ranging from 5·39 to 5·49, with the result that it would not make Muscovado sugar at all. It is not surprising to read that, in view of the over-sanguine estimates which appeared in a section of the Press as to the results which were to be achieved by the recourse to seedling canes, the professor's remarks were received with some degree of amusement. As we have so often pointed out, we have always recognised the importance of seedling cane experiments, of which we may claim to be the inaugurators, but we do not think that any advantage can be gained from over-estimating the results attained. —Journal of the Imperial Department of Agriculture for the West Indies.

PICKLES AND PICKLE-MAKING.

By AUNT KEZIAH, in *Garden and Field.*

The art of pickle-making is one which requires more skill and painstaking than any other branch of preserving. There are many important matters to be considered—the vegetables must be fresh, young and tender, the vinegar should be of the very best, for this is much more economical in the long run. It must also be remembered that whatever preparation is required in the preliminary stage—that is, whether the articles to be pickled are scalded or parboiled in salt and water to make them absorb the vinegar, or whether they are sprinkled with salt in the ordinary way—they must be cold and quite dry before adding the vinegar. Good vegetables, good vinegar, and careful attention are the essentials of good pickles.

Gherkins, or Young Cucumber Pickles.—Choose young and fresh gherkins and put into a salt and water brine. Keep them in brine until they come yellow, then boil the brine and pour over the gherkins till they become green. Dry them, place them in bottles, and pour on vinegar, in which has been boiled mace, cloves, ginger, peppercorns to taste, and a little salt. Vine leaves laid on the gherkins while in the brine will improve the green colour.

Onion Pickles.—Scald the onions and peel them. Put them into brine for a week, changing the water twice or three times. Put into jars, pour fresh boiling salt and water over them, cover them, leave them, and leave till cold, then take off the cover and repeat the operation. Drain the onions until perfectly dry, and then bottle, pouring over them vinegar, in which ginger, mace, cloves, peppercorns, and a little salt have been boiled.

Cauliflower Pickles.—The cauliflower must be hard and firm. Pull into small pieces, soak in brine of salt and water for two or three days. Pour off the brine, and boil it. Pour the boiling brine over the cauliflower, then drain and dry. Put the cauliflower into bottles, pour over vinegar, in which peppercorns, ginger, allspice, and cloves have been boiled.

French Bean Pickles—Beans are prepared like cucumbers or gherkins. If the beans lose their colour pour boiling vinegar over them several times, keeping in the steam, and they should return to a green colour.

MIXED PICKLES.—Mixed pickle may be made by using a collection of vegetables, such as gherkins, cauliflower, onions, beans, and radish pods, also, if procurable, a few green chillies. Make a brine of salt and water, and let the vegetables stand in it for, say, 12 hours; then place in a pan, and heat to boiling point. Now pour off the liquid, and thoroughly dry the vegetables. This may be used as plain mixed pickle by adding spices (peppercorns, ginger, and mace), by pouring over the whole cold vinegar, and will be ready for use after standing for, say, a month. The mixed vegetables may be made into mustard pickle by mixing a cup of flour, 4 tablespoons of mustard, 1 tablespoon curry powder, 1 dessert-spoon of turmeric colouring, with enough cold vinegar to make a smooth paste; then add half-a-teacup of sugar and sufficient vinegar to make about 5 pints in all. Put this mixture into a pan, place on the fire, and stir until it thickens, when you may add the vegetables, and allow the whole to reach nearly boiling point, when it may be bottled.

PICKLED FIGS.—Four quarts of vinegar, 1 lb. of loaf sugar, 4 oz. of salt, ½-oz. peppercorn, 2 oz. allspice, 2 oz. cloves, 2 oz. ginger. Soak the figs in the ingredients for three days, then drain it off, and boil, and add it boiling to the figs. This pickle must stand for at least a month before using.

GREEN TOMATO PICKLE.—Slice 6 lb. of green tomatoes and three large onions, sprinkle them with salt, and stand over night. Next morning drain, and add half-a-gallon of good vinegar, 1 lb. of dark treacle, and boil for about three-quarters of an hour, with 3 oz. of whole ginger, 1 oz. cloves, a little mace, allspice, and half teaspoon of cayenne pepper tied in a muslin bag. Bottle and tie down.

KEEPING BIRDS OUT OF FRUIT TREES.

The birds of Ceylon must have different ideas of the value of material objects from those entertained by our Queensland felons in feathers, the fruit-eaters. In our February issue we described a plan for obstructing their nefarious proceedings by means of looking-glasses, as given by the *Ceylon Tropical Agriculturist*. A correspondent from Georgetown, Etheridge, now writes to say that he has found looking-glasses to be a complete failure. The bower birds simply danced round them with delight, and one even tried to carry off a bit of the broken glass. Our informant bought a dozen cracked mirrors and hung them by strings from sticks stuck in the ground and on the branches. It appeared, however, that the birds were rather attracted than repelled by the glitter of the mirrors. Those who know the habits of the bower bird will not be surprised at that dancing dervish amongst birds trying to run away with the glass, for they seize on anything shining, as well as shells, to scatter round their bowers, which are often "halls of dazzling light."

HOW A SMALL ORCHARD WAS KEPT CLEAN.

The wife of a settler in the Opaheke district, whose orchard was noted for its fine yields of good fruit, never infested by the codlin moth, though nearly every orchard in the neighbourhood was troubled with the pest, thus narrates how she and her husband kept the enemy at bay. The soil about the roots of the trees was removed as far as the roots went, laying them bare. The wood ashes from the household fire, carefully saved, bagged, and kept dry, were strewn over the exposed roots, and kerosene sprinkled on afterwards. The soil was then returned to its place. The trunks were tarred to the height of 1 foot just about budding time, and beyond that washed with a mixture of kerosene and warm water. After that was done, the upper part of the trunk, and the limbs as far as convenient, were whitewashed. No bandages were used, no paper in the forks. Cultivation was resorted to under the trees. Only the one washing, when the trees were budding, was given to the trees.—*New Zealand Farmer*.

INSECT TORMENTORS OF HORSES.

The *Chasseur illustré* says that a decoction of 1 part of stramonium leaves to 3 parts of water, boiled for 20 minutes and applied, when cool, to the face, about the ears, inside the legs, about the belly and croup, is sufficient to keep a horse free from its insect tormentors during a whole day. Stramonium is said to be much more efficacious when thus used than tobacco.

PRECAUTIONS TO BE TAKEN BY CONSUMERS OF VEGETABLES.

Extract from l' *Agriculture Moderne.*

We (*La Revue Agricole de l'Ile Maurice*) think it will be useful to reproduce a paragraph inserted in the *Agriculture Moderne* relative to the treatment which raw vegetables should undergo before being eaten.

The recommendations by Dr. Ceserole have all the more importance in hygiene, as market garden produce in the colonies is often treated with liquid manure.

It has for a long time been known that intestinal worms are generally transmitted to us through the medium of vegetables. Dr. Ceserole, of Padua, has devoted careful study to the subject; he has examined the sediment of sterilised water in which various market vegetables had been washed, such as lettuce, endive, radish, celery, &c. The microscope revealed in this water the presence of fifty-two common species of fauna.

But, besides these parasites, Dr. Ceserole found a number of microbes—notably, a bacillus analogous to that of typhoid fever, the septic bacillus, and the bacillus of tetanus.

This infection of the vegetables is especially to be imputed to watering them with liquid manure. Great care has consequently to be exercised. Lately, Metchnikof, of the Pasteur Institute, has discovered that a certain number of parasites appeared to have their origin in intestinal worms.

Dr. Ceserole recommends that, to avoid danger, the vegetables previously well washed should be plunged for half-an-hour into a 3 per cent. solution of tartaric acid, which has an agreeable flavour, is cheap, and of great antiseptic power.

THE CURE OF SNAKE-BITE.

In an article recently published on the prevention of deaths from snake-bites, M. Henri de Parville cites several well-authenticated cases in which the anti-venomous serum of Dr. Calmette, head of the Pasteur Institute at Lille, has been the means of saving life.

Dr. Calmette, it may be remembered, was himself bitten on the hand by a cobra when experimenting in his laboratory a short time ago, and only escaped death by the application of the serum discovered by himself. A mining engineer, in a letter to the writer from Australia, also relates how he was bitten in October by a deadly serpent, and an hour afterwards was fast losing consciousness, when the timely intervention of Dr. Calmette's antidote brought him back to life.

But the most striking testimony to the value of the French professor's serum comes from India, where a woman was recently bitten by a venomous snake of unusually large dimensions, and cured when she was at the point of death.

To prepare the serum, the venom has to be procured from living serpents, and it was while engaged in this risky operation that Dr. Calmette came near losing his life. The Pasteur Institutes at Lille and Paris forward consignments of the saving serum to all countries in which venomous serpents are found.—*Australian Field.*

CEMENT FOR BROKEN CHINA, GLASS, Etc.

The following recipe is vouched for by a correspondent as being a good one, and, being nearly colourless, it possesses advantages which liquid glue and other cements do not.

Dissolve ½-oz. of gum acacia in a wineglass of boiling water, add plaster of Paris sufficient to form a thick paste, and apply it with a brush to the parts required to be cemented together.

HOUSEHOLD RECIPE.

Now that the cool weather has arrived, we shall be able to enjoy the luxury of young roast sucking pig. Properly cooked, and of a proper age, there is no better dish. But how many know how to cook a sucking pig to perfection? We give our lady readers the benefit of the experience of "Marie," who gives the following recipe to the *Agricultural Gazette*, London:—

To Dress and Re-dress a Sucking Pig.

When nicely cooked and served with plenty of suitable accompaniments, a sucking pig forms a most delightful and very highly appreciated dish, but to be eaten in perfection the animal should be of prime quality, nice and plump, and not more than 6 weeks old; indeed, epicures, with whom this dish is a great favourite, say that the pig should not be more than 3 or 4 weeks old. However, on this point opinions differ very widely. But whatever may be the exact age of the pig, the fact must always be borne in mind that the sooner it is cooked after being killed the better, as the flesh very quickly loses its richness and delicacy It should, therefore, be killed and properly prepared one day, and if possible cooked the next. For this reason especially a home-killed pig is decidedly to be preferred to any other, as then there can be no question as to its perfect freshness. To prepare the sucking pig for dressing, take it directly after being killed and plunge it into cold water for 10 or 15 minutes, then scald it in quite boiling water for about 5 minutes, or until the hairs begin to loosen, after which lay it on a table and entirely remove the hairs by rubbing with a clean coarse cloth; next slit the pig open and empty it of everything except the kidneys, which should be left untouched, then cut off the feet at the first joint, leaving sufficient skin to fold neatly over the ends, thoroughly cleanse every part of the head, and wash the pig in two or three clean waters in which has been dissolved a little salt, then dry it inside and outside, wrap it up in a damp cloth, and keep it in a cold place.

When required, stuff the pig with any of the forcemeats mentioned below, sew it up securely, truss it neatly and firmly, brush it entirely over in every part with liquid dripping, salad oil, or clarified fat, and cook it in a well-heated but moderate oven until done enough, basting frequently and very freely. As the rind or crackling is considered one of the dainty tit-bits of a sucking pig, great care should be taken to see that it does not become too hard or too darkly coloured; it should just be a rich golden brown, and deliciously crisp. The exact time required for cooking must be regulated by the age and size of the pig, therefore upon this very important point the cook must rely entirely upon her own judgment, but as a general rule a pig 3 weeks old requires about 1½ hours, and one 6 weeks old from 2 to 2½ hours.

When done enough, first remove the head, and split it in two, cut the pig in halves lengthwise and arrange these, back to back, on a very hot dish, with one-half of the head on each side, garnish tastefully with fancifully cut slices of fresh lemon and sprigs of parsley, and serve at once accompanied by some rich creamy brown gravy and apple sauce—or, if preferred, by tomato, piquant, poivrade, provençale, maître d'hôtel, or the old-fashioned, but still very highly appreciated, currant sauce, the choice being simply a matter of taste.

There are several kinds of forcemeat used for the stuffing of sucking pig, but those most popular are as follow: No. 1, put 1 pint of sifted breadcrumbs into a bowl with 4 large tablespoonsful of finely chopped parboiled onion, 1 tablespoonful of minced parsley, the liver and heart of the pig, which have been parboiled and finely chopped, a pleasant seasoning of salt, pepper, and powdered sage, 2 oz. of slightly warmed butter, and 2 or 3 well-beaten fresh eggs ; mix these ingredients thoroughly, and, when they form a well-blended whole, use as directed. No. 2 is a potato stuffing which can be made in two ways, one being to mash some well boiled or steamed potatoes in the usual manner until perfectly smooth, then to season them rather highly with salt, pepper, grated nutmeg, and chopped parsley, and to moisten them nicely with beaten egg yolks; the other method being as follows: Peel the requisite quantity of potatoes and cut them into ½-inch dice, then wash them thoroughly in salt and water, drain well, and put them into a stewpan with 2 or 3 medium-sized onions and the liver and heart of the pig, all of which have been carefully scalded and cut up finely, a seasoning to taste of salt, pepper, powdered sage, and lemon-juice, and 2 or 3 oz. of fresh butter, and fry together over a moderate fire, stirring constantly until the potatoes, &c., are partially cooked, when the forcemeat is ready for use. No. 3 is chestnut forcemeat, which is prepared in the following manner: Carefully roast and peel about 50 large chestnuts, then boil them very gently in white stock, or milk and water slightly salted, until tender, after which drain them and put them into a mortar with the finely minced parboiled liver and heart of the pig, 2 tablespoonfuls of breadcrumbs, 3 oz. of fresh butter, a good seasoning of salt, pepper, and nutmeg, and 2 tablespoonfuls of finely minced parboiled onion, then pound the whole as smoothly as possible, after which add 2 or 3 well-beaten fresh eggs, mix thoroughly and use. No. 4 and No. 5 are just the ordinary sage and onion stuffing and veal forcemeat, both of which are too well known to need any directions being given for their preparation.

Methods of Re-dressing.—The remains of a sucking pig can be served up in various ways, but the two nicest are, I think, the following:—No. 1 method: Free the meat entirely from skin, gristle, &c., and cut it up into small neat pieces, then season these pleasantly with salt, pepper, nutmeg, and lemon-juice, and cover them over in a cool place until required. Put 1 oz. of fresh butter into a stewpan, and as it melts stir in very smoothly 1 oz. of flour, and continue stirring for a few minutes, until the flour is partially cooked, but see that it does not acquire any colour; then add some roughly chopped onions and celery, a bunch of herbs, a seasoning of salt and pepper, and ¾-pint of good white stock —or, failing this, milk and water in equal parts—and simmer gently until the sauce is pleasantly flavoured, somewhat reduced, and of a nice creamy consistency, then strain off into another pan and put in the meat; let this get thoroughly hot through without boiling, then add the beaten yolks of 3 fresh eggs and 1 dessertspoonful of finely chopped parsley, and stir for 3 or 4 minutes, after which dish up the meat and sauce in the centre of a neatly arranged potato border, garnish with an outer ring of buttered sprouts or creamed cabbage, and serve the whole very hot.

No. 2 method: Prepare the meat as above, but in this case cut it into neat slices as even in size and shape as possible, then season these well with salt, pepper, mixed herb powder, and lemon-juice, and let them remain in a cool place for about 2 hours, turning them once during the time to ensure the meat being equally flavoured all through; then coat thickly and smoothly with beaten egg and breadcrumbs, and when the covering has been firmly pressed in fry the slices in boiling clarified fat until just nicely and evenly browned; when done enough, drain thoroughly and dish up neatly on a bed of skilfully prepared haricot purée, garnish round about with daintily fried crisp potatoes, either slices, quarters, chips, or ribbons, insert a sprig of parsley here and there, and serve at once.

NATIONAL AGRICULTURAL AND INDUSTRIAL ASSOCIATION OF QUEENSLAND.

Entries for the Twenty-seventh Annual Exhibition of the Association will close on 15th July. Late entries will close on 19th July.

Answers to Correspondents.

ANGORA GOATS.

MOHAIR, Daintree River.—

Question.—Where can I get pure Angora goats?

Answer.—Before replying to your question, we must inform you and all other correspondents that, although we will go to any amount of trouble to answer questions, we decline in future to give replies to anonymous correspondents. If, as often happens, we require some further information from the correspondent in order to make our answer intelligible, how can we refer to him if he merely signs himself "Mohair, Daintree River"?

Now, in the first place, we do not think that Angora goats would thrive in your moist, hot climate, although the common goat, we believe, would live in—well, a much hotter place. Again, there is much difficulty in the way of importing from other countries. You might get some in New Zealand from the Department of Agriculture, by whom they were imported from Australia, and which did well on Somes Island, where they were quarantined. They are now running in several parts of the colony, and are found to be particularly suitable to rough country. They are very fond of blackberry foliage and briars, and the people in New Zealand find them of great use in keeping down those pests. There is a considerable demand in New Zealand for the animals, but great difficulty is found in supplying it. The Turks have prohibited their export, and the Government of Cape Colony has placed a heavy export duty upon them. In addition to their value in keeping down blackberry, briars, and other similar pests, the goats give a plentiful supply of rich milk, and from each one between 4 lb. and 6 lb. of mohair, worth from 1s. 4d. to 2s. per lb., can be cut every year. At the present time there are about 4,000,000 Angora goats in Cape Colony. Mr. Willis, Springsure, Queensland, has a flock. There is also one at Moura, near Banana; and in the Kilkivan district there is a grade flock. You might write to Mr. C. M. Jenkinson, Brisbane, who is greatly interested in the success of the Angora goat in Queensland.

LUCERNE AND OATS.

SCRUB FARMER, Woodend, Q.G.R.—

Question 1.—Are there two different kinds of lucerne? What is the difference?

Answer 1.—Yes, the narrow and the broadleaf. The broadleaf is the best.

Question 2.—Where can I rely upon obtaining the best kind?

Answer 2.—Anderson and Co., seedsmen, Ruthven street, Toowoomba; or S. Eaves and Son, seedsmen, Queen street, Brisbane.

Question 3.—Which is the best kind of oats to sow for hay only?

Answer 3.—Black Tartarian or Algerian. The former will give the heaviest crop.

PINEAPPLE TOPS *V.* SUCKERS.

J. D. M., Mooloolah—

Question 1.—How long does it take pineapples to come into bearing on the supposition that this season's tops were planted next planting season?

Answer 1.—Tops of pines ripening now, if set out in a nursery and transplanted next spring, should produce fruit during the summer of 1904.

Question 2.—Is it better to plant suckers than to plant tops?

Answer 2.—Strong suckers from selected plants are superior to tops.

Question 3.—Do the suckers remain longer in bearing than tops?

Answer 3.—They will continue to produce marketable fruit quite as long as tops.

Note.—We have at this moment several tops planted three years ago. One has come into bearing this summer. The others will not fruit for another year. Planting tops, even if they are procurable in quantity, is a slow method of starting a pinery of any size.

PLANTING CEDAR-TREES.

Farmer, Geraldton—

Question.—There are a number of young cedar-trees, about 2 feet high, growing near my place. I want to plant a few. Should I plant them in the middle of the scrub, or how?

Answer.—No. Plant them in the open, or if in the scrub, plant in good cleared spaces. We once planted two thousand cedars in the scrub, and all died. Those planted in the open lived and throve.

VOLUME OF A DAM.

J. Reimers, Quinalow—

Question.—I excavated a dam for a neighbour. The dimensions were:—Length on top, 22 yards; length at bottom, 11 yards; width on top, 11 yards; width on bottom, 4 yards 6 inches; depth, 6 feet. How many cubic yards of earth did I take out?

Answer.—You took out exactly 267$\frac{2}{3}$ cubic yards.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	February. Top Prices.
Peaches, per quarter-case	8s.
Apples, per half-case	9s.
Pears, per half-case	13s.
Pears, per quarter-case	7s. 6d.
Lemons, local, per half-case	8s.
Lemons, Italian, per 360	25s.
Oranges, Australian, per half-case	8s.
Oranges, Italian, per 100	11s. 6d.
Plums, per quarter-case	5s. 6d.
Persimmons, per quarter-case	3s.
Pineapples, rough, per dozen	3s.
Pineapples, smooth-leafed, per dozen	4s.
Quinces, per half-case	4s.
Grapes, per lb.	6$\frac{1}{2}$d.

AVERAGE TOP PRICES FOR FEBRUARY.

Article.		February. Top Prices. £ s. d.
Bacon	lb.	0 0 7⅝
Bran	ton	4 11 3
Butter, First	lb.	0 0 10¾
Butter, Second	"	0 0 8½
Chaff, Mixed	ton	3 15 0
Chaff, Oaten	"	4 5 0
Chaff, Lucerne	"	4 12 6
Chaff, Wheaten	"	3 10 0
Cheese	lb.	0 0 6⅛
Flour	ton	7 13 9
Hay, Oaten	"	3 10 0
Hay, Lucerne	"	3 18 9
Honey	lb.	0 0 1¾
Rice, Japan (Bond)	ton	14 10 0
Maize	bush.	0 3 0¾
Oats	"	0 2 9
Pollard	ton	5 12 6
Potatoes	"	7 5 0
Potatoes, Sweet	"	3 7 6
Pumpkins	"	7 7 6
Sugar, White	"	20 15 0
Sugar, Yellow	"	18 10 0
Sugar, Ration	"	15 0 0
Wheat	bush.	0 3 2¼
Onions	cwt.	0 6 0
Hams	lb.	0 0 10
Eggs	doz.	0 1 0⅛
Fowls	pair	0 3 6
Geese	"	0 5 1
Ducks, English	"	0 3 0
Ducks, Muscovy	"	0 3 11¼
Turkeys, Hens	"	0 6 9
Turkeys, Gobblers	"	0 12 11

ENOGGERA SALES.

Article.	February. Top Prices. £ s. d.
Bullocks	10 0 0
Cows	7 6 3
Wethers, Merino	0 12 10½
Ewes, Merino	0 9 0
Wethers, C.B.	0 12 8¼
Ewes, C.B.	0 11 1½
Lambs	0 10 0
Baconers	...
Porkers	1 10 0
Slips	0 15 0

AVERAGE TOP PRICES FOR YEAR 1901.

Article.		Top Prices.		
		£	s.	d.
Bacon	lb.	0	0	7¾
Bran	ton	4	14	3½
Butter, First	lb.	0	0	10⅓
Butter, Second	,,	0	0	7¾
Chaff, Mixed	ton	4	3	6
Chaff, Oaten	,,	5	8	9
Chaff, Lucerne	,,	4	7	1
Chaff, Wheaten	,,	3	15	0
Cheese	lb.	0	0	7
Flour	ton	7	11	9
Hay, Oaten	,,	4	13	11
Hay, Lucerne	,,	3	3	6½
Honey	lb.	0	0	2
Japan Rice (Bond)	ton	15	7	1¾
Maize	bush.	0	3	2⅙
Oats	,,	0	3	2¼
Pollard	ton	4	15	11
Potatoes	,,	6	17	7
Potatoes, Sweet	,,	2	19	8
Pumpkins	,,	2	11	4½
Sugar, White	,,	17	12	7
Sugar, Yellow	,,	15	16	6
Sugar, Ration	,,	12	11	0
Wheat	bush.	0	3	2½
Onions	cwt.	0	11	9½
Hams	lb.	0	0	9⅛
Eggs	doz.	0	0	11½
Fowls	pair	0	3	8¼
Geese	,,	0	5	4¾
Ducks, English	,,	0	4	1
Ducks, Muscovy...	,,	0	5	0
Turkeys, Hens	,,	0	6	7¼
Turkeys, Gobblers	,,	0	13	4¼

ENOGGERA SALES.

Article.	Top Prices.		
	£	s.	d.
Bullocks	9	10	2
Cows	6	16	0
Wethers, Merino	0	15	3½
Ewes, Merino	0	12	3
Wethers, C.B.	0	15	9
Ewes, C.B.	0	14	0
Lambs	0	12	4½
Baconers	2	6	2⅝
Porkers	1	10	11
Slips	0	11	0

Orchard Notes for April.

By ALBERT H. BENSON.

The Orchard Notes for March dealt largely with citrus fruits, especial attention being drawn to the importance of taking every precaution, now that the fruit is reaching maturity, for preventing its destruction by the various pests that attack the ripening fruit. At the same time I pointed out the necessity for the proper handling, sweating, and packing of the fruits, in order that it shall be placed on the markets either of this or the other Australian States in the most attractive manner and best possible condition. All that I stated in last month's Notes applies with equal force to the present month, and in fact as long as the citrus season continues, so that I need not repeat what I then wrote, but will simply draw the attention of all citrus-growers to the importance of my remarks, as it is useless to take every care throughout the year to keep the trees well pruned and free from disease and the orchard in a high state of cultivation if we do not do our best to protect the result of such work and to market it to the best advantage.

With the exception of the marketing of citrus and a few other fruits—such as persimmons, pines, bananas, custard apples, &c.—April is a somewhat slack time for fruit-growers, especially those who depend on deciduous fruits, so that the opportunity should be taken to clean up the orchard before winter, and to finish up any odd jobs that have been neglected during the previous months. Such work will consist of looking after all fences, drains, headlands, &c.; the casting back of soil round trees where same has been washed away by the heavy summer rains; the ploughing in of all weeds and trash that have accumulated in the orchard during the wet season; the removal of all dead or worthless varieties of trees that it is desirable to get rid of; and any other work—such as the collection of material for and making of compost heaps—that may be necessary.

Cyaniding for all kinds of scale insects may be continued during the month, taking care not to treat any trees bearing fruit when same is either wet with rain or heavy dew, as, if treated under these conditions, the fruit is apt to be marked.

Strawberry-planting can be continued during the month, but the planting of all kinds of fruit trees should be delayed till the wood has been thoroughly matured. Keep the nursery clean, see that all young buds are growing properly, and that all unnecessary shoots are removed; the young tree being trained to one straight stem till high enough to form the future head of tree, when it should be topped.

Farm and Garden Notes for May.

FIELD.—There will probably be a few crops of late maize ready for pulling notwithstanding the late very dry season. These should be got in at once. Lose no time in sowing wheat, barley, oats, rye, and vitches. Earth up potatoes. This is a good month for sowing wheat. Do not sow too thickly. Note the experiments recorded in the *Journal* on rolling wheat when about 6 inches high. If wheat becomes too rank owing to rainy weather, turn in sheep to eat it down, the plants will then tiller and give as heavy a crop as if it had been sown thickly, or probably a much heavier one. Lucerne may still be sown, in fact, it is the most favourable time to get it in, as the insects and weeds will now be a very small source of trouble, and winter begins on the 24th of June. If April and May are dropping seasons, however, the farmer must set all his resources to work to get rid of weeds which muggy, showery weather will produce. There is scarcely any crop which is of such great value to the farmer as lucerne, and it has the great advantage of being able to resist long spells of dry weather owing to its drawing nourishment from a great depth and from the air. For the dairy farmer and stockowner it is invaluable, and every effort should be made by all farmers who have a deep, rich soil to get in a few acres during this month. Another good stand-by is a root crop of some kind, such as mangels, Swedes, turnips, kohl-rabi, carrots. These are all extremely serviceable for feeding stock. Although the last two months are a better time to sow Swedes, still they may be yet sown. Take every opportunity of providing for winter feeding of stock by chaffing all kinds of green fodder into the silo. Where no silo exists a stack may be made.

Coffee-gathering should be proceeded with vigorously. Transplant strawberries; 6,000 plants are required for 1 acre. In some localities strawberries will have been transplanted in March, when the fruit is ready to gather in April.

Kitchen Garden.—A good supply of winter vegetables should now be in a forward state, and should be encouraged to develop themselves by frequent stirring of the surface. All early-planted cabbages and cauliflowers must be earthed up. Plant out cabbages and cauliflowers, and sow for a succession, although it is almost too late in the season to sow cauliflowers, unless in a very rich, deep, well-worked soil. Sow peas and broad beans. If the weather is very dry, soak them in tepid water for about twenty-four hours before sowing. Sow full crops of carrots, parsnips, beets, turnips, kohl-rabi, radishes, lettuce, cress, spinach. As you plant out keep on sowing so as to get a full supply during the winter and spring and well into the summer.

Make plantings of asparagus and rhubarb, or if not ready, prepare the ground by trenching or subsoiling and well manuring. Full instructions for asparagus growing are given in this *Journal* (Vol. II., page 322, and Vol. IV., page 159).

When sowing parsnips, sow in rows 2 feet apart, thin out afterwards to 8 or 9 inches in the rows. Depth of soil is of the utmost importance, therefore either trench or plough very deeply. The crop should be ready in about 100 days after germinating.

When planting out asparagus, put plenty of manure at the bottom of the trenches, because once the bed is planted you cannot manure below.

Flower Garden.—Now will the flower garden give evidence of the care or want of care you have bestowed upon it. It should be gay with roses and many kinds of choice flowering plants and annuals. With a little care you may keep up this state of things during the whole winter and spring. If you have not already sown annuals do so at once, and to make up for lost time give the soil a little top-dressing of some well-decomposed fertiliser. Choose showery weather for sowing seeds in the open, and to avoid failures do not neglect mulching. Before this month is over you may fill up vacant places with roses and ornamental shrubs and trees, such as poincianas, poinsettias, lagerstrœmias, jackarandas, magnolias, camelias, azaleas, gardenias. Transplant soft-wooded plants such as petunias, verbenas, penstemons, &c. Cut back and prune all trees ready for digging. Take up dahlia roots and plant anemones, iris, ixias, freesias, narcissus, snow flakes, and you may try hyacinths and tulips, but with little hope of success. Towards the end of the month prune the roses and plant the cuttings in a shady bed. Fork in the mulching, remove all shades and screens from the plants, and keep the hoe going on the walks.

We would remind our readers that our Farm and Garden notes refer, in a great measure, to the coastal country, and that notes for May, June, and July then would, on the Darling Downs and parts visited by heavy frosts, be more suitable for July, August, and September. For wheat, cereals generally, root and grass crops, however, they are as suitable for one part as for another.

Agriculture.

FIRST STEPS IN AGRICULTURE.

5th Lesson.

THIRD STAGE.

By A. J. B.

Drainage—Part 1.

If you refer to the first primer of this series and read over what I told you about drainage in the 6th and 7th Lessons, and also in the 8th Lesson of the Second Book, you will refresh your memory as to the objects of draining the land, and as to what drainage does for both land and crops. In our last lesson we discussed briefly some of the various kinds of drains, and you were shown sections of them and also diagrams of the tools required for digging the drains. Let us now go a step further.

Before deciding to drain your farm, sit down and calculate the cost of the work, and then ask yourself, "Is my farm worth the expense?" Where land is cheap and good, and if you have a good large area, you will probably come to the conclusion to cultivate such portions of it as require only surface draining and to utilise the rest as grazing paddocks, because it will take you some years to make up the £5 or £6 per acre which substantial tile-draining will cost; still it is as much a substantial and permanent improvement as building a house, erecting fences, or sinking wells.

The proper depth for drains depends upon a variety of conditions. Without a fall or slope, drainage cannot be properly carried out. I told you that 4 feet is about the depth for under-drains, but you need not be told that if you only have a fall of 2 feet it would be a silly expense to dig 4-feet drains, as the water you want to get rid off would lie in them to a depth of 2 feet—that is, with a stiff retentive subsoil. Study, therefore, the fall, and if it is not greater than I have said then dig shallower drains and more of them, deep enough to keep the roots of the plants clear of the cold stagnant water, shallow enough to carry off the surplus water to its outlet, and again deep enough to preserve the tiles from being broken, or stones, or timber, or whatever material you have used, from being disturbed by the plough or subsoil plough. At present you see very little, if any, subsoil ploughing done on our farms. The land is rich enough to supply abundance of plant-food in the surface soil, but the day will come, when you are all grown up men and women, when the old farms will require manuring, draining, and subsoiling, in order to keep up their fertility, and it is therefore well you should be warned to be careful, when you have to drain, to place your tiles at such a depth as to ensure their safety from injury.

Remember that a 4-feet drain costs comparatively far more than one only 3 feet deep, notwithstanding the fact that, while the drain is about 18 inches wide at the top, it narrows down to 4 inches—that is, to just the width of the tile.

How far should drains be apart? I might as well ask you, How many peaches can a boy eat? The last depends upon his appetite, and on the time of eating them, whether before dinner or just after a hearty meal. The answer to the first question can only be: It all depends upon the nature of the soil, and mainly upon its porous texture. Again, the fall or what is called "the angle of descent" at the outlet into the drain will depend upon the porosity of the soil and the distance between the drains. As the water reaches the level of the drain pipe, it, of course, begins to flow away towards the outlet, and the drains on the right hand and left hand draw away the surplus water from the land between them. So here you see how important it is that drains should be placed at a proper distance from each other, because the whole success depends upon this one thing. As I have already told you, if they are too far apart, the land will be imperfectly drained, and if they are, on the other hand, too close together, you will have spent more money over the work than was at all necessary. Now, you will naturally ask: Is there any rule to go by to determine the distance between the drains?

Professor John H. Klippart, the corresponding secretary of the Ohio State Board of Agriculture, in America, shall decide this point for you. He says, in his excellent work on "Land Drainage":—

"We translate the following from H. Warner's work on drainage:—

"'For this purpose I instituted experimental drains in similar soil at unequal distances and observed their effect.

"'After I had determined the distance of perfect drainage for the given soil, I took this as a basis for further observation and experiment, and proceeded as follows:—

"'I first ascertained the amount of clay contained in the soil, then desiccated (dried) a portion of this in an oven. I then filled a glass tube 18 inches long two-thirds full of this soil, and covered the lower end with a piece of thin linen to permit the water to flow off readily. I then added a certain quantity of water, and marked the time exactly when it had all escaped at the lower extremity of the tube, minus what was retained by the force of cohesion. This experiment I repeated with different grades of soil, and noted carefully the difference of time at each new experiment. I thus found that loamy earth, containing 35 per cent. of clay, permitted the passage of water in half the time required by clay soil containing 70 per cent. of clay; that loamy sand, with 15 per cent. of clay, yielded the water three times more rapidly than clay soil of 70 per cent., &c.; and upon this I based the calculation of the distance proper for the distance apart of the drains, as given in the following table:—

1.	In clay soil ...	70	per cent.	clay in	2	roods	
2.	„ „ ...	65	„	„	2	„	3 feet
3.	„ „ ...	60	„	„	2	„	6 „
4.	„ „ ...	55	„	„	3	„	9 „
5.	„ „ ...	50	„	„	3	„	— „
6.	Loamy soil ...	45	„	„	3	„	4 „
7.	„ „ ...	40	„	„	3	„	8 „
8.	„ „ ...	35	„	„	4	„	— „
9.	„ „ ...	30	„	„	4	„	6 „
10.	„ „ ...	25	„	„	5	„	— „
11.	Loamy sand ...	20	„	„	5	„	6 „
12.	„ „ ...	15	„	„	6	„	— „
13.	„ „ ...	10	„	„	6	„	6 „
14.	Sand ...	5	„	„	7	„	— „
15.	In sand at ...	0	„	„	7	„	7 „
16.	In granular sand	0	„	„	8	„	6 „

"'In the experiments afterwards instituted in the construction of drains, these calculations were verified exceedingly well, and they have been the basis of my plans ever since.

"'That departures from this are required for draining springs and ponds is naturally to be supposed. Such cases require the technical knowledge of the drainer, and do not permit the application of fixed rules.'"

Now, I have only given you this to show you that science has been brought to bear on the subject in such a manner that you need only follow its teachings to enable you to work on correct lines. You are not required to make these experiments for yourselves. All is ready at your hand.

The latest experience as to distance apart of 4-feet deep drains is this:—

1. Heavy clay soil	...	20 to 24 feet apart
2. Clay soil ...	...	24 to 30 „ „
3. Loamy soil ...	...	30 to 36 „ „
4. Light loamy soil	...	... 48 „ „
5. Sand loamy soil	...	... 60 „ „
6. Very light soil	...	80 to 120 „ „

The length of drains is another important matter, and numbers of experiments have been made to ascertain the greatest length permissible with the diameter of drainpipe used. The fall enters into the question. With a fall of 3 inches per rod ($5\frac{1}{2}$ yards) and a 1-inch pipe, the length of drain should not exceed 50 rods, supposing the drains to be 16 feet apart. With a fall of only 1-inch per rod and a 1-inch tile, the length may not exceed 28 rods, but with a $1\frac{1}{2}$-inch pipe and a fall of 1 inch, the drain may be 79 rods ($434\frac{1}{2}$ yards) long, so that a $1\frac{1}{2}$-inch pipe will suffice for all small drains.

As to the cost of draining, you must take three things into consideration—digging the drains, the price of tiles, and the cost of hauling them from the kiln to the land. These items will vary in different parts of the State. In the North, labour—unless kanaka—will be costlier than in the South; so also will be the price of tiles. What do tiles cost? Whilst a 4-inch tile costs double the price of a 2-inch, a 6-inch is double the cost of a 4-inch, and 1,000 tiles will lay 330 yards.

At 33 feet apart there will be 440 yards per acre of drains. Then the main drains have to be considered, and authorities on the subject add 10 per cent. for these, for, as a general rule, one-tenth of all the drains in a field are main drains, and they cost about double of the minor drains.

You may wonder how the water gets into the pipes, because well-burnt drain pipes only allow water to filter through them very slowly, far too slowly for drainage purposes. The water, however, goes in through the joints, which cannot be made so tight as to prevent the water from streaming through them

In the next lesson you will learn how to lay out drains.

Remember that I am only giving you these lessons on draining because they may possibly some day be of use to you. As a matter of fact, not one farmer in a thousand in Queensland has occasion to drain, but that is no reason why a farmer should not know how to do it if the occasion should arise, and therefore the subject fitly enters into this little book.

Questions on Lesson 5.

1. What is the first thing to be considered when you propose to drain your land?

2. On what does the proper depth to which underground drains should be dug depend?

3. Why is a 3-feet drain to be preferred to one 4 feet deep?

4. How far should drains be apart?

5. What is the effect of placing drains too far apart—too close together?

6. How far apart, generally speaking, should drains be placed—(*a*) in clay soil; (*b*) in loamy soil; (*c*) in loamy sand; (*d*) in sand?

7. How would you determine the length of drain permissible when using a 1-inch pipe with a 3-inch fall per rod—with a 1-inch fall—with a 1-inch fall and a $1\frac{1}{2}$-inch pipe?

8. In reckoning the cost of drainage, what three things must be taken into consideration?

9. How much must be reckoned for the additional cost of main drains?

10. How does the water find its way into the drain pipe?

6th Lesson.

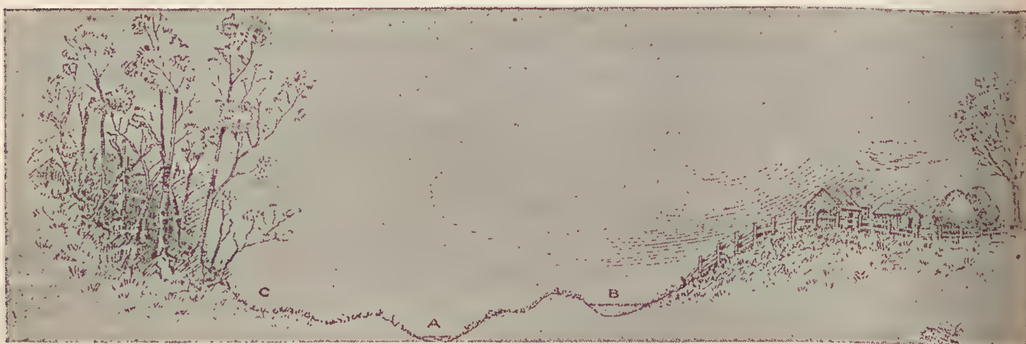
THIRD STAGE.

Drainage—Part 2.

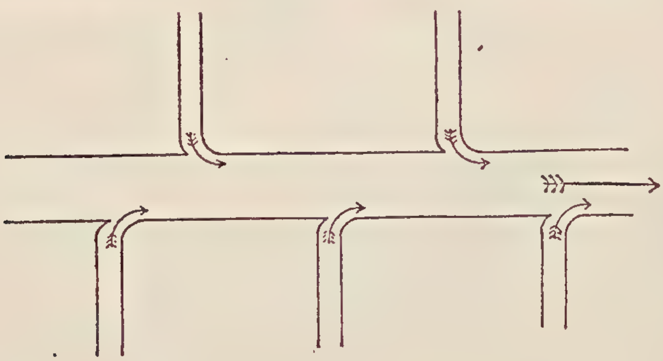
Let us now suppose that you have, after carefully calculating the cost and the probable value of the work with respect to the increase in future crops, decided that you will drain, if not all, some portion of your land, from which you are deriving little benefit owing to the water retained by the stiff subsoil.

The first thing you must do is to find out what fall there is and of course the direction of the fall.

Now, just think for a little, and try to show, without my telling you, on what part of the field shown in this illustration you would make a start. You say you would begin to dig your main drain at A, because it is the lowest part,



and all the water from both sides must flow towards it. Very good. What must next be done? Suppose the main drain to be dug, all the lesser drains will start from it on either side. Remember that it is not a good plan to start the lesser drains at right angles to the main drain, because the current of water from the former can get away more quickly by travelling slightly in the same direction as that in the main drain, and if the latter is an open drain (not tiled) the incoming water would eventually damage the opposite wall of the drain. Therefore, let the lower end of the smaller drain make a bend for a few feet before entering the main drain in the direction of the fall, and do not let them enter the main drain opposite to each other. (*See* Fig. 2.)



You must bear in mind that the large drain must always be deeper than those leading into it, say 1 foot deeper, because the outlets of the minor drains are liable to get choked with silt, green frogs, &c. How deep should the main drain be? Being placed at the lowest point of the farm it will have to carry off a quantity of water, and it must be, as I said, a foot deeper than the deepest of the minor drains, or rather the lowest of them. It should, if an open drain, slope well at the sides and have a width at the bottom of 18 inches. This means a considerable width at the top—about 10 or 12 feet—and that means the shifting of a lot of soil. But this soil can be thrown up on both sides, and planted afterwards with a protecting hedge to prevent cattle getting into the drain. As for the other drains, you have already studied a table of distances for them. Taking an average of the distance apart required for heavy clay soils and sandy loamy soils respectively, they would be 40 feet apart—30 feet is better; still the fewer drains you can do with the better both for your pocket and for the land.

Now, look again at the farm picture. You will see that there is a hollow at B, which holds water—a very useful bit of swamp when you first started the farm, and lived in a bark humpy, but an eyesore, and one which is of no further use since you built a house with galvanised iron roof, and set up a number of water tanks.

You must get this piece drained. Again, at C, there is a rather steep wooded slope. The roots of the trees prevent the soil on it from being washed away in heavy rain. Still quantities of water rush down the slope at such times and damage the crops in the fields below it, so that will have to be remedied. How are we going to set about it? The answer to the first question, how to drain the swamp A, will depend upon whether the swamp is fed by springs or merely by rain water, because each of these cases requires a different method. Suppose it is to be fed by rain water, we must not only carry off the stagnant water of the swamp, but we must prevent the water from the higher ground continuing to supply it. Now you must understand that water coming down a hill, *does* come down the hill, it does not spread out sideways. Some people would cut drains 30 feet apart *across* the line of descent. By doing this all the water would require to travel through 30 feet of soil in order to reach a drain. But if they are dug up and down the slope, it is clear that instead of travelling 30 feet, the water will only have 15 feet to go before it gets to a drain. If there is much higher land above the swamp, then it will be well to cut a "heading"—a drain cutting across the hill and leading into one of the other drains, whichever is most suitable to carry off the water. This drain is called by road-makers who wish to prevent water rushing down a hillside into a road, a "catch-drain."

Now for Question 2—How to drain the hillside (C). People have different ideas about the best method to adopt. Some prefer to cut the drains obliquely to the line of descent of the water, but others say—and really have proved—that the best plan is to do as we did in the case of the swamp—*i.e.*, cut the drains straight up the slope—that is, the minor drains—and lead them into a main drain at the lowest point.

Remember what I told you about the length of a minor drain. It should not exceed 200 yards. What then is to be done if you have to drain a paddock of 400 or 800 yards in length? In such a case you must put in a "subleader" or subdrain across the lateral drains, in an oblique (slanting) direction, into which they will all lead.

Great care must be exercised in laying the tiles. Cases have occurred where quicksands have been met with which afford no solid bed for the tiles, and these have to be specially dealt with by laying a foundation on which to rest them. Tile drains, if the tiles are only 1½ inches in diameter, often become choked, especially if the fall is slight. To obviate this, and cause a quicker rush of water, the "pitch" of the pipes is broken; but where the fall is sufficient there is no necessity to do this.

In draining soft, spongy land, it is not advisable to lay the pipes and fill in at once, as all such soils shrink and subside when drained, and it may happen that the drains will require deepening. In some cases the subsidence has been from 6 inches in the shallow drains to 14 inches in the deeper in the short space of a month. This actually happened at Dunwich, when Mr. A. Watt, farm manager at the Queensland Agricultural College, was in charge of the drainage of a large area of swampy land which was to be reclaimed. There is another important reason why deep drains in wet land should not be at once filled in. The land is sour, and the more it is exposed to the action of the atmosphere the sooner it will sweeten.

By the subsidence of the land the soil becomes more compact, and land which will not bear the weight of a sheep would, in a few months, carry horses on its surface.

If you look up the 8th Lesson in the Second Book you will find that I advised you to go and examine the crops on drained and undrained land. There is such a marked difference in the stand of the crop and in the colour denoting health or otherwise that you must come to the conclusion that it will pay to drain. There is another great advantage arising from draining, and that is that you can put horses on to drained fields after continued wet weather many days sooner than you can on the undrained land.

Well, I think I have given you enough on the subject of draining to enable you to grasp the first principles of the art. Of course, there are all sorts of things connected with it which you can learn by experience and observation, but what I have told you is what is generally accepted by scientific farmers, and you cannot go far wrong in following their lead.

As to whether draining will pay, that all depends on the expense entailed by the work, on the quality of your soil, on the aspect of the farm, the climate and the rainfall, and last, but certainly not least, on the amount of intelligent work you put in your business as a farmer.

Here is something for you to ponder over on the question as to whether draining will pay or not:—

If you own your land, you must pay your various rates—divisional board, and so on. You must also pay for labour, implements, and food. Now, if this land of yours is so wet that it rarely will yield you a full crop, you work at a great disadvantage. You decide to drain it, and you then find that without any additional cost for labour, seed, or money, it will yield a good crop, and this great increase you may properly set down as the profit of drainage.

A writer in an Australian newspaper gives two instances—of course, there are hundreds of others—which will prove the statement that drainage pays. One is, that a 20-acre field, which usually only yielded 25 bushels of corn per acre, was tile-drained at a cost of £2 per acre. When this work was done, the next crop yielded 60 bushels per acre, and the yield of the other rotation crops was equally increased.

Now just reckon the gain in the corn. The increase was 35 bushels per acre, at that time worth 1s. 3d. per bushel. That one crop paid the whole cost of the draining, and had the price been double that, or 2s. 6d. per bushel, which is an average price, that farmer would not only have paid for the draining, but would have had £2 7s. 6d. to the good per acre.

The other was a case in which a big swamp had been drained at a cost of 30s. per acre. It was broken up and sown to millet. The first crop paid the expense of the under-drainage.

In the reclaimed fens of North-west Germany the yield of wheat is 80 bushels per acre and of potatoes 34 tons. One head of cattle is reared and fattened for the butcher on an acre; and there are instances of three head being raised per acre, all owing to drainage and irrigation.

With these examples I will close these lessons on drainage.

Questions on Lesson 6.

1. When you decide to drain a piece of land, what is the first step to take?
2. What is meant by the terms "main drain," "submain drain," and "minor or lateral drain"?
3. Where would you dig the main drain?

4. What precaution must be taken when starting the minor drains, at their opening into the main drain?

5. How would you drain a swamp on rising ground and a steep hill slope?

6. If your paddock is longer than 200 yards, what course would you adopt to make all the drains effective?

7. Why should drains not be at once filled in on soft spongy land?

8. Give two examples showing that it pays to drain wet land.

THIRD STAGE.

7th Lesson.

Irrigation.

Having your farm properly drained, you may now think of another very important matter—a regular supply of moisture to the crops. Although crops on drained land can stand a dry spell much longer than those on undrained land, still, unless a certain and regular amount of water can be supplied to the plants, the best results are not to be expected. Although throughout a period of forty-two years the mean annual rainfall in Queensland has been 50·37 inches, with an average during that period of 133 wet days in the year, still this rain water is unequally distributed. The North and the coast lands get a fair share, as a rule, but the Western country is alternately flooded or dried up by drought.

If you refer to Lesson 9 in the Second Book you will find that I gave you the quantity of water contained in every 100 lb. of vegetables, grass, grain-plants in blossom, and in 100 lb. of mature leaves of trees.

One inch of rain is equal to 4·673, or a little over 4½ gallons of water to the square yard, or 22,617 (101 tons by weight) to the acre, so that a much smaller rainfall than that of this State would supply an immense quantity of water to each acre. But, as I have already said, the rainfall is unequally distributed both as to seasons and districts, and in spite of the fairly sufficient amount of cloud water there will be times when your crops will languish or fail altogether, because the rain did not come at the exact time when the plants required it.

How are you to regulate the water supply so that the crops will get all the water they require during the whole growing season?

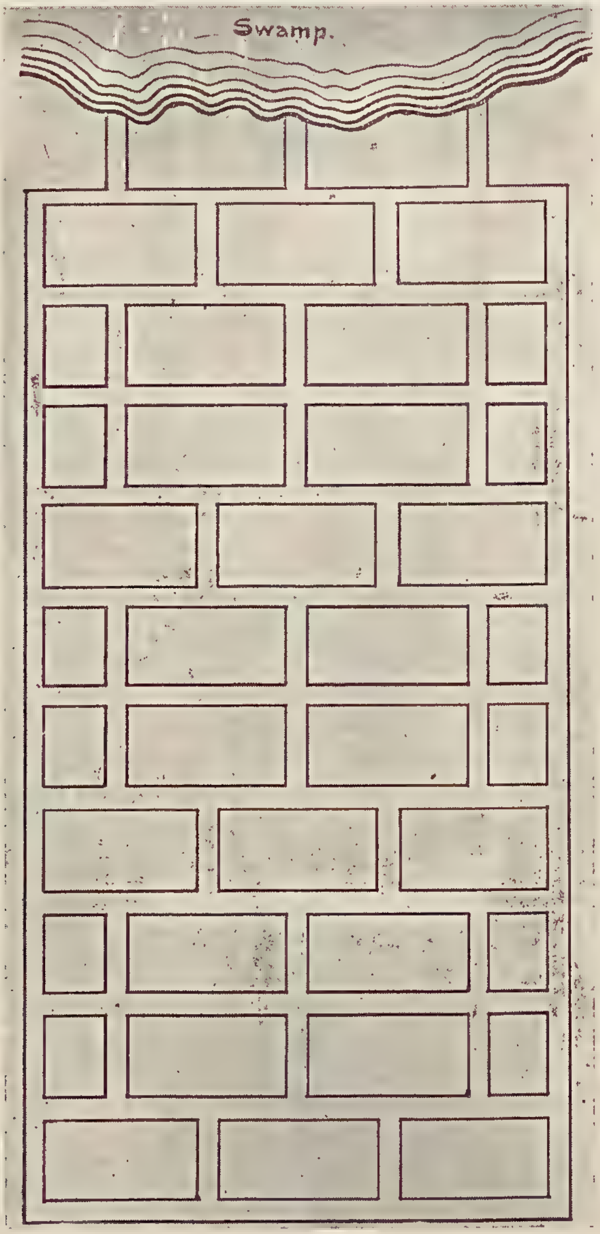
By irrigation. (Look up Lesson 9 again in Book 2.) You have probably read or heard of the great River Nile in Egypt, which every year in the same season regularly overflows its banks, spreading out far over the land on either bank. This overflowing is anxiously looked for by the Egyptian farmers, for they depend entirely upon this water, and the rich sediment it leaves behind, to produce those magnificent crops of cotton, cereals, and many other farm products for which that otherwise sandy, arid country is celebrated. Millions of acres of sandy desert in Algeria, and in other parts of Northern Africa, have been changed into rich fertile fields, simply by irrigation works of great magnitude. I cannot here describe them to you, but you can find out all about it from other books.

The amount of water required to give a field a good drenching would, if it were evenly spread over the surface, lie 4 inches deep all over the field. That is the calculation by many scientific men, whose figures it is that I give you here. They say that half of this sinks into the soil, and the other half flows off, and is utilised on fields lying at a lower level. The amount of water delivered on to a field is measured by cubic feet—so many cubic feet a second.

Of course you know what a cubic foot is, but, in case there should be any of you who do not know, a cubic foot is a figure (rectangular), which measures a foot every way, in height, length, and breadth. If you make a box of those dimensions inside, and fill it with water, you have a cubic foot of water.

Before you can irrigate, however, you require two things. One of these is water, of course, and the other is some means of getting it cheaply and easily onto the land. Now, you may at once give up the idea of irrigation if your land lies so high above a water supply that to bring it to the crops by means of expensive steam engines and lifting apparatus would cost more than the whole value of, perhaps, a succession of crops, however good they be in consequence of irrigation. But where your land is situated on a low river or creek bank, or where you have a fairly deep permanent lagoon or swamp, there you may irrigate fairly cheaply. I once irrigated 5 acres of lucerne from a big swamp, which lay a little higher than the lucerne field, by a very simple device which I saw practised in a Chinaman's garden.

I first cut a shallow trench 5 chains long (110 yards) across the head of the field, and more trenches a chain apart parallel to it. These I connected by drains running in the opposite direction. Then I made two or three openings into the heading from the swamp, and the water ran in and filled the drains, whence it found its way right through the whole field. A few sods thrown into the lead from the swamp stopped the flow when necessary.



Such irrigation as this, where possible, has the great merit of cheapness and effectiveness, no expense being incurred beyond the labour of opening up a few shallow surface drains.

Had the swamp been on a lower level than the land, a different plan would have had to be adopted. Pumping must be resorted to when the water is below the level of the land to be irrigated. For small market gardens hand-pumping or wheel and bucket may be employed, but for larger areas, steam, water, or wind power must do the work.

I saw a very good example of the use of wind-power on a farm near Gatton, on the way to Toowoomba, some years ago.

The farm lay at a height of about 20 feet above a permanent creek. On the highest part of the creek bank a stout scaffolding of bush timber was built, and on this were placed six 400-gallon tanks. A pump worked by a windmill brought the water from the creek into the tanks. In dry weather the windmill worked night and day whenever there was wind enough to drive it, and the water was led from the tanks to a lucerne field, over which it was delivered by iron pipes and drains. Such an arrangement is not very costly for irrigating from 10 to 15 acres. But when it comes to a very large area, then it is that the cost increases, as the whole area has to be laid with pipes.

There are two or three methods of irrigation by means of pipes. Galvanised iron pipes perforated with a number of holes are laid on the surface of the soil at distances of 30 feet apart, and water is pumped through them by means of a steam engine. The water is forced through the holes, and the whole surface is subjected to a shower bath, which may be kept up until the land is thoroughly watered.

A system something like this is employed at the Queensland Agricultural College, near Gatton. The land near Lockyer Creek is laid with iron pipes on the surface; but, instead of being perforated, hydrants are attached to them at different suitable intervals, and by means of a hose a very large area is thoroughly irrigated. The water lies some 30 or 40 feet below the top of the bank. A four horse-power engine drives a turbine pump fixed in the creek below, which furnishes an ample supply. The value of this simple means of irrigation was well demonstrated during the drought in 1901-02. When the ordinary farm crops failed, owing to the long-continued dry weather, the irrigated land bore heavy crops of all kinds of vegetables, stud wheats, potatoes, and strawberries.

Subterranean irrigation is an expensive business. In this system the water is carried beneath the crops instead of over them. It is of great value on soils of fair tenacity, but is not so suitable for very porous soils.

Numerous experiments have shown that by subterranean irrigation much less water is required than by any surface system. It is said that not one-twentieth as much is wanted. I must tell you here to be careful how you answer Question 9. The question is: How much water is *saved*, not how much is *required?*

There is a great deal to be said in favour of sub-irrigation by tiles, notwithstanding the great expense attaching to the work. The water passing through the pipes acts on the soil above much in the same manner as natural water does when it lies at the most suitable level for the growth of plants. The water as it passes through the porous pipes is drawn up by capillary attraction and supplied in just such quantities as the plants require. Again, when the surface is watered, there is much evaporation and consequent loss of heat. The tiles also act as drains in wet weather. In fact, when you have under-drained your land, you may consider that you have also provided the means for sub-irrigation, because, by making suitable reservoirs at the head of your lateral drains, you can, in dry weather, send streams of water flowing through them to irrigate the crops, whilst in very wet weather they keep the soil comfortably dry.

Since writing this I have come across the following statement in an American newspaper, which goes to prove what I have just told you about drain pipes serving also for irrigation purposes:—"The late Isaac Terwilliger performed the initiatory work in inventing or adopting a plan of sub-irrigation and drainage in one that is responsible for the present development of the cultivation of lettuce and celery on a large scale. His method was to construct a cement pipe, with a proportion of charcoal, sparks, or cinders, which at that time was a waste from the locomotives. This gave a porous pipe, pervious in or out; so when the soil was dry the pipes were filled from the artesian wells, and when the opposite condition occurred outlets were opened and the pipes received water from the soil.

"But the new trick of the drainage and basins leaves nothing more to be desired, for by it an absolute control of water in the soil is had. This system needs some explanation. In the first place the ground is very nearly level, the incline being only 2 or 3 inches to the 100 feet. Suppose a flowing well on the upper side of the field. From that a 3-inch tile is laid along the summit, at a depth of 18 inches: This tile enters at the bottom of one side of a basin of wood or brick, and leaves the other side in the same manner. These basins are placed usually 20 feet apart, and from each a parallel drain originates. These parallel drains are also supplied with basins through which the water might freely flow for a partition rising nearly, not quite, to the surface. When it is desired to saturate the soil, as for instance as a preparation for transplanting, the water is made to flow over this partition. In that case the water level is raised in the soil above this point. On the other hand, if it is desired to dry the ground, or after a heavy rain to carry off the surplus, a plug is removed at the base of the partition, and the water passes through the bottom of the basin.

"All the parallel drains are supplied with basins at distances of 40 to 60 or more feet where the surface is nearly level; or closer than that if the incline is considerable. One can see that any particular portion or the whole place can be dried or saturated at will."

I have already told you of the great irrigation works now being carried on on Mr. Gibson's sugar plantation at Bingera, near Bundaberg, and I should advise you to watch this expensive experiment, and note the result.* You will probably be astonished at the increased yield of cane which irrigation, combined with special manuring, will bring about.

One thing more before I conclude this chapter on irrigation. Waters that are very alkaline are highly injurious to vegetation if constantly supplied to plants. The alkali gradually accumulates on the surface as the water evaporates, and infallibly destroys the crop. You can easily prove this by making even a weak solution of chloride of sodium (common salt), magnesia, soda, or any other alkali. Take a large flower-pot or box of healthy plants, and whenever you water them do it with this alkaline water. You will see that at every succeeding drying of the surface the alkaline deposit will increase on the surface, and by and by the root-crowns of the plants will rot, and the plants themselves will wither and die. Water containing much iron is also unsuitable for irrigation purposes.

In the 8th Lesson of the 1st Primer, I gave you a few reasons why some land should be irrigated Those were: To increase the crops; to supply the want of moisture; to supply the extra moisture some plants, such as *rice*, require; to get early crops; to supply plant food which water contains.

To these you may add that irrigation sweetens the soil and destroys noxious weeds, such as moss, rushes, sedges, and many low forms of plants which thrive on the acids and other products of chemical action which are prejudicial to farm crops. By irrigation these acids are washed away into the drains, and the abovenamed weeds, no longer having their natural food, shrivel up and die, whilst the plants of economic value thrive in the warmed and sweetened soil and yield abundant crops.

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* Since this was written, the results show a crop of 60 tons of cane per acre, equal to over 7 tons of sugar or £80 per acre.

Questions on Lesson 7.

1. What is the mean annual rainfall of Queensland?
2. Why cannot farm crops be so well produced in the Western parts of the State as on the coast?
3. How is the want of rain in Egypt supplied?
4. How is the amount of water delivered on to a field calculated?
5. What two things are required for irrigation?
6. What is the cheapest system of irrigating a field when the water supply lies slightly higher than the land to be irrigated?
7. Describe two methods of irrigation by means of surface pipes?
8. What are the advantages of subterranean irrigation?
9. Is there any saving of water effected by subirrigation as compared with surface irrigation? How much is saved?
10. Why are some waters unsuitable for irrigation purposes?
11. How does irrigation sweeten the soil? What is the effect of this sweetening?

IRRIGATION FOR SOUTH AFRICA.

A LESSON FOR QUEENSLAND.

"The permanent development of the agriculture of South Africa will depend on irrigation, and on irrigation alone."

Thus says Mr. W. Willcocks, C.M.G., M.I.C.E., in a report on irrigation in South Africa addressed to His Excellency Lord Milner. In this report he states at the outset that irrigation is the foundation stone on which alone can be built the permanent prosperity of South Africa, and he declares that as administrator of the recently acquired Crown colonies of the Orange River and Transvaal, His Lordship is in a position to confer a benefit on South Africa such as has fallen to the lot of few men. The colony has remained strangely stationary, apart from the development of its gold, diamond, and coal mines. Fifty years ago, says Mr. Willcocks, it was a pastoral country, importing cereals and dairy produce and even hay from foreign countries. It is the same to-day. Half-a-century ago, it needed a farm of 5,000 acres to keep a family in decent comfort; to-day it needs the same farm of 5,000 acres to keep one family in comfort.

Except in the extreme south-western corner of Cape Colony, agriculture has scarcely been attempted, except on the most primitive lines, and on the most insignificant areas. Farmers to-day trek from the high veldt to the low veldt and back again with the seasons, just as the wandering Arabs of the desert have done for centuries. The reason for this want of development of the agricultural wealth of the country, and the consequent acute stage of the poor white question, lies in the fact that the rainfall of the three colonies, with the exception of the extreme south-west corner, is not only erratic and uncertain at the times most opportune for sowing, but is constant and heavy in autumn. Autumn again is quickly followed by a very severe and frosty winter, without a particle of moisture in the air. When rain is wanted it is generally not there; when it is not wanted it is invariably present. For countries so situated the only possible means of development lie in storage of water when it is present and not needed, and its utilisation by irrigation when it is needed. Agriculture without irrigation is generally impossible in the new colonies. In the face of such a state of affairs we find the irrigation laws of the three colonies framed by Englishmen and Dutchmen who come from wet and foggy countries, and who considered the accumulation and storage of water as public nuisances, and the transfer of water from one valley to another as a public evil. If these countries are ever to develop the immense agricultural wealth which is to-day buried many thousands of feet below impenetrable strata of unwise and unsuitable legislation, the first step must be to proclaim the countries themselves as arid or semi-arid regions, and legislate accordingly.

Mr. Willcocks intimates to Lord Milner that the whole of South Africa, from one end to the other, is looking to him to take the first step in the two colonies which he administers, declaring that the self-governing colonies of the Cape and Natal must follow suit or take up an inferior position.

He then cites Italian precedent as worthy of imitation. On that head he descants thus:—

"When Victor Emmanuel consolidated Italy into one country, he decreed at the outset of his reign that the whole of the rivers and torrents of Italy were part of the public domain, and, as such, the property of the Government representing the people. Old irrigation rights of thousands of years' standing stood in the way of such legislation, but the Government of Count Cavour possessed a strong hand. Having decreed the rivers and torrents as public property, the Government in the same bold and decisive manner defined with great accuracy all the indefinite and vague claims of centuries, and then set itself to legislate for future concessions. Modern Italy owes much of its prosperity to this wise and strong legislation. The irrigation laws of Italy are given in great detail by Mr. W. Ham. Hall, in his book, 'Irrigation Development: France, Italy, and Spain.' These Italian irrigation laws, in great part developed by the Ancient Romans, might be taken as a model for all arid and semi-arid countries in the possession of Europeans. It is to laws such as these that vast tracts in India and the whole of Egypt owe all their prosperity. And it is to legislation such as this that all thoughtful men in South Africa are looking forward, confident that the Nation possesses in Your Lordship a man qualified in every way to take his stand by statesmen of the type of Cavour."

He next deals with a point on which different opinions have been held in the past, but on which to-day there is a great convergency to one point of view, and that is that in many countries statesmen have considered that irrigation works should be left to individuals and concessionaire companies, which we in Queensland call syndicates. Such works, he says, have been, as a rule, conspicuous failures in the hands of companies impatient to realise profits, and which have, in consequence, forced their engineers to overtax their reservoirs and canals in their early and undeveloped stages.

With works carried out by States the results have, on the contrary, been decidedly encouraging. Canals, which in their early years have not paid their working expenses, have gradually paid their interest charges, and in the course of seven and eight years have paid profits of 5 and 6 per cent. on many millions of capital, even when the capital accounts have been swelled by all the interest charges during the early years of loss and slow development. Having served for twelve years in the Indian Irrigation Department, where the Government has spent £30,000,000 on irrigation works, and is on the eve of spending as much again, and having served for eighteen years in Egypt, when Lord Cromer's Government has carried out irrigation works which can only be approached in magnitude by the great works of the Twelfth Dynasty Pharaohs, he naturally considers the execution of important irrigation canals as the first works which an enlightened Government should carry out in an arid or semi-arid country. Not only do well-conceived and well-executed irrigation works bring in a direct benefit to the State if allowed to develop on slow and natural lines, but they also bring in all the indirect benefits which a State reaps from increased wealth of every kind.

Mr. Willcocks then goes on to show how concessionaire companies have proved a failure in America, and says that if private enterprise cannot succeed in irrigation works of magnitude in America it will surely not succeed in any other country in the world. There is one side of the question which he considers should not be lost sight of in a country like the Transvaal. There the mineral wealth is extraordinarily great, but it is exhaustible—some say in 50, some in 100 years. It would be a disaster indeed if none of this wealth were devoted to the development of agriculture. Agricultural development is slow, but it is permanent and knows no exhaustion. If the companies working the gold, coal, and diamond mines were, by decree, compelled to devote a percentage of their gain to the execution of irrigation works on lines laid down by the Government, they would assist in the permanent development of the country. Thus it would happen that when the mineral wealth of the country had disappeared its agricultural wealth would have been put on such a solid basis that the country would not have to fall from the height of prosperity to the depth of poverty, and here it is that he brings in the statement at the head of this article. After a short dissertation on the advantages of the metric system of measurement as compared with the English system, he proceeds to describe the different sections of the three colonies in detail.

As numbers of Australians are looking to South Africa as a country in which to settle down to agricultural pursuits, we reprint these details from the *Agricultural Journal of the Cape of Good Hope.*

The South-Western Corner of the Cape Colony.

The Koeberg District lies between 200 and 600 feet above sea-level, and is typical of the south-western corner of the Cape Colony. The average rainfall is about 30 inches per annum. This is one of the wheat districts of the colony. The abundant winter rains render it independent of irrigation in winter. The average size of the farms may be taken as 2,000 acres, of which about half the area seemed to be under cereals of some sort, principally wheat and oats. These areas appear to be too large for their profitable working by comparatively poor farmers, and the ploughing was done perfunctorily. There is a universal complaint against rust in wheat. As no rotation of leguminous crops with cereals is ever attempted, but cereals are made to follow cereals with occasional fallows, this is not to be wondered at. One of the successful farmers recently sowed lucerne with his wheat in certain of his fields, and has been rewarded fivefold. It is contended that there is no market for beans and other legumins in Cape Town, and consequently they cannot be profitably grown, and that lucerne cannot survive the summer drought. If an agricultural railway was constructed through this district it would be easy to dispose of fodder, and very possibly the Egyptian clover (berseem, a legumin) would be an excellent rotation crop for a climate like that of the Koeberg, and it has a winter annual. Egypt and the Cape Colony might mutually aid each other by making an exchange of seeds. Egypt is particularly rich in legumins, while the colony is rich in fodders capable of existing under conditions of extreme drought. A crop like the Egyptain clover grown in rotation with wheat might store the soil with nitrogen and probably destroy rust in the wheat.

In these districts reservoirs for providing perennial irrigation would be premature at present. When the landowners had thoroughly developed their single crops per annum, it would be time to think of double crops. All over the colony legumins might be grown with cereals with great benefit to agriculture. In a protected country it should not be difficult to start oil-mills, make oil out of beans, and utilise the cake for cattle-feeding. Both in India and in Egypt the natives consume immense quantities of lentils ("ads" in Egypt, and "dall" in India), with great advantage to themselves; while beans form one of the principal foods of donkeys and poultry in Egypt. In India, horses, sheep, and cattle are fed almost exclusively on "gram," which is another lentil. A change from mealies to "gram" would be a great gain to horses and cattle in this country. If the taste for lentils was once developed among the coloured races, there would be a great demand for legumins in the colony. The Kimberley and Johannesburg mines might encourage their workmen to eat lentils cooked with curry powder, with advantage to the workmen and to the agriculture of the colony. Indeed, in the present condition of the meat supplies of South Africa, lentils (dall and rice) might be introduced as a food for Europeans as well as for natives. In India, Europeans find it a nutritious and palatable diet. European children are brought up on it in great part. It is the main base of "Revelenta Arabica," a well-known food for invalids. And, moreover, Darwin, in the account of his first voyage, states that the best developed men he ever saw were the workers in the copper-mines of the Corderillas, and they lived almost exclusively on lentils.

LANDS EAST AND SOUTH-EAST OF CAPE COLONY.

The Wynberg District may be taken as typical of this country. It has a mean height of some 600 feet above sea-level, and has a mean rainfall of some 30 inches. The rainfall is seasonable, as it is everywhere in the south-western corner. The district is famed for its vineyards, which have been much hurt by phylloxera. Hardy American vines are in many localities replacing the depleted vineyards. Much of the grape juice is converted into brandy, which is very largely drunk by the natives, to their great detriment. If the resinous firs which are so common in Greece were introduced into the country, it might be possible to convert the grapes into the light resinate wines of the Greeks (wines which are manufactured by the smallest Greek farmers and largely consumed). These wines would do no harm to the native population, while they would insure their profits to the farmers. I make this suggestion with great diffidence, but any change from the brandy which the natives drink would be a change for the better.

THE BREEDE RIVER VALLEY.

This valley is east and south-east of Cape Town, and has rains in both winter and summer, though the winter rains are by far the most constant. The land may be taken as from 500 to 1,000 feet above sea-level. The Breede River seems to have an excellent discharge, which is scarcely utilised. The river runs in a low trough, and expansive river and canal works will be needed to properly irrigate the district, but the works will well repay expenditure. The soil of the valley is well suited for irrigation, while the rainfall is only about 15 inches per annum in the places to be irrigated, and over twice that amount in the hills where the waters of the river come from. The perennial springs are all thoroughly utilised (as they are everywhere in the Cape Colony). It is the river water which is here allowed to run to waste. No gauges have ever been read on the river, and no discharges taken. At Robertson, on the 12th August, 1901, the river was discharging about 800 cubic feet per second, and I was informed that this was the ordinary winter discharge. The summer discharge was very considerably less, while the January, February, and March discharges were assumed as infinitesimal. The river may be taken as a type of others in its neighbourhood. In such rivers the water is generally clear, while the flood waters are charged with sand, but never with clay. This peculiarity results in the formation of extraordinarily sandy foreshores, which will reduce very considerably the discharges of the canals traversing them. The river weirs at the heads of the canals should be made 12 feet high, and the canals taken out of the sandy foreshore as quickly as possible. If the canals cannot be taken out quickly they must be allowed 33 per cent. extra section while in the sand, and planted thickly on both banks with willows and poplars. The cross drainage is considerable and complicated, and needs for its management canal engineers with practical and theoretical knowledge. Stone masonry flank walls and wrought-iron aqueducts and syphons should be freely provided for these cross drainages. In a country like the Cape Colony, where labour is exceedingly dear and occasional storms very sudden and very severe, the maintenance charge of ill-considered works will be a very heavy item; I therefore recommend well-designed and solid works with low maintenance charges. If the rivers carry sand and silt in flood, and few rivers carry neither, the canals should start with an initial slope of at least 2 feet per mile, changing gradually to 1½ feet and 1 foot per mile, but all the changes should be gradual, and not completed in less than 6 miles from the head. Where the irrigation season is in winter, a duty of from 150 to 200 acres per cubic foot per second may be considered as a maximum. The type of weir recommended will be described under a special heading called "Dams and Weirs," which will come later.

Verkeerde Vale Reservoir.

The Verkeerde Vale Reservoir is situated near the sources of the Touws River at a distance of some 10 miles from the Touws River Railway Station. The vale is about 2,500 feet above sea-level. It is sufficiently near the south-western corner of the Cape Colony to have its more important rainfall in the winter months. The total rainfall is some 12 inches per annum. The reservoir itself covers 800 acres, and the average depth of the reservoir is 5 feet. The powerful Boksburg Springs flow through the reservoir and help to sustain its level. A gauge has been read here for some fifteen years. The reservoir is generally at its highest in October, at the end of the winter season. As the winter and summer rains of 1896-1897 failed almost entirely, the reservoir continued to fall from the 1st January, 1896, to the 15th June, 1897, and was practically dry during the first six months of 1897. As such droughts occur periodically in the colony, provision must be made for them in all reservoirs for perennial irrigation in the dry regions of South Africa. Such a provision could be made for them at this reservoir by raising the floor of the escape sill and gradually raising the dam. The Hon. Dr. Smartt contemplated the raising of the dam by some 8 feet. Such raising should be done very carefully, as the dam is in great part built of porous sand and lies on porous sand. The new earth should be thrown on the up-stream side of the existing work after the stone has been stripped off the surface. The water should not be allowed to rise more than one extra foot per annum. The wash of the waves on the dam, according to Mr. Whittaker, the State engineer in charge, is exceedingly heavy in summer. In the Touws River Valley in years of ordinary winter rain, good wheat crops can be grown on the alluvium of the river. These crops might be made permanent by the construction of 15 feet high weirs at suitable sites, and the leading off of small canals from the up-stream sides.

With respect to the Boksburg Springs, I should state that Mr. Whittaker informed me that the municipality of Touws River had deepened and increased in number the cuttings into the side of the hill where the springs rise, so as to increase the flow of water. These cuttings had resulted in a decided increase of supply, but this increased supply had been temporary and had been followed by so serious a decrease in the discharge during summer that they had filled up the new cuttings, and restored the spring to its normal condition. This is common sense, and should not be lost sight of at similar places elsewhere.

Editorial Note.

It may be asked why we have taken up so much of our space in dilating on the advantages of irrigation works in South Africa. To that we reply that Western Queensland is in like case. Years ago, Mr. G. C. Watson, Land Commissioner, drew up a scheme for irrigation and canal works for the West, which, had it been carried out, would have minimised, if not entirely obviated, the disastrous effects of the late drought. We hold the belief that the statement of Mr. Willcocks, which introduces this article, is applicable to Queensland—"The permanent development of the agriculture of the Central and Western districts will depend upon irrigation, and on irrigation only."

It is, of course, merely a question of money. Were this State in a position to spend one or two millions on irrigation canals, there is no doubt that the Government would do everything possible in the way of assisting to clothe the West with nutritious grasses and crops of various kinds. The wish to do, this is shown in the manifold ways in which agriculturists and pastoralists have been assisted to tide over their difficulties, and it is certain that when the present troubles, owing altogether to the disastrous drought, have been overcome all that can be done will be done to prevent a recurrence of the losses which have of late so huddled on the heads of the graziers and farmers.

A NEW CEREAL.

In a recent Bulletin issued by the United States Minister for Agriculture, Mr. Mark A. Carleton, a specialist in cereals, &c., describes a new species of grain known as "Emmer." Considering the extremely variable climatic conditions of some of the Western States, he thinks it desirable that the Department of Agriculture should pay particular attention to crops which are able to resist extremes of temperature, drought, and moisture, and he describes Emmer as a cereal which should do well in the semi-arid districts of the Western country. Emmer is a kind of wheat, and, as to its origin as a cultivated plant, it dates back to pre-historic times. It belongs to the Einkorn family, is of simpler form than wheat, and originated apparently in the south-east of Europe. It was at first discovered in Switzerland, where it is now cultivated. It is grown in Servia, Germany, Russia, Spain, and Abysinnia, and to some extent also in France and Italy. Russia produces annually a considerable quantity of this grain, and the best seed comes from that country, and when sown in the north-west of the United States produces a grain of as good a quality as the original. The annual Russian production reaches about 16,000,000 bushels. Its cultivation in the United States is as yet in its infancy, but there are indications that it will produce a crop of the greatest value as forage for cattle, as it is said to compare favourably with oats and barley. Hitherto Emmer has not been much used for human consumption, but the large quantity of protein contained in this cereal would indicate that it possesses very valuable nutritive qualities. In Russia large quantities are eaten, and special machines are employed for decorticating the grain. The greater part of the food of the peasants who inhabit the districts north of the Volga consists of this cereal, and in certain parts of Germany, Switzerland, and Italy, where wheat is not grown, the Emmer grain is considered an excellent alimentary food.

QUEENSLAND'S AGRICULTURAL RESOURCES AND DISABILITIES.

The natural resources of the State, in so far as they relate to soil products, cannot be overstated. In what other country in the world do we find the trees, shrubs, plants, cereals, flowers, of every part of the known world growing luxuriantly side by side as they do in this much-favoured State? Cereals of every known variety yield abundant harvests; with root crops it is the same. The sweet potato—the batata of South America—thrives alongside of the Irish potato. The West Indian yam grows simultaneously with the cauliflower and cabbage, and we might enumerate a vast number of vegetables which only come to maturity under certain conditions in other countries, yet which thrive here under the most primitive style of cultivation.

As far as fruits are concerned, we have the apple, pear, orange, strawberry, mango—in fact, every fruit which is produced in the world, the only exception being, perhaps, the mangosteen, and even that grows wild on the Bellenden-Ker Range, as Mr. Meston has proved.

In forestry, there is no need to travel more than a mile from Brisbane to see the British oak flourishing alongside the Moreton Bay fig, the silky oak of the scrubs, the plane-tree, and the Bunya pine, all within the area of one acre.

Unmeasured tracts of fertile soil, inland as well as on the coast, an equable climate which knows nothing of the vicissitudes of Europe or America, and products which, as we have already said, vary in all degrees between those normal to the temperate and tropical regions of the earth, are the prominent features of our natural wealth.

In view of this variety of field, orchard, and forest crops noticeable throughout the length and breadth of the State, how are these resources utilised? What reforms are in practice? How are our agriculturists being raised to the level of their opportunities?

So far, our disabilities are due in a measure to our methods of cultivation and to the subsequent handling of our crops.

Take the maize crop. Can anything more primitive be conceived than our management of this crop from sowing to marketing? Of course we plough and harrow the ground in the usual manner. What do we do then? We mark off the rows with a plough (there are exceptions to this method amongst our up-to-date farmers) one row at a time. Then we walk along and dribble the seed in by hand. The result of this is an unequal stand of the crop. By and by we have either to replant misses or to remove superfluous plants. Then we sucker the stools—a needless operation. At one time we hilled up the corn with a shovel plough, but that practice has been discontinued. When the corn is ripe we pull it, haul it to the barn, and husk it. Then it is shelled with a hand machine capable of shelling 20 bushels an hour, and finally we winnow it in a sieve, bag it, and draw it to the railway station. How much profit do we get out of the crop when the selling price is 2s. 6d. per bushel? A large part of all this work has been unnecessary. How do the Americans do it?

There, two general plans are followed with the corn crop. The land is ploughed or else the crop is "listed." We gave a description of listing corn in the *Journal* (Vol. VII., p. 500). The "lister" is a plough with a double mould-board, and is also furnished with a planter and covering apparatus. It makes a furrow for each row of corn. One man and a team of three horses plough, mark the ground, plant and cover the seed at one operation, doing about 6 acres per day.

When the crop is being cultivated, two rows are taken at each passage of the cultivator across the field. Hand-hoeing is rarely resorted to unless the field is very foul. The husking is a single operation, one man doing about 60 bushels a day. But now the husking, and shelling, and winnowing are done by a single machine at the same time.

Now, see under what artificial burdens the Queensland agriculturist labours. His crop is ready and bagged. What follows? He still has heavy odds against him. The bagging alone has cost him from 4d. to 6d. for four bushels. He loads it on to his wagon or dray; he hauls it often 10 miles to a railway station, where he may wait all day before he has a chance to unload, and the unloading he does himself. Then, at last his crop is loaded on to the train, and he pays pretty heavily for the privilege of being allowed to send it to Brisbane, or Rockhampton, or Maryborough, as the case may be. Then he has the middleman to deal with, the result being that he often receives no return whatever for his crop. Taking all things into consideration, his best plan is to sell straightout to one of the buyers representing the produce dealers. He then knows, at least, how much or how little profit he will get. What does the Yankee farmer do? He drives his load of corn straight to an elevator, where the weighbridge promptly gives him the weight of his load. Then, at the touch of a lever, the hind wheels of the wagon drop a couple of feet, and in a second the load is shot into a large hopper at the side of the weighbridge. Thence it is carried to the elevator, where, if it is in the cob, it is shelled, cleaned, and graded, and delivered to a special bin, from which it is spouted straight into the railway truck. When that truck has reached its destination, a steam shovel empties it into a hopper, from which it is lifted into the elevator of some trade centre. The farmer then receives from the elevator a receipt for so much grain of a certain standard of quality or grade. This receipt now does duty in the commercial world for the grain it represents. It may be held, sold, or transferred at the pleasure of the owner, and it is negotiable at the bank precisely as a bill of lading or a warehouse receipt.

To sum up the whole business, the farmer can take his corn husked and shelled or only husked to the railway station, and then all his concern ends. He gets the elevator receipt and can then deal with his corn as he pleases.

Now, why all this trouble about bagging? We allude, of course, to maize, wheat, and barley. Why a pathetic appeal to the Government for aid? Have our farmers no ideas on the subject of co-operation? Bulk-handling of grain is talked about glibly enough, but what is done? It is suggested that the Government should provide grain elevators. For what? The last harvest, a really good one, may total 1,500,000, or we will even hazard a guess of 2,000,000 bushels. How long would it take a grain elevator to deal with 2,000,000 bushels of wheat? At the port of Novo Rossiesk and Odessa there are immense grain houses, having a capacity of 65,000 tons of grain, built by one single railway company. At the former port 2,000 tons of wheat are shipped within twenty-four hours. Our crop of, say, 2,000,000 bushels would be equal to 53,574 tons. The latest grain elevators would dispose of this in three weeks so far as shipping is concerned. What is wanted is storage room, so that farmers need not be compelled to sell owing to want of barn space. When that storage room is supplied the farmer can rest assured that he will not be "had" by the middleman. He can afford to wait. It is possible for him to get an advance on his crop once it is stored, especially as the Agricultural Bank is now an assured institution.

As with cereals, so it is with many other crops. Want of storage is the great drawback. Farmers cannot afford to build large stores in which to hold their produce for a market. But by co-operation they could easily do so without having to ask any Government help. We have so often pointed out the benefits of co-operation that we feel disinclined to advocate it any longer. Surely in every farming district there are scores of intelligent men who cannot be ignorant of the simple fact that if Jones buys 1 ton of seed potatoes for £5—Tom, Bill, and Harry combining to buy 3 tons or 30 tons will get them for probably £4 per ton or less. Why farmers in every district will not combine to get their seed potatoes, seed corn, provisions, and even clothes and furniture at an enormous discount is one of those things that "no feller can understand," and we leave the problem to the farmers themselves.

MANURING MANGELS.

The following experiment in manuring mangels, tried in England, will certainly be of interest to Queensland farmers:—

A piece of land was treated with farm-yard manure, and when the mangels were singled out they were top dressed with 1 cwt. nitrate of soda per acre. Soil, gravelly sand. The sort grown was Yellow Fleshed Golden Tankard. Two plots were marked out and dressed in addition to the above; Plot 1, nitrate, 2 cwt. per acre; Plot 2, 2 cwt. muriate of potash per acre.

The leaves on Plot 1 were bigger and better colour after being dressed with the nitrate, but, quite contrary to my expectation, Plot 2, dressed with muriate of potash, gave nearly 10 tons per acre more; the cost of dressing would be about the same in each case.

It appears from the above that it is not so beneficial to use all one sort of manure, but the right combination seems to answer best.

ONIONS.

Those who took time by the forelock and sowed onions in April and May, will, provided they have got good seed, and have had sufficient moisture, have a good show for a crop. Much now depends upon careful cultivation. When six weeks old they are large enough to be thinned out, say, to 6 inches apart for the Barletta and 4 inches for Flat Red. Fill up any gaps there may be in the rows by transplanting, but choose a calm day or a day when a southerly or easterly wind is blowing. Westerly winds are fatal to young onions, which will perish quicker before them than under a hot sun. Take the machine hoe and straddle the rows. One hoeing every three weeks will suffice to keep the ground open and sweet. Take out all weeds in the rows by hand. By

September the plants will be too large to straddle, as the leaves will entirely cover the ground. But if you have been careful to keep the ground clean up to the last possible moment this will not matter, as no further cultivation will be needed. Keep all the seed heads broken out as they appear, otherwise the bulb will become pipey. The two varieties abovementioned will not require to have their necks twisted or broken down, as they are perfect bulbers.

About the end of October go through the crop and lift any onions of which the leaves are dying away. Be careful not to bruise them. Top and tail them in the field, and do not put more than 70 lb. or 80 lb. in a bag. Cart them to the barn and spread them out thinly on saplings, so that the air can come through underneath them. They will then be ready for the market in two or three days. The whole crop will take six or seven weeks before it is all off, harvesting it as the bulb ripens.

A good dusting of wood ashes before the final scuffling will keep the onions from decaying at the roots before they begin to ripen.

The Brown Spanish is a very good variety to grow in the Southern and Western district, but experience has shown that on the North Coast, about Maroochy, Mooloolah, and the Blackall Range, generally the extra early Barletta and the Early Flat Red are the best adapted to the soil and climate. The yield from well-tilled land averages about 10 tons per acre, but 12 and 15 tons have not seldom been harvested.

WHEAT.

The New Zealand Loan and Mercantile Agency Company, Limited, Melbourne, under date 6th March, make the following interesting report on the wheat market:—

"GRAIN.—Cables from London indicate some slight improvement there in the wheat market, a rise of 3d. per quarter being notified in Australian cargoes. Business was done at the close of last week at 29s. 3d., and subsequently 29s. 4½d. and 29s. 6d. were paid for Sydney cargoes, and 29s. 7½d. for Melbourne cargoes, with shippers wanting 29s. 9d. to 30s. per quarter of eight bushels. The latter are not anxious sellers, and in this respect we believe they are following a judicious policy, inasmuch as nearly every cargo shipped since the end of January must stand them in a severe loss owing to the high local prices, against which they are now setting the probability of a rise in home values. We think an upward turn may come at any moment in the London market, as the stocks begin to be reduced to a low level. Excellent crop prospects on the Continent and in America might prevent a rise, but, all things considered, shippers are taking a very small risk of loss in holding on to their cargoes. Sydney shippers are not so well established as those in this centre, and hence show more desire to sell. As far as growers are concerned, their interest in the movements of the home wheat market remains small. True, there is a possibility of values more in accord with shipping prices ruling here, but for the moment that must be regarded as a contingency not likely to be faced until the entire shipping engagements are filled. At the moment the local markets are ruled entirely by local surroundings and conditions, and the value of wheat in London has little or nothing to do with the value here, a fact which we can illustrate clearly by stating that London values would have to rise 4s. per quarter to place the f.o.b. value Melbourne on a parity with to-day's rates.

"Freights, in the face of an almost entire absence of chartering for produce, have eased again during the month, and but for the Newcastle business would be still lower; 18s. is a full rate for wheat ships, and this rate, though owners are not anxious to accept it, would be difficult to obtain. It is to be hoped, in the interests of growers, that we are in for a period of low freight rates.

"The past month has been an irregular one in the wheat markets of the Commonwealth. Adelaide and Sydney have danced up and down to the tune set by buyers and sellers in Melbourne. The market was a difficult one to gauge in this centre, and twice rose to 3s. 6d., only to fall each time by 2d. per bushel to 3s. 4d., followed again by a slight recovery. As far as the Melbourne market is concerned, it seems plain that shippers' engagements are drawing to a close. Whether they will be increased is a difficult question to answer, but we must confess that as soon as exporting is over the prospects of an active market are small, unless speculation is carried on. The same applies to Sydney, while Adelaide is also pretty well cleared out as far as large supplies are concerned. Generally speaking, it is our opinion that the end of April will see almost all the Australian exporting done, and the remaining months of the season will be filled in with a jobbing market, which can be expected as usual to show remarkable fluctuations.

"The Australian oat position is being carefully considered. To some degree it is dependent on New Zealand, for if prices in that colony rule high we may expect a recurrence of the demand for export to South Africa; on the other hand, if New Zealand farmers are willing to sell at what we now term low prices, this market is likely to be quiet for some time, at least until Tasmania's surplus is absorbed. It is questionable, however, whether the supplies of Australia will be sufficient for the whole of her wants for the season, and though a period of quietness may be passed through, there is little doubt that ultimately the market will regain activity and will not be overweighted by any great surplus. It appears to be growing plain that we must import barley with some freedom, and we expect to see some considerable quantity brought in from New Zealand. Until the New Californian crop is reaped about four months hence no further supplies than already ordered can be obtain from 'Frisco. The quantity under engagement from 'Frisco for Sydney and Melbourne is said to be 40,000 bags.

"WHEAT.—The market, which ruled firm at the opening of the week covered by this report, has since hardened, and very little is offering. We quote prime in parcels, 3s. 5d.; good, 3s. 4¾d.; fair, 3s. 4½d.; medium, 3s. 4d.; and inferior, 3s. 3d; seed, from 3s. 6d. to 3s. 7d."

LEAKAGES ON THE FARM.

We some time ago pointed out where leakages leading to petty losses and even to heavy losses on a farm occur. As emphasising what we wrote, we print some excellent remarks by Mr. C. G. Freer-Thonger, M.R.A.C., F.C.S., on the subject, which are much to the point. He writes in *Colonia*, the Colonial College Magazine, Wollesley Bay, Suffolk, England:—

In order to pay, farming should be considered as any other business enterprise. It should not only yield a suitable return for the amount of money invested in the land, the implements, and the stock, but should also return a suitable remuneration for the labour in maintaining the work and the management of the entire business. Yet we often hear the complaint that, in far too many instances, what is outlined above is not attained, and in this note it is our aim to point out some of the loopholes by which the profits of the farm are often imperceptibly drained away.

One of the most important leaks on many farms is the lack of system. Any business that has grown from small beginnings, and attained any considerable degree of success, will in every case be found to have been managed by a mind which had a systematic and methodical way of doing things. Of course, system may be abused and cause the farmer to be a slave to it, and in such cases it is a cruel master, but more farmers are sadly lacking in this regard than otherwise. Let there be careful thought and planning how to get at the best way of doing things, and when this best way has been decided upon let this become a law or rule of the farm. Of course, this way may be changed from time to time as more knowledge is gained, or new ideas acquired which would seem to warrant a change. But let no change be made without due and mature deliberation. A good system on the farm will carefully lay out all work to be done in advance of the time of doing it, so that when the time arrives when it should be done there may be no unnecessary delay by not having everything in readiness.

A good system provides for a regular method of feeding the stock at stated hours every day. When stock are fed and watered at the same hour, they thus become accustomed to the hour of feeding, and thrive much better than they would if fed at different times on each succeeding day.

The careless way in which many implements are looked after causes the loss of many pounds to the farmer, who often can ill afford it. If you will observe the thrifty and successful man, you will see that all his farming implements are taken good care of, while many men who complain of the hardness of the times allow their wagons, ploughs, and other implements to remain exposed to the weather when not in use, thereby causing them to rot and rust, doing more injury in a month's exposure than by a year's careful use. There should be a place on every farm to keep all wagons and other tools under cover. They should be kept well painted, and a workshop provided so that all slight repairs could be attended to in the winter season, or on rainy days. How many farmers leave their work to get some bolt repaired, and lose, perhaps, several hours in going to the nearest blacksmith's shop, when, had they used a little care, they might have averted the expense by a little forethought or examination of the implement before it was wanted for use.

Then, again, many farmers often lose by not observing the ordinary principles of business. When they have an article to sell, need the money, and have no use for the article, then they should sell, even if the price is not quite what they thought it should be. When they depart from this principle they are speculating, and run the risk of loss in more ways than one. Another leak in this connection might be mentioned, the keeping of animals about the place which do not pay for their keep. If he has more horses than he needs for carrying on the work of the farm, then he should sell what he does not need, at anything like a reasonable figure. If he has a cow, which, though she may be giving milk, does not give a sufficient quantity to justify her care and food, she should be turned off, and her place filled with another, which will yield a profit for her owner.

Then farmers sometimes lose money because of their knowledge. They know too much, so much in fact that they think it impossible to know more. They think there is nothing to be learned from others, and that any new idea is sheer nonsense. Although this class is of small numbers, in proportion to the many wideawake men at present engaged in farming, yet there are far more of them than there ought to be, and the sooner they wake up, the sooner will they reap larger rewards for their own benefit. I care not how good a farmer a man may be, he can gain ideas from other farmers which will be of value to him. The men who have been successful, and have made money at farming, are certainly capable of imparting valuable information to those who have not the same experience, or attained the same degree of success.

How many farmers there are who do not subscribe for a paper devoted to farming; these men are certainly losing money by this false economy. In this age of progress it is ideas that count; the "know how" that brings the money. A single idea may be learned from a paper, which, when put into practice, may represent a gain in money value of many times the subscription price of the paper.

Another leak which takes money out of the farmer's pocket is neglect in keeping fences and buildings in proper repair. The old saying, "For the want of a nail the shoe comes off," is peculiarly appropriate in this connection.

The expenditure of a few shillings for nails and timber may result in the saving of feed, and the additional comfort of the stock before the onset of the winter. A leak in the roof of a barn, or a loose board flapping in the wind, if promptly attended to, well repays the exertion required to do a thing properly. Then the satisfaction, as well as the added appearance of buildings kept in good repair, with the addition of paint or whitewash, should be reward enough even it did not make them more durable, which it certainly does.

Many other sources of loss might be mentioned, but sufficient has been said to suggest others.

HOW TO TELL HYBRIDS FROM PURE ITALIANS.

Mr. Root, in his excellent work, the ABC of Bee Culture, says that if the beekeeper gets an imported queen, and rears queens from her eggs for all the other hives and for all increase, none of the worker bees, the next season, will be less than half-bloods, and all the drones will be full-bloods. Many of the queens will prove pure, and by persisting in this course, year after year, Italians will soon be the rule instead of the exception. This has been proved practically, he says, in hundreds of apiaries.

It must, however, be taken into consideration that the drones are constantly meeting queens from neighbouring hives and from the forests. How then? This will have no further effect the first season than to produce hybrid workers without changing the drone progeny; but when these hybrid stocks begin to send out swarms, these swarms will furnish hybrid drones, and soon will come all sorts of mixtures. This does no particular harm, for any admixture of Italian blood improves the common stock.

But, if we are going to buy or sell bees, we want to know what to charge for them, and also what to sell them as. We also wish to know which queens to remove when we are Italianising our apiary throughout; hence it becomes very important to know which are Italian and which are not. Mr. Root says candidly it is not *always* possible to tell, but one can come near enough for all practical purposes.

The queens, and drones from queens obtained direct from Italy, vary greatly in their markings, but the worker bee has one peculiarity never found wanting; that is, the three yellow bands we all heard so much about. Unfortunately there has been a great amount of controversy about these yellow bands, and to help to restore harmony Mr. Root went to the expense of having engravings made, but, failing to get the engravers to understand just what was wanted, he made the sketches which are here reproduced—

Every worker-bee, whether common or Italian, has a body composed of six scales, or segments, one sliding into the other telescope fashion. When the bee is full of honey, these segments slide out, and the abdomen is elongated considerably beyond the tips of the wings, which are ordinarily about the length of the body. Sometimes we see bees swollen with dysentery, so much so that the rings are spread to their fullest extent, and in that condition would sometimes be called queens by an inexperienced person.

On the contrary, in the fall of the year, when the bee is preparing for his winter nap, his abdomen is so much drawn up that he scarcely seems like the same insect. The engraving on the right shows the body of the bee detached from the shoulders, that we may get a full view of the bands or markings that distinguish the Italians from the common bees.

Now, observe particularly that all honey bees, common as well as Italian, have four bands of bright-coloured down, J, K, L, M, one on each of the four middle rings of the body, but none on the first and none on the last. These bands of down are very bright on young bees, but may be so worn off as to be almost or entirely wanting on an old bee, especially on those which have been in the habit of robbing very much. This is the explanation of the glossy blackness of robbers often seen dodging about the hives. Perhaps squeezing through small crevices has thus worn off the down, or it may be that pushing through dense masses of bees has something to do with it, for we often see such shiny black bees in great numbers in stocks that have been nearly suffocated by being confined to their hives in shipping or at other times.

These bands of down differ in shades of colour many times, and this is the case with the common bee, as well as with the Italian.

Under a common lens the bands are simply fine soft hair or fur, and it is this principally which gives the light-coloured Italians their handsome appearance. You have perhaps all noticed the progeny of some particular queen when they first came out to play, and pronounced them the handsomest bees you ever saw, but a few months afterwards they would be no better-looking than the rest of your bees This is simply because they had worn off their handsome plumage in the stern realities of hard work in the field. Occasionally you will find a queen whose bees have bands nearly white instead of yellow, and this is what has led to the so-called Albino bees. When the plumage is gone they are just like other Italians. Now, these bands of down have nothing to do with the yellow bands that are characteristic of the Italians; for, after this has worn off, the yellow bands are much plainer than before. A, B, C are the yellow bands of which we have heard so much, and they are neither down, plumage, nor anything of that sort, as you will see by taking a careful look at an Italian on the window. The scale or horny substance of which the body is composed is yellow, and almost transparent, not black and opaque, as are the rings of the common bee, or the lower rings of the same insect.

The first yellow band (A) is right down next the waist. Now, look carefully. It is very plain, when once you know what to look for, and no child need ever be mistaken about it.

At the lower edge is the first black band; this is often only a thin sharp streak of black. The second (B) is the plainest of all the yellow bands, and can usually be seen even in the very poorest hybrids. The first band of down is seen where the black and yellow join, but it is so faint you will hardly notice it in some specimens. We have, at the lower edge of the scale, as before, a narrow line of black; when the down wears off this shows nearly as broad as the yellow band. Now we come to disputed ground: for the third band (C) is the one about which there is so much controversy. Some contend that a pure Italian should show it, whether he is filled with honey or not; others admit that a part of the bees would show it only when filled with honey. Now there are, without doubt, hives of bees that show this third band at all times, but it is pretty certain that the greater part of the bees of Italy do not. The conclusion, then, is, that the bees of Italy are not pure.

The bees from Italy are better honey-gatherers than ours are, and if we import from Italy we should be satisfied to get such as they have, especially so far as the markings are concerned.

If you are undecided in regard to a queen, get some of the bees that you are sure were hatched in her hive, and feed them all the honey they will take. Now put them on a window, and if the band C is not plainly visible call them *hybrids*.

Now, the bees from Italy are not all alike, and the yellow bands have different shadings, as well as the band of down, but they are always found there.

We have heard of bees having a fourth yellow band. This would have to come on L G, but although a great many examinations have been made nothing has ever been found but very bright yellow down, and no trace of the yellow in the horny scale as found in A, B, and C. When we come to hybrids we find a greater diversity, for while bees from one queen are all pretty uniformly marked with two bands, another's will be of all sorts, some beautifully marked Italians, some pure black, others one or two banded. Some will sting with great venom, while others with only one or two bands will be as peaceable as your best Italians. Without a doubt many queens have been sent out as pure that produced only hybrids. A very slight admixture of black blood will cause the band C to disappear, but we should be very careful in such matters to be sure that the bees in question were really hatched in the hive, for bees of adjoining hives often mix to a considerable extent. If you examine a colony of blacks and one of hybrids, you will find many Italians among the blacks and *vice versâ*. Take young bees that you are sure have hatched in the hive and you will be pretty safe, but you cannot readily distinguish the third band until they are several days old.

MAIZE BLIGHT.

The following description of Maize Blight, its cause, and remedial measures to be adopted for its prevention, has been prepared by Mr. H. Tryon, Entomologist and Vegetable Pathologist to the Department of Agriculture:—

A meeting, under the auspices of the Lower Burdekin Farmers' Association, was lately held in the Federal Hall, Ayr, for the purpose of hearing an address from the Government Entomologist, Mr. H. Tryon, on the subject of "Maize Blight," a theme that is one of much interest to our Northern agriculturists. Mr. J. G. Smith, President of the Association, occupied the chair, and the more representative farmers of the district were in attendance. The chairman, having briefly introduced the lecturer, and alluded to the purpose of the latter's visit to Ayr, Mr. Tryon stated that although he had elected to speak on "The Pests and Diseases of our Crops," he would confine his attention to two topics of especial interest, "Maize Blight," and "The Grub of Sweet Potato," but would principally deal with the former of these topics. And in proceeding, he remarked as follows:—A limited acquaintance only with the arable lands of the Lower Burdekin suffices to indicate how large an area is suitable for maize cultivation, even when that available for the growth of sugar-cane is not taken into account. There are grounds also for concluding that when irrigation is employed in maize-growing this crop can be sown with promise of success throughout the year, except during the present month or in May, in which events cold will either injure the young plant or retard seed germination. Crops, moreover, of 60 bushels to the acre have been reported; and the maize itself is of a quality that compares well with that of this cereal yielded by lands better known as sources whence it may be derived. Moreover, it is a fact that already in this district hundreds of acres are devoted to maize cultivation. When, therefore, one learns, as has been my experience during the last few days, that under certain circumstances large fields of maize yield but half the crop anticipated, or even fail to produce any, it becomes a matter of considerable importance to discover both how such failure has been occasioned and how a repetition of it may be avoided. The undesirable results alluded to are occasioned by what is styled "Maize Blight," a title by which is designated a malady of very marked characteristics. No one during the present season can have failed to have observed maize fields in which the plants may have attained their full dimensions, but have prematurely died; that have their foliage—and especially the lower leaves—variously blotched, spotted, or otherwise marked with yellow and brown; that appears to have been dipped in some blackish fluid that has dried upon them; that are to a greater or less extent covered with some sticky material that may be remarked also here and there on stem or leaf, issuing from the underlying tissue in the form of little masses of whitish growth; and that, moreover, yield only small and stunted cobs, or, as more commonly happens, none at all; or, further, three or four diminutive barren cobs may arise from a single stem on the stalk.

During the present season it is maize that has been planted either late in March or during April that has principally suffered, but prior to it, so-called "blighted" crops have resulted from sowings made during August and November, as well as in other months. Corn grown with and without irrigation have alike suffered; and the "blight" has been experienced with several varieties of maize, as well as in that which has grown under different conditions so far as regards soil. This maize affection, that is far too well known to need further description, is by no means peculiar to the Lower Burdekin districts; nor is it one whose first occurrence is a very recent one. It transpires that it was noticed here by some farmers seven or eight years ago, and has recurred annually with greater or less severity ever since. The speaker, however, already, in 1889, described it as prevalent in the preceding year, if not earlier, in the maize fields of the Herbert River; and it occurs in Cairns, as well as apparently everywhere along the coast to the north of Mackay. With regard to its direct cause, it may be remarked that its presence has been assigned to many agencies, but on looking into the matter none of these are found to be adequate for its explanation. It will be unnecessary, therefore, to enter into particulars concerning them. Those who are familiar with the disease are well aware that the maize plants affected by it are constantly subjected to the presence of numerous insects of all orders, both day and night. These have been, with few exceptions, attracted by the sticky fluid that issues from all parts of the plant as one of the symptoms of its presence, or by the whitish-brown gum-like substance left by this on drying, or by the sooty fungus that grows as a mould upon the latter. Amongst these there is one which, though not the most conspicuous, and indeed capable of being overlooked, is of both peculiar form and habit. It is a tiny leaf-hopper less than one-sixth part of an inch in length, belonging to the genus "delphax" and family "Fulgoride." In its adult condition it is a small narrow object, the brownish-grey colour of which is suggestive of that of portion of the dead maize plant itself. During bright weather, on being approached, or the plant whereon it occurs disturbed, it will readily spring into the air, when it can be seen only as it meets the direct sunlight. At other times it may be seen singly, or in twos or threes, furtively making off behind or beneath the stem or leaf on which it rests, moving with a curious sidelong gait, and ever and anon suspiciously resting in its progress. In its passage through the air it is aided by its ample wings folded backwards along the sides of the body when not in use, of which the first pair are prettily marked, and in jumping by the peculiar conformation of its hind legs, that are each endowed with a peculiar semi-oval terminal toothed plate on the tibia, and several stout spines on the feet. These insects vary in size, the males being invariably smaller than their consorts. When young the maize "Delphax" has a very different appearance. It then is of a pale yellowish-brown colour, with red eyes, and has no wings, or, if more advanced in growth, wing-pads only. In this pupal or larval stage it may be met with on pulling the leaf from the stem, just within or above the leaf-sheath, beneath the young tassel (male inflorescence) or amidst its branches, on opening this out, or in similar hiding places in contact with young and succulent plant tissue. In this young condition scores of insects may be met with in one of the situations mentioned, moving over the surface like so many large plant lice, even when the presence of the adults may be overlooked in consequence of their active habits. It is this insect that is the cause of the "Maize Blight," and of the great loss inseparable from its presence. This conclusion is the outcome of observations made during the course of the present visit to Ayr. Writing on some of the injurious insects of the maize plant in 1889, in which year the leaf hopper was first described (H. Tryon, "Insect and Fungus Pests," pp 193-6), this opinion did not, however, find favour. But then an opportunity for conducting investigations into the origin and nature of "Maize Blight," was not forthcoming. It was, however, stated then as follows:—"It might be concluded that these insects give rise to all the symptoms of disease recorded, and especially so since they are both competent to, and do, injure the maize plant. We are not, however, prepared to admit as much concerning them, but only that they may act as the exciting cause of the "Maize Disease."

In giving rise to "Maize Blight," the "delphax" insect does so primarily by occasioning two descriptions of injury, one of which arises in the exercise of its feeding habit, and the other is attendant on the peculiar method observed by it in the deposition of its eggs. The latter mode of injury is, however, that which is by far the most potent in determining its presence. In the first place the insect feeds on the plant juices, or sap, and obtains this by inserting a long hair-like tube, formed by three conjoined portions, into its cell substance. This organ is found beneath the three-jointed proboscis proper, which, when the insect is not feeding, is bent backward, and is of a length sufficient to reach from the head to the hind body. When undisturbed and occurring upon its food-plant, it is almost continuously engaged in partaking of its liquid nutriment. In dealing with this leaf-hopper as the originator of "blight," its egg-laying habit is of especial significance. The eggs themselves are transparent, and when fully developed measure 56mm. (about $\frac{1}{4}$-line) in length, and are about three times as long as they are broad. They are placed by the parent insect within the tissue of the plant amongst the cells that intervene between the fibres (fibro-vascular bundles). Although there is usually no external indication of their presence, still they may occur in this situation in enormous numbers. They may be laid in almost any of the vegetative organs of the maize, except in the seed and essential parts of the flower. Commonly they are to be met with in the leaf-sheath, immediately beneath the inner skin or epidermis; also in the leaf blade itself, and again in the stem, and in the main stalk, as well as in the branches of the tassel or male inflorescence. When present in the last-mentioned situation their position may be revealed, on removing the gummy matter present, by the occurrence of minute elevations roughening the stem-surface. A small fragment of the plant may, indeed, contain a score or more eggs.

In placing the eggs in the position referred to the insect utilises a peculiar instrument with which it is endowed. This is in the form of an elongated, slightly curved saw, the appearance of which is suggestive of the bread-knife that has recently found its way into many households. This saw, together with its accesories, is contained in a conspicuous groove occupying nearly the entire length of the under surface of the abdomen. With it a tiny slit is produced, and into this, between two elongated directors, each egg on extrusion is forced. The saw itself is operated by four special muscles. Four or five eggs may be placed in each slit, but commonly only two or three, or even one. In almost all cases these minute slits remain open, and as, moreover, a determination of sap is occasioned by the irritating presence of the eggs within them, the latter finds its way to the surface, and hence the presence of sticky gum-like matter, formed on its evaporation, results. At the same time, but more especially on the issue of the insect-larvæ, specks, spots, and blotches of yellowish-brown appear as evidence of the mechanical injury that has been inflicted. In addition to this, internal pathological changes arise within the tissue. These manifest themselves in the occurrence of small masses of froth-like matter here and there upon the surface of the plant. These detrimental modifications, however, give rise to a far more significant phenomenon. This arises when the maize plant has become grossly infested by the leaf hopper prior to its "cobbing." As previously stated, the insect especially favours the stalk of the male inflorescence, or flower-head, and its branches as sites wherein to implant its eggs. These, indeed, when the gum or extravasated sap has been removed, are rough from the presence of the tiny weal-like elevations which illustrate this fact. In consequence of this the inflorescence only partially expands, or if it does issue and open out, it has been already robbed of its virulence, and can no longer liberate pollen wherewith the female flower can be fertilised, as is essential for the production of grain-yielding cobs. Indeed, it often happens that neither the mechanical injuries nor the physiological changes that these give rise to affect the purely vegetative growth of the plant. Hence, in order that the disease may ensue and be followed by its full effects, these leaf-hoppers must occur in abundance, and must attack the plant at a special period in its life-history. Thus it may be that maize that is planted shortly after a long period of dry weather—and this is inimical to the increase of the insect—may escape some injury itself, although it may serve as the breeding ground of the numerous hordes that may destroy such as is later sown. This is probably the explanation of the fact that during the present season April planted maize, almost without exception, has succumbed to "blight," whereas that derived from seed sown in January, and early in February, has not only not suffered, notwithstanding it has harboured—in some numbers—the insects, but has yielded good crops. When writing about the "Maize Delphax" in 1889, attention was called to the fact that it was not only a native insect but one also that has as its host-plant one or more of our indigenous species of grasses. This fact must suggest, as a matter of probability, that this insect that is injuriously related to grasses somewhat generally, would damage amongst others the sugar-cane also, especially so since a species of "Delphax" (named *D. sacchari*) is one of the insect pests of the latter plant in the West Indies and elsewhere. Local investigation, however, leads to the conclusion that the maize leaf hopper does not resort to the sugar-cane plant except when this is growing adjacent to blight-infested maize, and even then does not occasion noticeable injury. The sugar-cane in the Lower Burdekin, as well as that growing in other parts of the State, does, strange to state, harbour a second and distinct species of "Delphax." This is a true sugar-cane leaf hopper, apparently restricted to the plant whereon it occurs. Its habits are similar to those of its congener. Thus it deposits its eggs in the tissue of the leaf-sheath as well as in that of other parts of the plant, giving rise, as a consequence of the act, to the red spots and blotches that have of late years been so noticeable in connection with this part of the cane-plant in our plantations, and to the premature drying up of the older foliage. The sugar-cane "Delphax" does not, as a rule, occur in such numbers as does the maize "Delphax," and in so much as cane is grown for sugar, and not grain, its presence on the plant that it affects is not a matter of such significance as would otherwise be the case.

With regard to measures to be adopted in coping with the "Maize Blight," only indications as to the general procedures to be adopted can at present be afforded. Preventive treatment, however, is the only one that is admissible. In the first place it must be recognised that the blight originates in the visitation of an insect from without, or as the outcome of migration of recently born insects from one part of the plant to another. We, therefore, require to repel the insect, to oust it from temporary possession, or to kill it. A noisome spray-wash, pungent smoke and tobacco dust, might be found valuable in the accomplishment of these purposes. It should be further borne in mind that maize stalks, even when a good crop has been harvested, may harbour the eggs of the leaf hopper in very large numbers—much more so the stalks of typically "blighted" plants. These, therefore, should be gathered up and destroyed on the earliest possible opportunity. Preferably, they should be destroyed by fire, rather than be ploughed in. At the same time they can, if early employed, be utilised as food for horses and cattle without detriment to the health of these animals. In objecting to ploughing in of the stalks, one is influenced by the knowledge of the fact that the insect may exist not infrequently upon the roots of the maize, whither it is transported by ants, and is capable of effecting its exit from a subterranean abode. Finally, advantage may be taken of the circumstance that maize sown during one month, rather than another, is less liable to become the victim of this so-called "blight," Several carefully prepared black-board drawings, dealing with the insect and its anatomy, as well as specimens of the insects referred to, as well as of "blighted" maize plants, served to illustrate these remarks.

Mr. Tryon then proceeded to deal briefly with the sweet potato weevil, dwelling especially upon the urgent necessity of resorting to the measures for stamping it out set forth in his recent memoir on this pest in the *Agricultural Journal.*

After the lecturer had, in response to an interrogation, stated that the blight had no such prejudical effect upon the seed as would debar its being utilised for replanting, a hearty vote of thanks was accorded both him and the chairman, and, they having replied, the meeting terminated.

SUNFLOWER SEED.

There is a growing demand in England for this class of feeding stuff, if we may judge by the following paragraph in the *London Agriculture Gazette.* Queensland is eminently the home of the sunflower, and, given easy rates of freight, £10 to £11 per ton should make the production of the seed a paying business:—

For years small parcels have readily found buyers among the large seed factors in London, but we can now chronicle the arrival of a cargo of 300 tons of sunflower seed from Odessa, that found a buyer on Saturday, 28th December last, at the high price of £11 5s. per ton. The importer demanded at first £12 per ton, and there were a good many bids made for the cargo ranging from £10 to £11 per ton, but eventually a large seed firm secured the lot at the price given above. This fact only is sufficient to show SMALL FARMER that there is a market for the seed, and when we take into account the fact that one acre on the average will produce 50 bushels of the seed—of course the produce will be according to the nature of the soil and mode of cultivation—without exhausting the soil to anything like the same extent as other feeding crops, its value as a profitable crop can be at once appreciated. Why it has been so long neglected by English farmers it is difficult to say, considering it has been largely and profitably cultivated in Germany, Hungary, and Russia. And further its value as a plant was so well known two hundred years ago, that in September, 1716, Arthur Buyan, sen., took out a patent in this country, No. 408, which states :—"How from a certaine English seed might be expressed a good sweet oyle of great use to all persons concerned in the woollen manufacture, painters, leather-dressers." This oil "is to be expressed from the seed of flowers commonly called and knowne by the name of sunn flower of all sorts, both double and single." SMALL FARMER does not like the idea of growing an acre or more without being certain of finding a market for the produce, but it must be borne in mind that not only birds of all kinds thrive on the seed, and there is no more fattening food for poultry, but that cattle like the seed as a food, either in their natural state or crushed and made into cake; while the very stalks may be ground up and mixed advantageously with other fodder. The cultivation of the plant is extensively conducted in the south-western section of Russia in Europe, where the climate resembles that of East Anglia, and the area in that country is increasing every year, as the demand is greater than the supply, notwithstanding the fact that each seed sown produces a thousand or more. The hull seeds contain:—

	German Seed.		Russian Seed.	
Oil	33·48 p.c.	...	34·25 p.c.	
Organic substances ...	54·04 p.c.	...	54·39 p.c.	
Protein substances therein	—	14·12 p.c.	—	18·80 p.c.
Ash...	2·86 p.c.	...	3·56 p.c.	
Water	9·62 p.c.	...	7·80 p.c.	
	100·00		100·00	

MARKET GARDENING.

CAULIFLOWERS.

The cauliflower is, of all the cabbage tribe, the most delicate, and is not so easy to grow properly as the cabbage. A writer in the *Epitomist* tells something worth knowing about how it should be done. The writer is a lady, and she says:—

"I chanced to make the acquaintance of a man who makes a specialty of growing cauliflower, and this is his method: The ground is ploughed twice, manured lightly, and the plants put in late in June, with a Bemis transplanting machine. The plants are cultivated several times with a Planet Jr. cultivator, and given one or two hoeings. He is very careful about tying them up. This is the main thing any way, for, no matter how large they are, they will not sell well if they are not snow white; and it is not only the tying up that does this, but a vigorous growth, with plenty of leaves shading the head.

"There is quite a knack about tying them up. If the cauliflower is tied up too soon or too close it stunts the growth; again, if not tied up close enough they get discoloured, and look bad. The best way, according to my informant, is like this: Take a ball of string, and wind it around from hand to elbow, then cut open the skein of string and the cut portions will be just the right length. Pulling out a string, gather up just enough leaves to shade the head perfectly, and no more than necessary, and tie this as low down as possible, just so low that the string is a trifle above the head, thus allowing the tops of the leaves to spread out somewhat to the air, and not retard the growth of the plant. They should not be tied until about the size of an egg or larger, if an extra heavy plant and the heads are well covered with leaves. The patch should be gone over about twice a week, as there are at first only a few heading up at a time. If you have never grown cauliflower, try a bed this season, as they are a profitable crop for selling or for home consumption."

SOME WHEAT NOTES.

By H. C. QUODLING,
Manager, Hermitage State Farm.

The almost unlimited field for expansion of the wheat industry in Queensland, and the many factors essential for its development, afford an all-absorbing subject surrounded with many undetermined problems.

The old axiom "Time and tide wait for no man" is in the former case amply illustrated by the active preparations being made for the forthcoming season, but unfortunately in the latter case the order is reversed, as at the present time we, as a community, are waiting for an equivalent to a tidal wave to give a fillip to all branches of primary industry.

Our present exploited wheat-growing belt offers such a diversity of situation, soil, and climate that the production of perfect wheats for local conditions is still unsolved. Much has already been accomplished by the intelligent observation of farmers in selecting and propagating some "sport" or variety of wheat which has made its appearance in their crops and has developed probably an innate characteristic causing it to differ in some respects from the original. Thus it may reasonably be inferred that under these varying conditions many varieties of different species of cultivated wheats may be produced, and by careful selection of the fittest will become adapted to the requirements of their several situations.

On the other hand, the improvement by cross-fertilisation (when combinations of good qualities are sought for), followed by a system of selection and the fixing of types, commends itself as a means whereby the strength of flours may readily be increased, and by which a well-known defect of some largely grown wheats may be remedied.

The evolution of a wheat calculated to satisfy all is a difficult matter. The producer, in the first place, is in search of a variety calculated to suit his individual soil and climate and to bring in the largest return for his labour. Secondly, the miller demands a wheat suitable for his machinery and to the production of the largest quantity of flour with a minimum of by-products. Then we have the "baker," who looks to the all-important question of colour, uniformity, and strength of flour to place the finished article before the consumer.

The disappointments met with in wheat-growing, and the reasons or causes from which they arise, are often avoidable by the observation of certain peculiarities and habits of the plants. One of the most striking features is the ability of wheat to adapt itself to varying conditions; hence the wide range of climates in which it is grown tends to have an effect in fixing hereditary characteristics on which much depends.

Taking in the first place "late" varieties, which require early sowing in order that they may have a winter season to develop their root system. These invariably require a good climate and regular rainfall, as their stooling proclivities burden them with the support of a large proportion of stalk and flag, and, unless their roots have had time and facilities for penetrating the subsoil, it is more than likely that, if dry conditions prevail from the period after the stem protrudes from the sheath, they will be inadequate to supply and the plant to elaborate sufficient for the maturing of a plump grain.

Indications of this may be noted by a withering of the tips of ears and leaves, which, by the way, may also be produced by frost; but Nature, in its attempt to supply adequate means for reproduction of the species, often confines itself to the development of a part of the remaining portion of ear, and, instead of fertilisation taking place uniformly, some of the glumes will be found empty, giving rise to the expression that the ear did not "mesh" well. Given favourable rainfall, these wheats are more likely to produce big yields, but, taking the other extreme without reference to midseason wheats, it is found that early or spring wheats have gained much favour for several reasons.

It cannot justly be claimed that two seasons are alike, and instead of attempting to grow late wheats, when the usual dry periods may be encountered from flowering to harvest, experience has proved that there is more likelihood of obtaining moderate yields from varieties possessing early maturing capabilities, which, if sown sufficiently early to encourage deep rooting, are in a position to mature grain quickly and escape rather than resist rust.

Thin seeding with these late wheats is generally noted as more applicable, having due regard to a proper balance of vegetation.

Taking the other extreme, thickly sown crops, although conducive to early maturing, suffer in a greater degree from droughty conditions, but, on the other hand, the matter of earliness in relation to escaping rust when the planting season has been delayed should have every consideration.

Rust, in its various stages, has a most important connection in all phases of this subject, and must be considered in the relation of resistance and escape in the choice of varieties.

Roots of the wheat plant will, under certain mechanical conditions of soil, penetrate to a depth of 2 to 3 feet, and in dry localities "deep tillage," where practicable, is to be commended to assist plants in developing this necessary feature. As a further means, early sowing of crops in accordance with variety should prove an additional adjunct to success.

In late-sown crops, where deep tillage has not been practised, there is a natural tendency for the development of surface roots, which are more subjected to variations of heat and moisture, bringing in their train decreased yields and inferior grain unless a most favourable season is experienced.

In rich soils, where plants obtain a good supply of their nourishment in the upper strata of soil and produce a superabundance of flag, it is often found beneficial to turn this to account by feeding off with sheep, encouraging roots to strike deeper, at the same time lessening the effect of rust by removing a most favourable propagation ground as well as consolidating the soil sufficiently to make a firm seed bed.

This system is not, as a rule, practicable in the arid regions, where early maturing wheats are in more favour, nor is it always advisable, but the after cultivation of crops to conserve moisture may be practised with advantage. If proper cultivators fitted with steering gear are not available, light lever harrows may be substituted, but it is not advisable to touch crops sufficiently long to drag.

The first and second and, in backward cases, sometimes a third cultivation may be given at intervals of from three to four weeks, commencing as soon as the roots are strong enough.

The numerous small cracks and fissures in the soil are the means whereby the moisture becomes rapidly lost. To prevent this it is necessary to break up these "ducts" and fill them with fine soil, so that excessive evaporation may be prevented, and moisture may rise and thus become available by capillary attraction.

ENSILAGE AT ST. HELENA.

At the Penal Establishment at St. Helena in November, 1901, grubs attacked the cobs of a splendid patch of maize, and on account of the continued dry weather they threatened to totally destroy the crop. In order to save it for cattle feed it was run through the chaff-cutter—¾-inch cut—and put into the silo pit on the 27th and 30th November, well tramped, but not weighted down. On the pit being opened on the 23rd January, 1902, just seven weeks and four days after filling, the silage was found to be in splendid condition and of excellent quality, the stock eating it greedily and doing well on it.

EXPERIMENTS WITH MAIZE.

By G. B. BROOKS, Manager, State Farm, Biggenden.

During the past season some experiments were carried out with a view to ascertain the suitability or otherwise of several varieties of maize obtained from America. The varieties were sown alongside locally grown seed, and under exactly similar conditions. An area of a quarter-acre was devoted to the respective sorts. The land on which the crop was grown was in good tilth, having previously been cultivated to a depth of 8 inches. The seed was sown in furrows opened out with the swing plough, 4 feet 5 inches apart, with a distance of 15 inches between the seeds.

Careful records were being kept as to the nature and habits of growth of the various varieties experimented with, but the extremely dry weather experienced before the crop could mature prevented this from being fully carried out, all the varieties ripening prematurely. During the whole period of growth the total rainfall amounted to 4·850 inches. As most of this fell shortly after planting, an even germination resulted, and the young crop made good headway. Unfortunately, however, when that period of growth was reached when success so much depends upon the crop getting a sufficient supply of moisture, very little rain fell, and that little only in drizzling showers doing little or no good. Had it not been that attention was directed to the conserving of the moisture already existing in the soil by means of frequent shallow cultivation, thus forming a very beneficial earth mulch, the returns would in all probability have been *nil.* This "dust blanket" is equally efficacious in the culture of fruit trees, vines, and other crops which admit of cultivation. Care must, however, be taken, in scuffling shallow-rooting crops such as maize, not to stir too deep, for if the roots are lacerated more harm than good will result from the practice.

The following table gives a detail of results obtained, these being a good deal short of what they would have been had the season been a good one :—

TABLE I.

Name.	When Sown.	Germinated.	Harvested.	Manures.	Yield per Acre in Bushels.	Weight of Maize per Bushel.	Weight of Cores per Bushel in lbs.	Total Rainfall.	Rainfall from before Flowering Stage until Harvested.
						Lb.		Inches.	Inches.
Legal Tender	12 Aug.	2 Sept.	10 Jan.	Nil.	26	56	13	4·850	1·39
Early Yellow Dent ...	12 "	2 "	10 "	"	20	56½	12	"	"
Riley's Favourite	12 "	2 "	13 "	"	20	58	13	"	"
Leaming	12 "	2 "	13 "	"	19	60	12·6	"	"
Golden Beauty	12 "	2 "	13 "	"	19	59	13·3	"	"
E. W. Horsetooth	12 "	2 "	13 "	"	19	60	12	"	"
Piasa Queen	12 "	2 "	13 "	"	17	58	12·4	"	"

It will be seen from the above that Legal Tender heads the list as giving the best returns, all the other varieties showing remarkably little variation from one another in their yield per acre.

EXPERIMENTS WITH SPECIALLY SELECTED SEEDS.

Experiments were also carried out with large *versus* small seed. This consisted in carefully selecting the largest seeds from the centre of the cob, and the smallest from the end, and sowing an equal area of each. The method of sowing and the conditions were exactly similar to the first-detailed experiments.

This experiment, I may point out, was not undertaken with any idea of proving that large seeds would produce larger seeds and cobs in return and the smaller in like proportion. The method of selecting the largest seed from any individual plant with a view to improving the strain is of little or no value, as it will be found that although individual plants may differ from each other in respect to transmission of character, yet from the same plant the results obtained will in almost every case be the same whether the seed be large or small. It is well known, however, that large seeds germinate a little earlier and give slightly more vigorous plants during the first week or so of growth. It was this fact that led me to experiment with those seeds in the hope of finding out whether, in the event of the weather proving at all adverse during the germination stage, this point would have any effect on the ultimate yield. The climatic conditions were, however, congenial, there being an abundant supply of moisture for germination purposes. As expected, the large seeds germinated first, and a little more evenly than the small, but each sort gave as near as possible a full percentage of germination. In regard to after growth no difference was noticeable, and the respective yields were expected to be about equal. The returns as detailed in the following tables, however, show, in many instances, a wide difference. The manner in which this variation can, I think, be accounted for is, that the crop grown from the small seed must have been a little more backward, and the premature ripening caused through the extreme heat (112 degrees in the shade) and dry scorching winds must have prevented it from catching up with the other. The following returns plainly show that the practice of sowing only the best seed is always safest and best :—

TABLE II.

EXPERIMENT WITH LARGE SEED SELECTED FROM CENTRE OF COB.

Name.	When Sown.	Germinated.	Harvested.	Manures.	Yield per Acre in Bushels.	Weight of Maize per Bushel.	Weight of Cores per Bushel in lbs.	Total Rainfall.	Rainfall from before Flowering Stage until Harvested.
								Inches.	Inches.
Legal Tender	16 Aug.	6 Sept.	10 Jan.	Nil.	26	56	13	4·850	1·39
Leaming	16 "	6 "	10 "	"	22	$50\frac{1}{5}$	12	"	"
Riley's Favourite	16 "	6 "	10 "	"	21	58	13	"	"
Golden Beauty	16 "	6 "	10 "	"	21	59	12·5	"	
Piasa Queen	16 "	6 "	10 "	"	20	58	12	"	
E. W. Horsetooth	16 "	6 "	10 "	"	19	60	12	"	"
Golden King	16 "	6 "	10 "	"	14	56	14	"	"

TABLE III.

SMALL SEED FROM END OF COB.

Name.	When Sown.	Germinated.	Harvested.	Manures.	Yield per Acre in Bushels.	Weight of Maize per Bushel.	Weight of Cores per Bushel, in lbs.	Total Rainfall.	Rainfall from before Flowering Stage until Harvested.
Legal Tender	16 Aug.	6 Sept.	10 Jan.	Nil	20	56	14		
Riley's Favourite	16 "	6 "	10 "	"	19	56	14		
Leaming	16 "	6 "	10 "	"	18	58·5	14·4		
Golden Beauty	16 "	6 "	10 "	"	18	56	13·3		
E. W. Horsetooth	16 "	6 "	10 "	"	18	58·5	13		
Piasa Queen	16 "	6 "	10 "	"	17	57·5	13		
Golden King	16 "	6 "	10 "	"	14	56	14·6		

REPORT ON WORK, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1902.

Farm.—I regret having to again report that the still prevailing dry weather has considerably detracted from the progress that otherwise would have been made. Maize, pumpkins, cow-pea, Cape barley, and sorghum have been planted, but, unless we get rain in the near future, the labour bestowed in cultivating the land, together with the seed, will be lost. Five acres of maize were planted in plot No. 9, 4 acres of which were treated with fertilisers, and the fifth, as a comparison, was unmanured. The following fertilisers were used :—

Per acre, 1. Ammonia sulphate, 1 cwt. ; Australian potash, 2 cwt. ; superphosphate, 2 cwt.
" 2. Australian potash, 1 cwt.
" 3. Australian potash, 2 cwt. ; superphosphate, 2 cwt.
" 4. Ammonia sulphate* ; superphosphate*
" 5. Unmanured.

The drills in which the maize was planted were ploughed 8 inches deep, when some of the soil was allowed to fall back into the drill; the fertilisers were then placed in the drill, the maize planted and covered by means of harrows.

* Quantities not given.—Ed. *Q.A.J.*

Twenty-five varieties of maize were also planted in a narrow strip of land where manurial experiments with mangolds were carried out last year. Five acres of Cape barley, for green fodder, were planted in the "calf paddock." Plot No. 1 (5 acres) was planted with cow-pea. Five acres of sorghum (plot No. 5) were planted, with Massey-Harris seed-drill, at the rate of 16 lb. to the acre. Five acres of potatoes were also planted (plot No. 4). We threshed 237 bags of barley, including 177 bags (748 bushels) of malting (Hallett's) and 60 bags (245 bushels) of Cape. The quality of both samples is good, the yield being 748 bushels malting from 24 acres, and of Cape 245 bushels from 8½ acres; this, considering the season, is a good return. Forty-five acres were ploughed, 25 of which is now ready for lucerne planting, the remainder being allowed to fallow in readiness for the season for planting. A great deal of other work has been carried out, including the following:—Clearing and stumping 2 acres in "sheep paddock"; clearing and stumping recreation grounds in front of Principal's house; scuffling young maize crop; pressing straw, chaff-cutting, and corn-crushing; bone-crushing; wood-carting; cutting noxious weeds; and forming Tarampa road. The rainfall for the month was 1·58 inches for three days, of which 1·29 inches fell on 22nd February.

Garden.—The "hill" orchard and vineyard have been cultivated twice, and all weeds kept down. The orchard and vineyard on the Lockyer Creek have been once cultivated, and all suckers removed from the fruit trees. The fig-trees gave a splendid crop, a very large quantity of fruit being taken off. In the vegetable garden a great deal of harrowing and ploughing has been done, and the ground is now in first-class order. Several sowings of cabbage, kale, Brussels sprouts, lettuce, cauliflower, radish, butter and French beans, parsley, marjoram, and thyme have been made. The seed germinated excellently when well shaded. Nine hundred cabbages (Giant Red, Drumhead, Henderson's Succession, Surehead, and Early Jersey Wakefield) have been transplanted into permanent places, and, with a liberal supply of water, are making good growth. The cabbage moth has given some trouble, but Paris green has been used for this with satisfactory results. The following seeds have been drilled in:—Swede turnips, beetroot, and kohl rabi. Seventeen rows of beans were planted: four rows Yosemite Mammoth, four rows Tall or Mont D'Or, and nine rows Canadian Wonder. Rain has been badly needed, but what has fallen has done good. Ten beds, each 30 feet by 5 feet, have been dug and treated each with one load of cow or stable manure, and have been planted with cabbages; these are close to the water and receive a good supply every day.

Dairy.—During the month, 1,501 gallons of milk produced 629 lb. of butter, and 150 gallons returned 163 lb. of cheese; 480 gallons were supplied to dining-hall, and 251 gallons fed to calves. The increase of dairy stock comprised 1 Guernsey and 4 grades (2 males and 2 females). The dairy herd was grazed for one hour daily on a lucerne plot, and was also fed on ensilage. Owing to the extremely dry weather, the bulls and young stock were also fed on ensilage, which is proving a good stand-by during the present season, being readily eaten by the stock.

Piggery.—Increase: Berkshires, 15 (2 boars, 13 gilts); Large Yorkshires, 6 (4 boars, 2 gilts); Small Yorkshires, 6 (2 boars, 4 gilts); common, 6 head. Sales: Berkshires, 21 (3 boars, 18 gilts); Middle Yorkshires, 3 (2 boars, 1 gilt); Tamworth, 1 gilt. A good demand exists for pedigree pigs, especially of the Berkshire breed.

Mechanical Department.—During the month pipes have been put down, and water laid on to the poultry yard. Three water troughs have been moved to fresh places, and connected with the water supply. A line of fencing near the cowshed has been completed. The stumps under the "main building," dormitories, and dining-hall have been re-tarred. The hayshed has had the gables and all exposed pine painted. Some of the farm wagons have been repaired, and a new pole has been put on the road-maker. In the blacksmith's shop, the usual horseshoeing and repairs to machinery have been carried out, and a number of wheels have been tyred.

MARCH, 1902.

Farm.—I regret having to report a serious loss to the College during this month—viz., the total destruction by fire of the hayshed and its contents. The shed contained about 410 tons of first-class lucerne, oaten, and wheaten hay, together with 5 tons of unthreshed rye, a considerable amount of barley straw, and a valuable chaffcutter. The actual loss we are likely to suffer can hardly be estimated during such a severe drought, more especially as we have been obliged to feed all the available ensilage to our stock in the earlier part of the season, leaving us now dependent on 15 acres of green maize, which will keep us going up to about the beginning of June next. As in most cases, where fires take place, there is no accounting for its origin; at the same time, I feel confident that it occurred through an accident. During the month we formed 68 chains of the Tarampa road. This work was carried out by means of the "Champion" road-making machine, which did excellent work. The cost of doing the work was increased by the fact that there were so many roots in the ground which should have been removed when the road was cleared. The actual cost of ploughing and forming the 68 chains was £26 10s., made up as follows:—Two men, 20 days at 5s. per day; 1 student, 12 days at 2s. 6d. per day; 6 horses, 20 days at 2s. 6d. per day each. This cost is about 50 per cent. below the ordinary contract price paid for such work. Ploughed and planted 17 acres of potatoes, viz.: 5 acres in plot No. 4, 9 acres in three-cornered plot at Head's road, 2 acres in creek paddock No. 1, and 1 acre in garden paddock. Eighteen acres on the bank of the Lockyer Creek was subsoiled to a depth of 18 inches preparatory to planting lucerne. The method adopted was to remove the mouldboards from Howard's double-furrow ploughs, which did the work well, and were drawn by a team of six horses. The work of clearing 40 acres of new land in creek paddock and 14 acres for recreation ground was continued. The hour before breakfast was devoted to the latter work. Other work done:—Cultivating maize and cow-pea, carting and dressing up manure, clearing up remains of fire, the ashes from which were placed on the land.

The rainfall for the month was ·26 inches for two days.

Garden.—The "hill" orchard and vineyard have been kept well cultivated, and are quite free from weeds. In the former, the young trees are suffering from the long-continued dry weather. The orchard and vineyard at creek have also been cultivated when necessary. In the vegetable garden, a very large amount of irrigation has been necessary; 2,500 cabbage plants are now growing and doing well. In the case of these, a great deal of spraying with Paris green has been necessary to destroy the grubs which attacked the hearts, and, in some instances, killed the plants. The beans and other vegetables have responded to the liberal supply of water given them at different times. Water and rock melons have been plentiful, and sufficient pumpkins have been gathered to keep the dining-hall supplied. Successional sowings of cabbage, cauliflower, kale, leeks, onions, broccoli, and lettuce have been made from time to time.

Dairy.—During the month, 1,808 gallons of milk gave a return of 778 lb. of butter, 474 gallons were supplied to the dining-hall, and 262 gallons fed to calves. The increase of stock comprised 1 Jersey (male), 1 grade Holstein (female), 1 Shorthorn (female). One grade Jersey bull was disposed of. The daily average of cows milked was 63 head. The cows in milk were grazed for about two hours daily on a lucerne plot, and then turned out into a grass paddock.

Piggery.—Increase for month: Berkshires, 35 head. Sales: Berkshires, 5 boars, 4 sows; Middle Yorkshires, 2 boars, 2 sows; Tamworth, 1 sow; Baconers, 10 head were sold to J. C. Hutton, realising £2 10s. per head. (These pigs were forwarded in January, but returns not received till March.)

Mechanical Department.—During the month all the gates on the place have been painted, also the verandas of the "main building," dining-hall, and dormitories. The horse troughs, several wagons, and some of the farm implements have been painted. Two wagons, and some of the other vehicles have been thoroughly repaired. New shafts have been made for the portable engine and for one of the wagonettes. Several pig crates were made. The brickwork around the dairy boiler was taken down and rebuilt, and repairs made to the concrete cutters at the stables. Owing to the dry weather, the pump on Lockyer Creek has been kept working constantly, and a great deal of firewood has been carted for the boiler. A large amount of work has been done in the smithy—altering the ironwork for the repairs to vehicles, repairs to pump, horse-shoeing, &c.

BREEDER'S TABLE FOR JUNE, 1902—30 DAYS.

(From the *Live Stock Journal* Almanac.)

Day of Month.	Name of Animal, Hen, &c.	Date on which an Animal served or an Egg set on any day of the present Month is due to give Birth or Hatch.										Remarks.
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit 30 days.	Turkey, Duck, and Peafowl, 28 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.	
1	...	May. 2	Mar. 8	Oct. 27	Sept. 20	Aug. 2	July. 1	June. 29	June. 22	June. 19	June. 14	
2	...	3	9	28	21	3	2	30	23	20	15	
3	...	4	10	29	22	4	3	July. 1	24	21	16	
4	...	5	11	30	23	5	4	2	25	22	17	
5	...	6	12	31	24	6	5	3	26	23	18	
6	...	7	13	Nov. 1	25	7	6	4	27	24	19	
7	...	8	14	2	26	8	7	5	28	25	20	
8	...	9	15	3	27	9	8	6	29	26	21	
9	...	10	16	4	28	10	9	7	30	27	22	
10	...	11	17	5	29	11	10	8	July. 1	28	23	
11	...	12	18	6	30	12	11	9	2	29	24	
12	...	13	19	7	Oct. 1	13	12	10	3	30	25	
13	...	14	20	8	2	14	13	11	4	July. 1	26	
14	...	15	21	9	3	15	14	12	5	2	27	
15	...	16	22	10	4	16	15	13	6	3	28	
16	...	17	23	11	5	17	16	14	7	4	29	
17	...	18	24	12	6	18	17	15	8	5	30	
18	...	19	25	13	7	19	18	16	9	6	July. 1	
19	...	20	26	14	8	20	19	17	10	7	2	
20	...	21	27	15	9	21	20	18	11	8	3	
21	...	22	28	16	10	22	21	19	12	9	4	
22	...	23	29	17	11	23	22	20	13	10	5	
23	...	24	30	18	12	24	23	21	14	11	6	
24	...	25	31	19	13	25	24	22	15	12	7	
25	..	26	April. 1	20	14	26	25	23	16	13	8	
26	...	27	2	21	15	27	26	24	17	14	9	
27	...	28	3	22	16	28	27	25	18	15	10	
28	...	29	4	23	17	29	28	26	19	16	11	
29	...	30	5	24	18	30	29	27	20	17	12	
30	...	31	6	25	19	31	30	28	21	18	13	

BREEDER'S TABLE FOR JULY, 1902—31 Days.

Day of Month.	Name of Animal, Hen, &c.	Date on which an Animal served or an Egg set on any day of the present Month is due to give Birth or Hatch.										Remarks.
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit 30 days.	Turkey, Duck, and Peafowl, 28 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.	
1	...	June. 1	April. 7	Nov. 26	Oct. 20	Sept. 1	July. 31	July. 29	July. 22	July. 19	July. 14	
2	...	2	8	27	21	2	Aug. 1	30	23	20	15	
3	...	3	9	28	22	3	2	31	24	21	16	
4	...	4	10	29	23	4	3	Aug. 1	25	22	17	
5	...	5	11	30	24	5	4	2	26	23	18	
6	...	6	12	Dec. 1	25	6	5	3	27	24	19	
7	...	7	13	2	26	7	6	4	28	25	20	
8	...	8	14	3	27	8	7	5	29	26	21	
9	...	9	15	4	28	9	8	6	30	27	22	
10	...	10	16	5	29	10	9	7	31	28	23	
11	...	11	17	6	30	11	10	8	Aug. 1	29	24	
12	...	12	18	7	31	12	11	9	2	30	25	
13	...	13	19	8	Nov. 1	13	12	10	3	31	26	
14	...	14	20	9	2	14	13	11	4	Aug. 1	27	
15	...	15	21	10	3	15	14	12	5	2	28	
16	...	16	22	11	4	16	15	13	6	3	29	
17	...	17	23	12	5	17	16	14	7	4	30	
18	...	18	24	13	6	18	17	15	8	5	31	
19	...	19	25	14	7	19	18	16	9	6	Aug. 1	
20	...	20	26	15	8	20	19	17	10	7	2	
21	...	21	27	16	9	21	20	18	11	8	3	
22	...	22	28	17	10	22	21	19	12	9	4	
23	...	23	29	18	11	23	22	20	13	10	5	
24	...	24	30	19	12	24	23	21	14	11	6	
25	...	25	May. 1	20	13	25	24	22	15	12	7	
26	...	26	2	21	14	26	25	23	16	13	8	
27	...	27	3	22	15	27	26	24	17	14	9	
28	...	28	4	23	16	28	27	25	18	15	10	
29	...	29	5	24	17	29	28	26	19	16	11	
30	...	30	6	25	18	30	29	27	20	17	12	
31	...	July. 1	7	26	19	Oct. 1	30	28	21	18	13	

FLAX CULTURE.

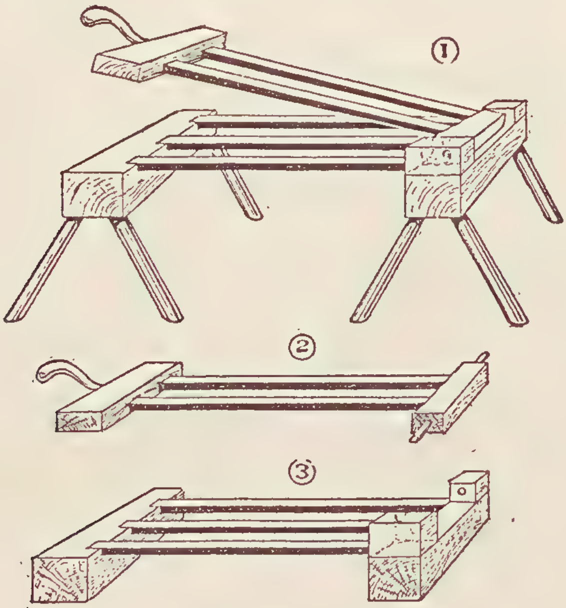
By J. HAYWARD, Homebush.

2.

Dressing Flax.

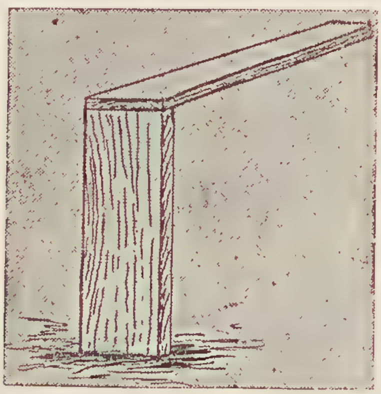
The Break.

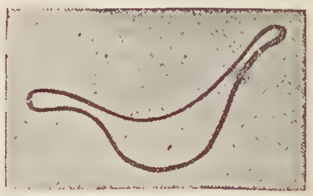
This is made of three battens, on a bottom frame 6 inches wide and 1½ inches thick, tapered upwards so as to break the stalks of flax, as you hold them in the left hand and lift the handle of the frame with your right, forcing the top frame which is made of two similar battens, and furnished with a wooden handle. The top battens are mortised in such a manner that when pushed down they fall between the other three on the bottom frame. I enclose a rough sketch of the top and bottom frames separately. Any handy man can make a break. It is about 6 feet long and is used merely to break the stalks before commencing at the board to finish off with. There is another kind of break similar to a clothes mangle, with two wooden rollers which have strips of iron let into them like cogs. You turn a handle and put the flax through



to its full length, and turn back again, and so on till it is quite broken up so as to clean it. I don't know the price of the machine, but it is much easier to work and is quicker than the one described above. At Yeovil, England, the ironmongers sold them, and I don't think they were very expensive.

After the stalks are broken up as described, we take a board about 4 feet long nailed to a stump as shown in the diagram, in the place were we are preparing the flax for market. The stump is let in the ground about 2 feet, and rammed firmly so as not to shake, and the board is nailed firmly to one side, which must be dressed level to receive it. The latter should be about 2 inches thick at the stump end, and taper off to about 1 inch at the top, and





dressed so as not to catch the fibre, because, if the nails are at all rough, it will only hinder you in turning the fibre over to get it clean. The above stand being fixed in position, the next tool required will be what we used to call a "swingle."

This is a blade made of wood having a handle, and what we call a "tail" to weight it with.

We used to pay a carpenter 2s. each to make them. The handle and tail can be made out of one piece of wood shaped like a boomerang 18 inches long, including handle and tail. We generally keep two or three near at hand on pegs—one heavy one to commence with as the stalks come from the break, and the other a little lighter to finish off with. To begin the operation stand up fronting the board, and you will have the stump between your legs. Take a handful of flax in your left hand, and spread it over top of the board. Now, take your swingle in your right hand, and chop away at it as hard as you can, taking care not to chop your fingers. A little practice will soon make you master of the work. Keep the left hand moving as well as your right to keep the fibre spread over the top of the board. If your board leans over too much you can knock it off the stump and fix it up again. You must use some stout board, or else it may split. We used to use English ash, as it was nice and smooth. There is one more tool you will require, and that is what is called a comb for combing out the tow and keeping the fibre straight. This is very easily made. Take a piece of 2-inch plank 9 or 10 inches wide and the same in length. Bore about thirty holes in it in three rows with ten holes in each row. Then drive into the holes 7 or 8 inch wire nails. Set up a post near the board where you are working and drive a large spike into a hole bored for the purpose in your comb. Drive it into the post, leaving your comb on a pivot, thus enabling you to turn it as well to any side you like. Now you have your outfit complete. Any handy man can make the whole lot for himself. I have prepared a good many pounds of flax for market by the above method. We used to get from 1s. 6d. to 2s. 6d. per 12 lb. for preparing it ready for market. With good flax, we could do from 20 to 30 lb. per day, and the hand-dressed flax was always in more demand and commanded a higher price than that done by the scutching machines. In a village I once visited in the old country they had the new scutching machinery driven by a water wheel. If the industry were tried here and proved a success, I think it would be a very good thing to try the water plan here. How would those artesian bores out West do for irrigating the flax and also for dressing same? In conclusion, I hope that these few notes on flax-growing and dressing may be some guide to intending growers. If the industry were once established it would provide profitable work for many of the unemployed.

The following are the dimensions of the parts of a Break:—

Bottom frame blocks, 6 x 6 inches by 18 inches in length.

Side board to receive axles of top frame, 6 x 8.

Battens, 6 x 1½ inches by 6 feet in length.

The batten for the top frame and the block with axles are of the same dimensions as those of the bottom frame.

ESSENTIALS FOR A SUCCESSFUL BUTTER FACTORY.

An American exchange gives as the necessary elements of success the following:—

1. A good substantial building. 2. Milk from at least 600 cows. 3. A first-class butter-maker. 4. A manager who knows all about factory work. 5. A competent secretary. 6. A board of directors composed of men who appreciate their position, and who will work for the factory's interest instead of their own. 7. Suppliers who will bring clean milk, and lots of it. 8. Suppliers who are up to date in their ideas of dairying. 9. Suppliers who will stand up for their factory. 10. A uniform quality of butter the year round. 11. Good drainage at the factory. 12. A separator that will get practically all the cream. 13. Machinery all of the best that money can procure. 14. A desire on the part of both butter-maker and suppliers to bring the factory to the front. 15. A spirit of harmony among all interested.

Dairying.

THE DAIRY HERD.—QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 28TH FEBRUARY, 1902.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie ...	Ayrshire	19 Nov., 1901	454	3·7	18·70	
Amy ...	"	7 Dec. "	565	3·9	24·57	With first calf
Isabelle ...	"	7 Sept. "	603	3·6	24·31	
Jeannie ...	"	7 Oct. "	617	3·8	26·25	
Laura ...	"	28 Aug., 1900	288	4·8	16·04	
Linnet ...	"	7 May, 1901	555	3·4	21·13	
Lavina ...	"	11 Sept. "	834	4·0	37·36	
Lass ...	"	24 Aug. "	563	3·9	24·59	With first calf
Lena ..	"	3 Dec. "	628	3·6	25·32	
Lowla ...	"	3 Dec. "	577	3·5	22·61	With first calf
Rosebud ...	"	13 Nov. "	796	3·4	30·31	
Ruth ...	"	12 Dec. "	615	3·7	25·48	
Ream ...	"	9 Nov. "	598	3·5	23·44	
ReamRouthie	"	13 Dec. "	666	4·0	29·83	
Leesome ...	"	15 Jan., 1902	1,004	3·4	38·23	
Molly ...	Grade Ayrshire...	5 Oct., 1901	460	3·7	19·06	
Lonesome ...	Ayrshire	8 Jan., 1902	432	5·0	24·19	With first calf
Bell ...	Jersey	15 April, 1901	402	5·0	22·51	
Connie ...	"	8 April, 1900	333	4·8	17·9	
Carrie ...	"	31 Aug., 1901	517	4·9	28·37	
Effie ...	"	18 Nov. "	621	4·4	30·60	
Eileen ...	"	2 Sept, 1900	442	5·2	25·74	
Ivy ...	"	24 Oct., 1901	485	3·8	20·64	
Spec ...	"	27 Aug. "	407	3·9	17·77	
Tiny ...	"	5 Oct. "	337	4·0	15·09	With first calf
Jersey Belle	"	17 Jan., 1902	542	3·9	23·67	
Bluey ...	Grade Jersey ...	9 Oct., 1901	421	3·7	17·44	
Pansy ...	" " ...	28 Oct. "	569	3·9	24·85	
Countess ..	Shorthorn ...	18 June "	515	4·0	23·07	
Empress ...	"	27 Dec. "	627	4·0	28·08	
Dott ...	"	31 May "	444	3·4	16·90	With first calf
Frizzy ...	"	13 July "	711	3·2	25·48	
Lady Vixen	"	13 July "	522	3·7	21·63	
May ...	"	16 July "	207	4·0	9·27	Dry, 27-2-02
Nestor ...	"	3 July "	547	4·2	25·73	
Louisa ...	"	23 Dec. "	662	3·7	27·43	
Violet ...	"	10 Jan., 1902	707	3·0	23·75	
Curly ...	Grade Shorthorn	12 Nov., 1901	778	3·3	28·75	
Esma ...	" " ...	29 Nov. "	374	3·3	13·83	With first calf
Eva ...	" " ...	26 Oct. "	568	3·8	24·17	
Laurel ...	" " ...	22 Aug. "	555	3·5	21·75	
Leopard ...	" " ...	6 Oct. "	582	3·8	24·76	
Lucy ...	" " ...	9 April "	602	3·3	22·98	
Peggie ...	" " ...	29 May "	337	5·0	18·87	
Redmond ...	" " ...	22 Aug. "	329	4·4	16·17	
Rusty ...	" " ...	7 Dec. "	545	4·8	29·29	
Stranger ...	" " ...	6 Nov. "	645	3·8	27·56	
Alice ...	" " ...	1 Jan., 1902	666	3·6	26·85	
Poly Red ...	" " ...	3 Jan. "	605	3·2	21·68	
Rosella ...	" " ...	18 Jan. "	853	3·8	36·30	
Ada ...	South Coast ...	16 July, 1901	604	3·6	24·35	
Grace ...	" " ...	15 June "	337	5·2	19·63	With first calf
Trixie ...	" " ...	4 July "	474	3·8	20·19	With first calf
Topsy ...	" " ...	4 Oct. "	720	3 0	24·19	With first calf
Fancy ...	" " ...	19 Jan., 1902	875	3·6	34·28	
Damsel ...	Holstein	16 Jan. "	931	3·1	32·32	
Angel ...	Grade Holstein ...	5 Dec., 1901	550	3·7	22·79	With first calf
Devon ...	Devon	30 Oct. "	395	4·7	21·90	With first calf
Lady Rose ...	Guernsey ...	26 Feb., 1902	20	4·2	0·94	
Kit ...	Shorthorn ...	14 Jan. "	727	3·5	28·49	
Lilly ...	Grade Shorthorn	22 Feb. "	95	3·0	3·19	With first calf
Catch ...	" " ...	13 Feb. "	197	3·6	7·94	With first calf
Haze ...	Grade Ayrshire...	11 Feb. "	304	3·3	4·23	With first calf

The cows were allowed to graze on a lucerne plot for one hour daily, and were fed in addition on a quantity of ensilage.

THE DAIRY HERD—*continued.*

RETURNS FROM 1ST TO 31ST MARCH, 1902.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie ...	Ayrshire	19 Nov., 1901	347	3·8	14·76	
Amy ...	"	7 Nov. "	444	3·5	17·4	With first calf
Isabelle ...	"	7 Sept. "	561	3·9	24·5	
Jeannie ...	"	7 Oct. "	532	3·4	20·25	With first calf
Laura ...	"	28 Aug., 1900	107	4·2	5·03	Dry, 17-3-02
Linnet ...	"	7 May, 1901	441	3·7	18·27	
Lavina ...	"	11 Sept. "	647	4·0	28·98	
Lass ...	"	24 Aug. "	422	3·6	17·01	With first calf
Lena ...	"	3 Dec. "	557	3·6	22·45	
Lowla ...	"	3 Dec. "	437	3·7	18·1	With first calf
Rosebud ...	"	13 Nov. "	685	3·6	27·57	
Ruth ...	"	12 Dec. "	388	3·9	16·94	
Ream ...	"	9 Nov. "	401	4·0	17·96	
ReamRouthie	"	13 Dec. "	574	3·8	22·42	
Leasome ...	"	15 Jan., 1902	781	3·4	29·74	
Lonesome ...	"	22 Jan. "	489	3·5	19·16	With first calf
Molly ...	Grade Ayrshire...	5 Oct., 1901	433	3·9	18·91	
Bell ...	Jersey	15 Sept. "	325	5·2	18·92	
Connie ...	"	8 Sept. "	217	5·6	13·61	
Carrie ...	"	31 Aug. "	404	5·0	22·62	
Effie ...	"	18 Nov. "	474	4·5	23·88	
Evileen ...	"	2 Sept., 1900	386	4·4	19·02	
Ivy ...	"	24 Oct., 1901	402	4·6	20·71	
Spec ...	"	27 Aug. "	321	4·0	14·38	
Tiny ...	"	5 Oct. "	307	4·4	15·12	
Jersey Belle	"	17 Jan., 1902	452	3·8	19·23	
Stumpy ...	"	17 Mar. "	287	4·0	12·86	
Bluey ...	Grade Jersey ...	9 Oct., 1901	312	3·6	12·57	With first calf
Pansy ...	" " ...	28 Oct. "	534	3·8	22·72	
Countess ...	Shorthorn ...	18 June "	470	3·8	20·0	
Empress ...	"	27 Dec. "	631	3·7	26·14	
Dott ...	"	31 May "	224	3·6	9·03	With first calf
Frizzy ...	"	29 Nov. "	676	3·3	24·98	
Lady Vixen	"	13 July "	341	3·5	13·36	With first calf
Kit ...	"	14 Jan., 1902	694	3·4	26·42	
Nestor ...	"	3 July, 1901	251	4·2	11·8	Dry, 30-3-02
Louisa ...	"	23 Dec. "	526	3·7	21·79	
Violet ...	"	20 Jan., 1902	727	3·5	28·49	
Curly ...	Grade Shorthorn	12 Nov., 1901	675	3·5	26·46	
Esma ...	" " ...	29 Nov. "	263	3·3	9·72	With first calf
Restless ...	"	16 Mar., 1902	262	3·5	10·27	
Eva ...	" " ...	26 Oct., 1901	477	3·6	19·23	
Laurel ...	" " ...	22 Aug. "	389	3·8	16·55	
Leopard ...	" " ...	6 Oct. "	437	3·5	17·13	
Lucy ...	" " ...	9 Sept. "	305	4·0	13·66	
Peggie ...	" " ...	26 May "	88	4·3	4·23	Dry, 12-3-02
Redmond ...	" " ...	22 Aug. "	105	4·0	4·7	Dry, 20-3-02
Russet ...	" " ...	25 Dec. "	409	3·6	16·49	
Stranger ...	" " ...	6 Nov. "	554	3·8	23·57	
Alice ...	" " ...	1 Jan., 1902	583	3·4	22·2	
Poly Red ...	" " ...	3 Jan. "	617	3·6	24·8	
Rosella ...	" " ...	18 Jan. "	694	3·7	28·95	
Ada ...	South Coast ...	16 July, 1901	487	3·7	20·18	With first calf
Grace ...	" " ...	15 June "	104	4·1	4·79	Dry, 20-3-02
Trixie ...	" " ...	4 July "	420	3·6	16·93	With first calf
Topsy ...	" " ...	4 Oct. "	573	3·2	20·53	With first calf
Fancy ...	" " ...	19 Jan., 1902	689	3·5	27·0	
Damsel ...	Holstein	16 Jan. "	791	3·2	28·34	
Angel ...	Holstein & Devon	5 Dec., 1901	502	3·6	20·24	With first calf
Reamie ...	Holstein & Shorthorn	7 Mar., 1902	415	3·3	15·33	With first calf
Lady Rose ...	Guernsey ...	26 Feb. "	563	3·8	23·96	
Catch ...	Grade Ayrshire...	13 Feb. "	424	3·5	16·62	With first calf
Haze ...	" " ...	11 Feb. "	431	3·6	17·37	With first calf
Lilly ..	Grade Shorthorn	22 Feb. "	560	3·5	21·95	With first calf

The cows were allowed to graze on a lucerne plot for two hours daily, and were then run on natural pasture.

PIG NOTES.

Don't keep the boar over fat. We have never yet seen a "show animal" at the shows that was in fit condition to be used for breeding.

Cleanliness is as necessary for the health and well-being of pigs as for other animals. Foul quarters are a direct invitation to disease.

The practice of so many farmers in different communities being satisfied with anything they have on the farm, and using any boar that is most convenient, is not to be commended.

Give pregnant sows laxative food, and they will not eat their pigs. This disease is caused by being in a feverish condition. Give such a sow meal and bran slops, in which put a ½ lb. of Epsom salts each day.

If you must have a swill barrel to take the waste from the houses for the pigs, have two, and see that one is emptied, and has a little chance to sweeten up while the contents of the other are being used.

When your pigs are heavy enough and fat enough for market, sell. It is expensive feeding after that, the gain not being commensurate with the food consumed, and there is always the possibility of a fall in price.

The village pig-feeder usually succeeds well, and why? Because in gathering slop at his neighbours' kitchen doors he gets a variety of foods just in the line of the pig's taste. The farmer notes that those pigs most always look thrifty, no difference how filthy their surroundings. The explanation of their thrift lies wholly in the fact that they have a variety of food. Give them all one kind, as the farmer often does, and they would soon become the meanest looking specimens imaginable.

In the attempt to get pigs of small bone and rapid growth there is danger of going too far, and getting those whose small bones and joints will not hold up even the lighter weights now considered desirable. It may prove better to choose one of the parents, and preferably the sow, of a coarser-boned type, and the male finer boned, with possibly an alteration once in a few years, but keeping in view the object of small bones and early maturity as far as possible without weakening any part. There has been but little scientific breeding of swine, but haphazard crosses, with the object, when there was any definite object thought of, of getting the largest weight and fattest meat possible. Now that the demand has changed to lighter weights, and science has proven that early fattening is less expensive than slower growth and longer feeding, we find there are many things about it that we have not learned and cannot find in the textbooks.—*Australian Farm and Home.*

THE DAIRY COW AND THE WEATHER.

From the University of Arizona (U.S.A.) Agricultural Experiment Station is being issued a series of "Timely Hints for Farmers." Amongst these is an article by Gordon H. True, under the above heading, which we reproduce for the benefit of Queensland dairymen. It reads as follows:—

The relation of the comfort of the cow to the cash received by her owner for her products is one that every dairyman should study with much interest. Those conditions—enough good food and pure water, shelter from the heat of summer and storms of winter, and kind treatment—are just the conditions man demands for his own comfort, and just what would be due every animal from every owner, for humanity's sake, even were there no business relations between them.

Those who read the twelfth annual report of the station may remember the effect of storm upon the production of butter fat by the cows of the station herd.

In thinking the matter over, the query comes to us: What is the effect of the various conditions of weather upon the animal anyway? The body of the cow, which is a complicated piece of mechanism, is so constructed as to do its work best at a temperature of about 101 degrees Fahr. Any marked deviation from the normal temperature indicates an abnormal or diseased condition of the body. This temperature is maintained by the generation of heat within the body itself, independent of outside conditions, but in accordance with their demands, one use of the food eaten being that of fuel to be burned in keeping the body warm. Not only must the body be warm enough, but it must not be too warm. So, when the air is warmer than the body itself, moisture is brought to the surface and the evaporation of this has the necessary cooling effect. Then, again, the body must be kept dry, and, just as fuel is necessary for production of steam in the boiler, so is fuel necessary in the body of the cow for the evaporation of snow or rain from her back and sides. Professor F. H. King, in his Agricultural Physics, is authority for the statement that "if a cow evaporates from her body 4 lb. of water she must expend the equivalent of 3·39 lb. of milk solids" in so doing.

When we stop to think it over, therefore, we come to the conclusion that the food of the cow serves some very important uses in her body aside from being converted into the product we desire for market; machinery must be kept going, the waste repaired, and the temperature maintained. In following out the familiar law of self-preservation, which is said to be the first law of nature, these functions are performed first and, if need be, at the expense even of that product intended for the nurture of offspring. If, then, a profitable flow of milk is to be maintained, not only must food be supplied for its manufacture, but for those other necessities of the body, which vary to meet the demands imposed by outside conditions. These are facts familiar, probably, to every reader of this hint, and yet how few realise their practical bearing on their own work.

The keeping of a herd record has enabled us to observe some of the practical bearings of the case, and below will be given very briefly some observations bearing on the relation of cold and rain to milk and butter fat production.

A study of the record of the amount of milk delivered at the creameries during the year seems to point to the fact that summer rains tend rather to increase the amount of milk brought to the creamery than otherwise. This increase is probably due to the cans being left open and not to an increased flow from the herds. In the case of our own herd there has been a falling off in the amount of milk due to heavy rains amounting to 10 per cent. The cows have recovered quickly from this decrease, however, and when the rains have been light no detrimental results have been noted.

During the second week of December, 1901, Salt River Valley experienced something of a cold wave, which is to say, the average temperature for twenty-four hours dropped 17 degrees F. in two days, and a minimum temperature of 24 degrees was registered by the weather bureau. There are few localities where this would be called cold weather, but compared with the warm weather preceding and following, it was cold. The creamery record seemed to show nothing more than a normal falling off in the amount of milk delivered during this time. The six cows of the station herd were upon rather poor pasture, but three of them were receiving hay in addition. During the week including the cold weather the three cows on pasture alone gave 10 lb. less milk and ½ lb. less butter fat than the preceding week, while the three cows having hay gave 20 lb. less milk and 1½ lb. more butter fat. From this it would appear that there was no falling off in product due to the cooler weather, but that the decrease from the cows on pasture alone was normal, while with those having hay the cold weather acted as a stimulant, causing a temporary rise in amount of product.

In the case of winter rains there seems to be no questioning their bad effect. A single example: The 17th, 18th and 19th days of November, 1900, were rainy days. From the day before to the day after the rains the amount of milk delivered at the creameries fell off 10 per cent. In the same time the milk from our own herd decreased 37 per cent. and continued to decrease until it had reached 50 per cent. It then took the cows a month to get back where they were before the rain.

The week of the storm and that following, two of the six cows had sugar beets in addition to their pasture. During these two weeks the four cows having pasture alone fell off 46 per cent. in amount of butter fat given, while the two having beets fell off only 20 per cent. Here is to be noted not only the effect of storm, but the effect of feed as well, the cows having sugar beets during the storm falling off less than half as much in their butter fat as did those on pasture alone.

From these observations we may safely conclude: That the exposure of dairy cows to winter rains results in serious loss to the dairyman; that this loss may be decreased by abundant feed; that the dry cold of our winter days calls for additional feed for the cows; and that exposure to the heavier summer rains should be guarded against.

TOPPING-OFF PIGS FOR FIRM FLESH.

A correspondent of a contemporary describes a new method of "topping-off" pigs and making the flesh hard instead of flabby. About an hour after the animals have had their usual ration, whatever it may be, give each one a small quantity of dry meal of whatever kind is preferred. It is not to be mixed with any other substance, nor is it to be moistened in any way. The pigs eat it slowly, as they are compelled to do on account of its dryness, and will take a good half hour to get through a small portion. The effect of this dry ration, eaten by itself about an hour after the usual feed, is to impart a firmness to the flesh which is difficult to obtain by any other method of feeding. The pigs appear also to enjoy the dry meal thoroughly.

PEDIGREE OF AYSHIRE COW LADY LAMINGTON.

Lady Lamington, bred by William Bell, Esq., of Yarra Glen, Victoria, and imported into Queensland by John Mahon, Esq., Principal, Queensland Agricultural College, Gatton.

LADY LAMINGTON; calved 1895.
Colour, white and red.
Sire—Jamie.

Dam—Mable (bred by John Grant, Esq.), by Wallace
g d Ardara 3rd, by Norman
g g d Ardara, by Lord Seafield
g g g d Jessamine, by Duke of Randwick (342 A.H.B.)
g g g g d Flora, by Glenelg
g g g g g d Flora, by The Miller
g g g g g g d Beauty, imported from Scotland.

Ardara 3rd got 1st prize for yearling, West Bourke, 1891.

Ardara got 3rd prize for Ayrshire cow, West Bourke, 1890; and highly commended, Melbourne, 1888.

Lady Lamington won first prize at Rosewood Show, 1899, for milch cow, judged by points, and 1st prize for Ayrshire cow, 1899.

In 1900 Lady Lamington won 1st prize at Rosewood Show for best milch cow, judged by quantity and quality butter fat, her yield being 58½ lb. milk for 24 hours.

In 1901 Lady Lamington won 1st prize for milch cow, judged by points, and 1st prize for Ayrshire cow, and silver medal for champion cow on the grounds.

She has carried off first honours every time she has been exhibited.

Lady Lamington is at present owned by Mr. David Elder, Rosewood.

Plate XX

Ayrshire Cow Lady Lamington.

Poultry.

WARTS IN CHICKENS.

A DISEASE OF HOT COUNTRIES.

The following article appeared in the *Bulletin de l'Union Agricole Calédonienne*, written by an evidently competent man, who simply signs himself Dr. N. It is reprinted in the *Journal d'Agriculture Tropicale*, and we translate it for the benefit of our poultry-keepers who are constantly having trouble with their chickens owing to this disease.

In hot countries birds, and particularly barnyard fowls, are attacked by numerous diseases. New Caledonia, although favoured by an exceptional climate, does not escape the general law. As concerning poultry diseases, mention must be made of enteritis, cholera, diphtheria, and their results. Each of these would require special study. Let us note *en passant* that isolation of the birds attacked and disinfection of the poultry-houses are the most certain methods of saving them. For the present, however, we will deal with a peculiar disease affecting the face, called "The Wart Disease."

Symptoms.—This disease is the "pian" of Guiana and of hot countries. It begins insidiously by the appearance around the bill and eyelids, and round the nasal apertures, of small, dark tubercles, rough and hard to the touch, varying in size from that of a pea to that of a small nut. These tubercles are only the apparent lesion. The real lesion is an ulcer—a sort of cancerous ulcer—plainly visible in certain cases in the bird's palate, and seen also if the dark crust which constitutes the wart is lifted with a pair of pincers. Then may be seen a rounded sanguinary ulceration, yellowish below. The epidermic crust is merely a sign of individual resistance; it is the horny epidermics of the circumference of the wound which has spread, covering a felting of fibrin which is exuded from the small excoriation.

That is the whole description of the disease, and yet its ravages in the poultry-yard are often considerable. Whole clutches of fifteen to twenty chickens have been known to die off in a few days. How is the disease to be overcome? In certain cases the ulcer spreads and the wart with it; the bill is covered with tubercles, the nasal orifices are obliterated, the bird can only breathe through his half-opened bill, and by its gasping one would imagine it was suffocating from diphtheria. In other cases the eyelids are closed, glued together by the tubercle; the bird becomes blind, although the orbs of vision are perfectly healthy. Incapable of finding its way or its food, it quickly becomes emaciated and dies in a few days of inanition. The disease is not deep-seated. The *post-mortem* examinations we have made have never shown that the lesion went beyond the organs of the senses; it is rare to find the brain or lungs affected by the disease. It is therefore purely a superficial, exterior lesion, but a dangerous one in so far as it attacks those organs which are necessary to the animal's preservation.

Cause.—What is the nature of the affection? What is its origin? How is it to be cured? It is produced by the inoculation of the spores of *Aspergillus fumigatus*, a very common mouldiness (fungus?), and of which some varieties become very virulent under favourable conditions of heat and moisture. We have isolated and cultivated here the dangerous mycelium; this it is which attacks the epidermis and raises it so as to form a wart, and it is under the surface of this wart that it is found in all cases.

* * * * * *

Whence does the infection come? From grain and from the soil.

The surface of grain is the habitat by preference of the *Aspergillus*. We receive them in incalculable numbers in bags of rice. Scattered over the soil they there find the moisture and heat to maintain their virulence.

In addition to this their resistant powers and their vitality are very great. Three or four years after cultivation they may be reproduced. They sometimes attack the eggs in process of incubation, and are thus transmitted to the embryo. The inoculation ordinarily occurs through the medium of an abrasion on the delicate skin of the chickens about the bill and eyes. Some bags of grain appear to be very strongly infected, and thus a whole brood may be contaminated at the same time. Then the disease appears to be contagious. Disinfection is resorted to; floods of limewater are poured out, but in vain; the disease continues, and weeks later will be reproduced in another brood. The reason is that fresh grain has introduced fresh virulent spores.

Remedies.—As the disease is purely external and not, as some say, a disease of the blood, it must be cured by external means. Lemon juice, acetic acid, &c., have been used with more or less success. These are uncertain antiseptics.

The poultry-breeder must watch his chickens as the mother-hen watches them, and must act vigorously the moment the first sign of disease is apparent.

1. Tear off the whole crust—the wart—with a pair of pincers or a pin.
2. Touch the entire ulcer with a little cotton plug moistened with tincture of iodine.

The iodine is an excellent antiseptic; it kills the spores. The mycelium is in the wound, and it must be destroyed there. Sometimes the disease is persistent; it is because the treatment has not been employed with a liberal hand. Some filaments have remained intact; the owner must persevere till he has destroyed the last vestiges of them.

* * * * * * *

When the disease has lasted for seven or eight days it is more difficult to cure, the cicatrisation not being uniform.

The only means of avoiding great loss is to treat the chicks at the very outset of the disease.

[We perfectly cured a number of half-grown Cochins which were badly affected with warts by a treatment which we were assured by a poultry-keeper could not fail. Dip the heads of the chicks twice a day in fresh urine. The remedy is simple and sure. Out of eleven badly-diseased chicks we lost only one, which was too far gone to recover.—Ed. *Q.A.J.*]

ALLOWING THE HENS TO PERCH.

Generally speaking more attention should be given by poultry-keepers to the period when chickens should be allowed to perch. If they are allowed free latitude in the matter they will do so very shortly after they leave their mothers. This accounts for the frequency of crooked breastbones in fowls. In a table fowl this is a most unsightly fault, and greatly depreciates the value of a bird; while in an exhibition specimen it means that the bird will be passed by the judge if he detects the fault. And detected it is very frequently, as many breeds require handling in order that the winners may be properly picked out. It is so easy to avoid, that there is really no excuse for birds being allowed to have crooked breastbones from other than a constitutional cause. The lighter class of birds should not be allowed to perch before they are three months old, and the heavier class for six weeks or so later. As long as the bones are soft, continued pressure on a particular part will indent or twist them, and they gradually harden as the bird approaches maturity. The pressure exerted by a light bird is comparatively small, but in the case of Dorkings, Indian Game, Malays, Langshans, Rocks, Wyandottes, &c., the pressure is heavy, and is sufficient to cause curvature until the birds are about five months old. These breeds should not be allowed to perch before this age. Another matter for attention is the shape of the perch. A thin, rather sharp perch, or a very small round one, are two very bad examples. The perches should be broad, not less than 3 inches, with the sharp corners bevelled off; and they should not be placed at too great a height from the ground. The heavier the breed the lower must be the perch, or bumble foot and corns will be quite common among the fowls. It is not good, either, for laying hens to have to jump down from a high spar. If very high, it sometimes causes rupture of the egg organs. For heavy breeds the perches should not be higher than 18 inches from the ground, while, in the case of light breeds, it does not very much matter if they are 1 foot higher. But beyond this they should not go.

All perches should be so fitted that they can be taken out any time and cleaned. A socket can easily be made to provide for this. Some kinds of vermin hide in the crevices during the daytime, when they are never seen, but come out in full force during the night and prey on the birds. If the perches get an occasional brush over with carbolic acid, and a little run into any crevices, there will be none of the little destructive red mites left to flourish; or paraffin may be used very effectively for the same purpose. No pains are too great to root out all vermin pests, and prevent their ever getting a foothold again.—*Farmer and Stockbreeder.*

POULTRY FOR FARMERS.

At the meeting of the Murray Bridge Branch of the Bureau of Agriculture, held on 26th January, the chairman (Mr. R. Edwards) read a paper on the above subject, as follows:—

The farmer should first learn how to manage poultry by starting with a few birds and giving them every attention. He should increase his flock each year until he has as many as he can properly keep and attend to. He should provide proper houses and yards for the birds. It is a great mistake to allow them to roost and lay about where they please. Every egg laid should be secured fresh. If the fowls are running at large, nests are often found containing a number of eggs, some of which may be several weeks old. These cannot be used if the farmer is honest. Often, however, they are included with others and sold to the hawker—an action that is sure, sooner or later, to recoil on the farmer, as well as on those who are innocent of fraud. Poultry must be properly attended to if they are to be made to pay. No farmer would expect to get a profit from his cows or sheep if he neglected them as he usually does his fowls. See that the chicks get the proper food, and feed them where they cannot be molested by the old birds. Give them every care when young, and you will find them to mature into strong healthy birds. For laying purposes a quick-maturing bird that will lay at least twelve dozen eggs a year is wanted. There is a remunerative market for good table birds all the year round, and a certain market for eggs; but you cannot get a champion layer and a champion table bird in one. There are, however, some birds that by careful selection and breeding now possess both qualities in a high degree, one of the best of these being the Orpington. Of the purely laying strain, probably the Minorca takes first place. In selecting birds for improving his flock, the farmer wants pure-bred birds, sound in health, and possessing the characteristics desired—not necessarily fine feathers and large combs and exhibition birds. Utility before mere beauty should be aimed at. A few years ago most poultry fanciers bred for fancy points; but this is not the case now, as most breeders devote attention to egg production or table birds, according to the class, besides working to standards of appearance. Many farmers appear to hold the opinion that one fowl is as good as another, which, of course, is a mistake. Each of the breeds has some special quality. The same farmer would think it absurd to talk of using a thorough-bred horse in the plough, or a draught horse for hunting or riding; yet they fail altogether to see that the breeds of fowls differ equally in their uses. Every farmer can, if he will, rear good birds that will bring in a fair income. One thing must be borne in mind—the flock should only be increased as experience increases. Many think that they can make 1,000 birds equally as profitable as 100; but in most cases this is a mistake. The question of feeding does not receive the attention it should. Fowls are naturally eaters of both grain and insects, so that to secure the best results they should receive a variety of foods. On large farms, and where the available land permits, a plot of lucerne or kale should be grown, and the fowls allowed free run on it. It makes excellent summer feed for the fowls, besides being also a good hunting ground for insects. The hon. secretary considered there were great possibilities in the improvement of poultry. There were too many fowls on many farms compared with the feeding received and the land they have to run on. The result was disease of all kinds affected the birds. Under such conditions it was no wonder that the farmer came to the conclusion that poultry did not pay.

RUSSIA'S POULTRY TRADE.

Russia is decidedly energetic in raising poultry, and although the fowls kept are not of any general breed, nor of great size, yet the small farmers seem to be able to make them pay. Of course, one secret is that a Russian farmer does not require a great amount of capital. The Russian does not seem to scientifically study the habits and manners of the different breeds to any great extent, or if he did without a doubt the profits that he gets now, which are considerable, would be in a short time doubled. The principal local varieties of fowls found in Russia are divided into three sections, called locally the Orloffs or Gilians, which are found principally in the Moscow districts. These are the largest in size, with red-coloured plumage, and muffs under the lower beak. The Pavlovsks are another variety generally found in the central districts, and smaller in size than the former, with large combs. The feathers are dark, and speckled with either gold or silver, and feather legs. The third variety, the Oushankis, are rather peculiar looking, with ear-like feathers on the head, and are found principally in Little Russia. They are hardy fowls, and good layers, although they do not come up to some of our breeds in Australia, either in size or number of eggs laid in the year. It is stated that the average laying capacity of the Russian fowl is seventy-five eggs per annum, the usual weight going from 1½ oz. to 1¾ oz. each. Russia also cultivates outside breeds, and crosses them with the above local varieties, resulting in better returns. Several of the breeds thus imported are Brahmas, Cochins, Plymouth Rocks, Houdans, Wyandottes, Orpingtons, and La Fleche. The farmers in their primitive ways are greatly encouraged by the various societies which exist in different parts for holding shows, and distributing knowledge by means of journals. The poultry-breeding goes on principally in the Baltic regions, where the best results seem to arise—no doubt on account of better breeds being kept, and more attention being paid to their general economy. It is stated that the annual sum from the poultry industry which Russia receives is about four millions of money, being much in excess of the amounts received from the exportation of horses, cattle, pigs, &c. The poultry trade, combined with which is the output of eggs, has grown in twenty years from £296,300 to £4,415,000, and is derived as follows:—Eggs exported, 75 per cent.; live geese, 12 per cent.; dead poultry, feathers, and down, 13 per cent.

RUSSIA'S EGG MARKET.

Russia is making great strides in egg production, and is fully alive to the latest ideas in the way of marketing to the best advantage, and uses the most up-to-date methods of collecting, grading, and preserving. Some little idea of the number of eggs exported can be gathered when it is known that last year's shipments amounted to no less a sum than £3,300,000. In Russia the eggs are collected by an elaborate system of "higgling" chiefly between the months of April and October, and the prices being very low compared with the

Australian scale, being only 1½d. to 2d. for ten eggs, but rising in the breeding seasons to 2s. for the same number. The eggs collected in the cheap time of the year are sent away to various countries, and sold at a good profit. Germany receives 37 per cent., while 30 per cent. goes to Austria, and 22 per cent. to Great Britain. Russia also goes in extensively for the "yoke-and-white" system, which takes up less room and reduces the freight, and the chances of breakages are done away with. The yolks are separated from the whites. During the years of 1898 to 1900 no less than 16,200 cwt. of yolks and 2,580 cwt. of whites were exported to Germany, Denmark, Great Britain, and Holland, Germany and Great Britain taking by far the most whites. Thus Russia satisfies a considerable part of the egg consumption of Europe, and from sources that are primitive in the extreme, and under circumstances that are in some respects adverse when compared with the advantages possessed in Australia as a poultry raising and egg producing country.—*Adelaide Observer.*

THE WET EGG.

An egg when it is laid is a wet egg (the shell is wet), and the longer you can keep an egg wet the fresher it will remain. This is a truth, expounded, I believe, for the first time, and has never before appeared in print. Why do we hear so much, especially through the winter months, about bad and stale eggs? We know that hens with all their faults never lay stale eggs; we also know, to our cost, that but few hens during the winter lay any eggs at all, good or bad! Then where do we get our stale British eggs from? We stupidly make them stale by dry storing. If all British eggs were wet stored the day they were laid, such a thing as a bad or even an indifferent egg would become a novelty, a curiosity, instead of being an everyday article of commerce. We all know that an egg becomes stale by keeping, but let me add, by improper keeping. If an egg is kept a week it is far from fresh, if kept a month it becomes very stale, even objectionable; if kept three or four months it becomes what is termed "the egg," "shop egg," "the foreigner," "not warranted," or, to be more precise, the bad or rotten egg!

We all know what dry storing is, when we look at a lot of eggs in a shop window or upon a shelf in the farmer's larder. Wet storing is the placing of eggs the day they are laid in glass water, and leaving them there until they are sold or required for immediate use. It matters not whether they have been wet stored a week, a month, or even five or six months, they continue equally fresh and always good alike. Surely this is a matter of some importance to the British farmer, the shopkeeper, and to every housekeeper? There is one way, and only one way, of forcing our farmers and shopkeepers to practise a little care and attention on the freshness of the eggs they supply. Let all housekeepers refuse to purchase British eggs from any shop unless they see them taken wet out of the preserving pan, and let all shopkeepers refuse to take in farmers' eggs except with a guarantee that they have all been wet stored the day they were collected from the nests. There is no more trouble to wet store than to dry store, the only difference being placing the eggs in a dry box or basket in the one case, and into a bucket one-third filled with water glass in the other instance. Where, then, is the extra labour? Lime-water has, for a century or more, been used in many private families as a preservative, but water glass is far better. The American and our own agricultural experimental farms and colleges have conclusively proved that glass-preserved eggs, even after six months' storing, were as nearly equal to a "new laid" as a preserved egg can possibly be. Eggs kept in lime-water after several months' immersion are apt to partake of a limey flavour and are only used for kitchen purposes, but not for the egg-cup.* I can speak personally as to the efficacy of water glass, for I have just finished two 9-gallon barrels of eggs, which I so preserved

* Not if properly cared for—*i.e.*, kept as much as possible from warmth and air.—Ed. *Q.A.J.*

last spring and summer. These eggs proved as sound and good as when I stored them nearly six months back; and, indeed, many of them, when the top was removed, retained within that "milky" matter, so characteristic of an egg taken straight from the nest.

All foreign and imported eggs are of necessity more or less stale and of uncertain age, having been laid weeks, and sometimes months, before they reach our markets. But the foreigner is more alive to his own interests than we are, and already they are beginning to practise the wet storing in water glass, and, unless we mend our ways, the day is not far distant when the stale, dry-stored egg will become the speciality of the British farmer and shopkeeper. It took twenty years before our farmers could be induced to adopt, even here and there, the Dutch factory system, to secure a good butter of uniform quality; how many years will it take us before we shall trouble ourselves to preserve the freshness of our eggs? As water glass is now an article of commerce, and quite cheap, let us hope that a jar of it may soon become a fixture in the larder or storeroom of all householders in town and country who can appreciate a fresh egg in preference to a more or less stale or bad one.—*Agricultural Gazette*, London.

PRESERVING EGGS.

Lime or Water Glass.

The *Scottish Farmer* writes:—There has been some talk lately of the superiority of water-glass (silicate of soda) to lime for the preservation of eggs. It is contended that eggs preserved in a solution of water-glass will keep longer fresh than in lime-water, and will acquire no taste; that, indeed, at the end of six months, the whites, when boiled, will have the milky appearance of a new-laid egg. Professor Long repeatedly recommends this method; and it is being largely adopted in America for market purposes. The proper solution is 10 per cent. of water-glass in perfectly pure water. The purity of the water is an important point. At Birmingham Show last December, out of twenty-four exhibits of preserved eggs (delivered four months previously), two were in water-glass, and neither got a prize. The first prize went to lime-water, and the second to eggs which were rubbed with vaseline, each egg wrapped in a cloth and packed in bran. If the contention in favour of water-glass be correct, there was some mischance befel those sent to Birmingham Show.

[We (*Q.A.J.*) have repeatedly stated from practical experience that the lime-water preservative is far and away the best, and we do not agree with the contention that the lime imparts a bad flavour to the eggs. After nine months, the eggs we preserved in lime-water were as good as when they were first laid.]

POULTRY NOTES.

Scaly leg is contagious, and will spread through a flock. For this reason it is advisable to keep a watch over the young birds as well as the old ones, and at the first indication of a roughness on the shanks to anoint them with sweet oil and kerosene, half and half.

It may be set down as a fact that the average hen will lay more eggs in the course of a year, if allowed to hatch at least one brood of chickens. The rest is needed, and will bring her out in better condition for renewed egg-laying. Nature points out the thing needed, and it better be heeded.

If you intend to breed pure-bred poultry get the best, for it costs no more to feed, keep, and house choice stock than it does the common mongrels, and there is a great difference in their looks and usefulness. It is a waste of time and money to breed and feed poor fowls, when good ones can be had at fair prices.

There are some farmers who claim that the hen-house should be cleaned out once a year. Others more extravagant manage to remove the accumulated manure twice a year. Can the poultry-houses be kept too clean? We think not. Clean them out every month at least. Better still if you would do it every week.

During the summer months the fowls should only be fed once a day when they have their liberty, and when kept confined in runs they should be fed twice a day. More than this is unnecessary—in fact, may be injurious. If the fowls have given to them all that they require they will become lazy, and will not trouble themselves to obtain natural food—which, by the way, is much more beneficial than is artificial—but if, on the contrary, they are kept hungry, they will forage about for themselves, and by this means save a lot in the food bill.

It was at one time supposed that the more dirt a fowl ate with its food the better; but we now know that when the hens want dirt they will procure it without any assistance. We know also that eating dirt produces disease, and the careful poultryman will never feed soft food in any manner except in a trough or on a board.

The surest remedy for gapes lies in their prevention. Give the chicks dry, clean quarters with proper food and clean drinking water. Some hold the chicken in the fumes from burning sulphur. Others swab the windpipe with the tip of a feather wet with a solution of carbolic acid or kerosene, both of which are much more troublesome than prevention.

Fowls, in a state of health and with proper facilities for dusting, do not suffer from lice, neither do they breed disease; it is when a fowl loses its ordinary activity that the vermin unduly multiply. Directly a fowl begins to mope, or an old fowl gets lazy, then the lice are active. One such lazy fowl will infect others, so that care and intelligence are required to regulate the matter, and to use insecticides when necessary. All sick fowls and moulting ones require a little attention. A good way is to have disinfecting powder in all dust baths.

Poultry suffer for water on many farms. Other live stock are properly looked after in the providing of water, but the poultry must get it any way they can. The hens that have to depend on their water supply by getting it from filthy pools will sooner or later succumb to mysterious diseases. Watch the flock on a warm day and note how much clean, fresh water they will drink. Then you will wonder how those that are cruelly compelled to partake of filthy water exist as long as they do.

The flavour of hens' eggs depends largely upon their care and food consumed. The food which goes to make the egg, perhaps within twenty-four hours, must carry with it to some extent its own qualities, good or bad. If we will feed a laying hen on onions we can taste them strongly in the egg, the same as milk from a cow that is fed on cabbage or turnips will taste of them. The same may be said of eggs that are from stale, unhealthy, and impure food. Although fresh, they will be unhealthy to eat, while those from clean grain, fresh meat, pure water, and grass, will be pure and healthy.—*Australian Farm and Home.*

FOWL TICKS.

We have received two letters on the subject of the poultry tick on which a paragraph appeared in our March issue. We then stated that as "far as we knew" the tick had not yet made its appearance in Queensland. We have kept poultry in large and small numbers for many years and have never had experience of the tick. Indeed this is the first time we have heard of the presence of the scourge in this State.

Mr. Thomas Thomasson, a breeder of fancy poultry at Rockhampton, states that the ticks have caused great losses at Longreach, in spite of all precautions taken in the way of disinfection, galvanised iron poultry-houses, swinging perches, &c.

Mr. H. G. Barnard, manager of the Union Bank at Bogantungan, tells the same lugubrious story concerning the ravages caused by the tick in localities on the Central Railway line, where the true fowl tick is very numerous. But Mr. Barnard has been successful in banishing the pest from his poultry-houses by adopting the following plan:—

"I noticed," he writes, "that at night the fowls were very unwilling to go to roost, and several times have seen them walking about in the middle of the night, but as the weather has been terribly hot I put it down to that. However, several fowls died and the rest were picking all their feathers off. On examination I found small ticks on them. I then inspected the fowlhouse and found it a mass of ticks. I set to work and boiled a large iron pot with water; the pot held seventeen kerosene tins of water. With this I drenched the house from the top to bottom and scalded millions of ticks. That they were quite dead was evidenced by them lying on the ground two days after, and I examined them. I hope with a few applications of the same kind to quite get rid of them. I also made a dip of arsenic water, two tablespoons of arsenic to five gallons of water. I then dipped all the fowls. They now go to roost properly and appear much stronger, and a few days ago some of them could hardly walk from weakness. Several selectors in this district have got rid of their fowls owing to the ticks."

BREEDING AND FEEDING FOR EGG PRODUCTION.

BY THE POULTRY EXPERT, Queensland Agricultural College.

As the cold weather, with possible high prices for eggs, will soon be here, the present is the time to look to the moulting hens. Hens that have commenced to moult should be fed liberally, so that they may commence laying as soon as possible. Early hatched pullets, not required for exhibition, may now be pushed on, and should soon be laying.

In the morning, as early as possible, feed pollard, mixed thoroughly with water into a crumbly mass, not sticky, but so that it will break into pieces when thrown down. In the evening, feed good heavy oats or wheat, with barley or maize for a change or for wet, cold days. If the fowls are penned up, give them a little cooked meat or green-cut bone; the latter is preferable, as it contains plenty of mineral salts and fat, besides being very rich in albumenoids; and, as the egg is chiefly composed of the above three constituents, bone feed cannot be beaten for egg production. It should be fed at midday.

Feed just sufficiently to keep the fowls in good ordinary condition, not too fat, or they will get lazy. A good plan is to feed the grain at night in a corner where there is some litter or straw, the fowls are then obliged to scratch for it.

Care should be taken to breed from the best layers only. It is surprising what can be done in a few years to increase the laying qualities of any breed of fowls by judicious selection. The cock, also, should be of a good laying strain. Then, having bred some good laying pullets, selecting the best layers each year, and feeding as above, not forgetting green feed (cabbage, lettuce, &c.) and some grit, success is assured.

The Orchard.

DESTRUCTION OF FLYING FOXES.

Whilst in the Allora district recently I paid a visit to the orchard of Mr. G. Moulday, on the Goomburra road, and was shown a somewhat novel method of destroying flying foxes which has proved decidedly efficacious during the past season, and will, I think, prove of interest to fruit-growers generally. Every fruit-grower who has suffered from the ravages of these pests will have noticed that they are always attracted by the largest tree either in the orchard itself or adjacent to the orchard, and in the case of the latter that they often hover round it or settle on it. At Mr. Moulday's there is a large gum-tree on the eastern side of the orchard that stands out prominently, and consequently acts as a great attraction for the foxes. Noting this, Mr. Moulday decided on utilising the tree as a trap for the foxes, and proceeded as follows:—In the first place he procured a bushy branch of a tree some 12 feet long and about 8 to 10 feet through, and attached to it by means of string a quantity of fruit that had been specially prepared by poisoning with strychnine, the strychnine being placed in a cut in the fruit. An artificial fruit tree was thus prepared to the butt of which a strong rope was made fast, and the other end of the rope was passed over a limb of the gum-tree some 40 feet from the ground. The artificial tree with its poisoned fruit was then hoisted up, and the end of the line made fast so as to keep it in position. The foxes were on no account frightened when on or near the prominent gum-tree, all shooting being confined to the orchard itself, so that when the foxes were disturbed in the orchard they flew to the gum-tree, where they fed on the poisoned fruit and were destroyed in considerable numbers. The branch with the poisoned fruit attached was lowered from time to time as necessary, and fresh poisoned fruit tied on. The poisoned fruit being firmly tied on was not carried away by the foxes, and the branch being some 40 feet from the ground was out of the reach of anyone, and thus any danger of accidental poisoning was done away with. I saw the remains of numerous foxes round the tree, and was assured by Mr. Moulday that this extremely simple method of dealing with the pest had proved very effectual.

ALBERT H. BENSON.

SCIENTIFIC METHODS OF MOVING TREES.

By DAY ALLEN WILLEY, in the *Scientific American.*

The transferring of trees is at present so scientifically conducted that it is not necessary to wait ten or fifteen years for shade trees to grow for one's grounds or to ornament the landscape with large specimens of trees. In fact, parks and the surroundings of country seats can be made to order these days, the grounds about the residence being beautiful and shaded while the home is being constructed. At a number of villages on Long Island can be seen fine specimens of forest growth ranging from twenty-five to fifty years old, moved various distances and replanted, yet are growing vigorously and to all appearances are in perfect health. They include such specimens as silver maple, Norway maple, beech, birch, linden, fir, hemlock, and cherry.

Apparently it would seem impossible to transplant a tree 50 feet in height, with a trunk varying from 1 to 2½ or 3 feet in diameter at the base, for even a novice realises the extent of the roots which spread through a wide area of ground in all directions, yet the operation is being performed with complete success. What is known as a tree-mover, the invention of Mr. Henry Hicks, of Westbury, New York, has been adapted for the purpose. In operating with this apparatus, the tree, if of 14 to 26 inches diameter of trunk, is dug by starting a circular trench with a diameter of 30 to 40 feet. An undercut is made beneath the roots with a light prospecting pick, and the soil picked out and caved down with a spading fork or picking rod, the points of which are rounded to avoid cutting off the roots. The loose dirt is shovelled out of the bottom of the trench and the roots are uncovered, tied in bundles with lath yarn and bent up, out of the way of the diggers. If the roots are to be out of the ground even for one day in dry weather, the bundles are wrapped in clay mud, damp moss, and straw or burlap. When the digging has progressed within from 4 to 8 feet of the centre, the tree is slightly tipped over to loosen the central ball, which cleaves from the subsoil near the extremities of the downward roots. On sand or hardpan subsoil this is at a depth of 2 to 5 feet. In deep soil it may be necessary to cut some downward roots. A ball of earth is left in the centre from 5 to 12 feet in diameter, or as heavy as can be drawn by four to eight horses. This ball is not essential with deciduous trees, but it is easier to leave it than to remove and replace the soil. With fine-rooted trees like the red maple, it is difficult to pick out the soil, while with coarse-rooted trees, like the beech, in gravelly soil the ball drops to pieces.

In loading for removal, the cradle of the mover, which is pivoted above or back of the axle, is swung over to the tree, the trunk first being wrapped with cushions and slats. It is thus clamped to the cradle by chains and screws without injuring the bark. By means of a screw 9 feet long operated by a ratchet lever or hand-brake wheel, the cradle lifts the tree from the hole and swings it over in a horizontal position. Pulling in the same direction by tackle fastened in the top of the tree aids the work of the screw. After the tree is loaded, the roots on the other side of the axle are tied up to the perches. The front wheels are on pivots, therefore the roots are not broken by the swinging of the axle. The roots are next drawn aside to put in the pole and driver's seat. Planks are placed under the wheels, and the mover is pulled out of the hole by tackle.

The hole to receive the tree is prepared with a layer of soft mud in the bottom, which partly fills the crevices between the roots as the tree is lowered into it. The weight of the tree is not allowed to rest upon and crush the downward roots, but is supported by the mover until fine earth is packed in. Soil is worked down between the centre roots in the form of mud by means of a stream of water and packing sticks. The side roots are next unwrapped and covered at their natural depth. While the tree is horizontal, it is usually pruned, the outside being cut back 1 to 3 feet, cutting to a crotch or bud, and the remaining twigs thinned out about one-third. Hardwood trees and trees with few roots need the most severe pruning.

Until it is firmly embedded, the tree is secured by guy wires. Anchor posts are set slanting 4½ feet in the ground with a crosspiece just below the surface. Two to six strands of galvanised steel wire are used, run from the posts through pieces of hose, around the tree and back to the post. It is twisted tight with two sticks turning in the same direction and moving toward each other. To prevent the sun from drying out the bark on the south side of the tree, the trunk is wrapped with straw, especially thin-barked trees, like beech and silver maple. By following the plan described, enough of the smaller roots of the tree are preserved to give it ample nourishment if it is transplanted in soil which contains fertilising elements.

As already stated, Long Island contains a number of illustrations of landscape gardening which includes large trees transferred in this manner. The accompanying illustrations give an idea of some effects which have been produced. They depict various species which have been dug up, transferred on the movable vehicles a distance of from 15 to 25 miles and reset. As will be noted, they have grown erect and in some cases more shapely than when in their original positions.

Plate XXI.

Roots with 35-foot Spread being Transplanted after being Tied to Branches.

Lowering the Tree into Hole after Pole and Seat are Removed.

Plate XXIII.

*Plate XXIII*A.

In spite of the details which accompany the work, a force of five or six men only is required to remove and set the largest trees, and the work can be accomplished in a comparatively short space of time. Consequently the owner of a plot of ground entirely destitute of trees can surround his residence with a grove of 100 or more hardy specimens of the forest, arranged in artistic groups to suit his fancy, the operation representing but a few months from beginning to end.

FRUIT-GROWING AT OUR STATE FARMS.

By S. C. VOLLER.

This month I want to show our readers who are unable to visit the State farms what the full rows of some of our trees look like.

I consider that, for the time they have been in, these trees have made excellent growth, and give sure evidence that they are adapted to the soil and climate.

Illustration No. 1 gives a good view of a full row of the apricots at Westbrook, while on the angle we have a cross view through other varieties. I think we may safely claim that good cultivation and careful pruning have accomplished their object in producing the result seen in this picture; and not the least gratifying feature about these trees is that they are bearing highly remunerative crops of very fine quality fruit.

It would amply repay settlers who intend to grow such fruits to either come and see for themselves what we have at the farms or, if they cannot do that, write for names of varieties which combine size and high quality with early ripening and have proved successful with us.

Sufficient attention is not yet paid to these points, and it is certainly a great pity to see a man put in a few years' hard work and trouble, and going to a certain amount of expense, and then find that he has grown something that won't pay because of its inferior quality.

We have a good many apricots which are well worth growing, and I would mention the following particularly, viz.:—Oullin's Early Peach, Moorpark, Blenheim, Alsace, Hemskerke, Royal George, Campbellsfield Seedling, Kaisha, Mansfield's Seedling.

Illustration No. 2 represents a row of French prunes on one side and a row of plums (Reine Claude de Bavay) on the other, growing in the orchard at the Hermitage State Farm.

Here again growth, shape, and general development are quite satisfactory, and, although only a light sprinkling of fruit has as yet been obtained from them, they are safe for full crops before long. We have a few other good prunes besides these, but, as they are pretty much of a class, one illustration is sufficient.

It is our purpose, later on, when full crops are obtained, to carry out careful experiments in drying this fruit, and we hope in due course to give satisfactory reports of the work.

The plum referred to above is evidently at home on our soil, as it is a strong grower and promises to fruit all right. It is of the gage type, of very nice quality, almost too sweet when ripe, and sells well. I consider it well worth the attention of growers.

No. 3 shows a good sample of the Hermitage peach-trees, one row being Lady Palmerstons and the other Globes. They speak for themselves as regards growth and general condition.

They certainly have done wonderfully well, and so far have given fruit of the very highest quality.

These varieties, and also some others that we have, come out surprisingly in contrast with a great deal of the ordinary fruit put on the market, and I am glad to say that they are so well appreciated that we caught almost any price for them.

Fruit, such as we have had from these trees, will pay the grower for a bit of trouble in packing, and there can be no doubt that a vast improvement is needed in this direction. I saw on more than one occasion in salerooms in Warwick, this season, fruit offered in cases that were a disgrace to the growers who sent them in—old, dirty, dilapidated, patched-up things, certain to lower the selling value of their contents.

Against this I am glad to put the fact that two intelligent growers made a trial of our own methods, using the same cases and material, and in both instances results were quite satisfactory.

Any grower, by simply writing, can get all the information we have at command as to better styles of cases, cost of timber, nails, cardboards for fancy packing, wrapping paper, &c., and it will pay all our growers to wake up on these points.

Our fourth picture gives a view of apricots at the same farm. They, like the peaches, have done remarkably well, and this year produced a good crop of fine fruit.

We had our serious drawback in marketing the apricots, in the shape of the heat wave and hot winds which came just as the fruit was ripening. This was an unusual visitation, and had a rather bad effect, but in spite of this our 'cots turned out very well.

FRUITING OF THE MALE PAPAW.

Mr. Gabriel Kirk, Moonuyra, writes as follows on the above subject:—I think it is generally recognised that the male papaw bears no fruit. Now, I have a tree from which, last year, I got three papaws, and this year it bore between thirty and forty. The storm that came before Christmas knocked several off, and others dropped off owing to the dry weather. The tree here illustrated had eighteen papaws on at the time the photograph was taken. To-day I got two ripe fruits from it. They had not such a nice flavour as the ordinary fruit, nor were they as good as those I got last year, but I blame the drought for that. Some of the fruit are as large as a teacup, the others are smaller. I have saved the seed from the fruit referred to, and shall try it to see the result. The flowers, which are male, with a female here and there, look beautiful on their long stems. I spoke to Mr. George Wescombe, of Carlton House, Mount Morgan, and he thought it was not possible for male flowers to produce fruit, so I invited him to look for himself, as seeing is believing. I had had the photo. taken then, and he was very interested in it, and he has searched some standard works for information on the subject, but could find no mention of such a case.

NOTE.—It was believed at one time that the male flowers of the papaw did not develop fruit, but such fruiting is now quite common in the North. We lately saw several male trees bearing heavily at the Kamerunga State Nursery, at Cairns, and also on the Lower Russell. We noticed several trees along the railway line, from Cairns to Kuranda, laden with fruit depending from stems nearly 2 feet in length.—Ed. *Q.A.J.*

FRUIT-GROWING ON OUR STATE FARMS.

By S. C. VOLLER.

As a good many varieties of fruit have now come into bearing at the State Farms, the following list will perhaps be of some interest and value to growers, as showing what we consider useful sorts suitable to the Downs country.

Any person wishing to obtain wood for either budding or grafting can get same on application to this Department, a small charge being made to cover packing and postage or freight. (*See* advertisement.)

Plate XXII.

Fruiting of the Male Papaw Flower.

The names of fruits are given in order of ripening, so that anyone intending to plant can see at once how their varieties will come in for marketing, and select accordingly :—

PLUMS.

Red American or Cherry Plum	before Xmas.

EUROPEAN PLUMS.

Evans' Early	New Year.
Angelina Burdette	end Jan.
Early Orleans	"
Washington	"
Golden Prune	early Feb.
Shropshire Damson	"
Giant Prune	mid. Feb.
Coe's Golden Drop	end Feb.
Purple Gage	"
Reine Claude de Bavay	early March.
Prime D'Agen	March.

JAPANESE PLUMS.

Burbank	New Year.
Chabat	mid. Jan.
October Purple	mid. Jan. to mid. Feb.
Shipper	latter half Jany.
Wickson	end Jany.
Juicy	"
Red Heart	mid. Feby.
Blood	"
Kelsey...	end Feby.

CHICKASAW PLUMS.

Helm	New Year
Robinson	early Jany.
Wild Goose	mid. Jany.
Lone Star	"
Cumberland	end Jany.
Newman	mid. Feby.
Golden Beauty	end Feby.

PEACHES.

Alexander	Xmas.
Briggs' Red May	"
Foster	early Jany.
Hales' Early	"
Lady Palmerston	mid. Jany.
Mountain Rose	"
Globe	mid. to end Jany.
Muir	end Jany.
Robert Stewart	"

APRICOTS.

Cullin's Early Peach	3rd week Nov.
Royal	early Dec.
St. Ambroise	before Xmas.
Moorpark	Xmas.
Blenheim	"
Hemskerke	"
Campbellsfield Seedling	"
Mansfield's Seedling	"
Alsace	Xmas and New Year.
Royal George	" "

PEARS.

Bartlett (Williams' Bon Chretien)... ...	early Feb.

APPLES.

Early Richmond	marketable 3 weeks Dec.
Lady Carrington	Xmas and New Year.
Emperor Alexander	early Jan.
Prince of Pippins	mid. Jan.
Jonathan	"
Ben Davis	mid. to end Jan.
Canvade	" "
Cellini	" "
Bismarck	Jan.-Feb.
Fall Beauty	"
Ribstone Pippin	Feb.
Gloria Mundi	"
Perfection	"
King of Tomkins County	"
Munroe's Favourite	"
Rome Beauty	"
Cleopatra	Feb.-March.
Gladney's Red	March.

QUINCES.

Portugal	March.
Pear Shaped	"
Orange	"

OLIVES.

Collumella	late March.
Picholine St. Chamais	"
Oblonga	"
Rubra	"
Uvaria	"

FIGS.

White Adriatic (best of all)	1st crop Dec. 2nd crop end Jan. and into Feb.
Brown Turkey	
Col de Signora Nero	
Brunswick	
Marseilles	

Viticulture.

TARTARIC ACID IN GRAPES.

Last month we published the results of an experiment in vine-topping, carried out by Mr. E. H. Rainford, Instructor in Viticulture. An error, however, occurred in the heading of the figures relating to the amount of tartaric acid present in the ripe grapes. The words "per cent." should have read "per mille," which, as winemakers, of course, know, make a startling difference in the result. We regret that the error should have occurred, but we were unable at the time of going to press to submit the proof-sheet to Mr. Rainford owing to his absence.

Horticulture

THE DREADED WATER HYACINTH.

Queensland Declines to Supply Madras.

Some time ago an application was received by the Queensland Agricultural Department from a correspondent for seeds or plants of the water hyacinth. Mr. P. McLean, Agricultural Adviser to the Queensland Department of Agriculture, very properly refused to assist in introducing this serious pest into India. *Planting Opinion*, Madras, writes thus on the matter:—

According to the *Queenslander*, Mr. P. McLean, Agricultural Adviser in Queensland, has declined to supply two applications from India, one for the most tenacious of all water plant pests "the Water Hyacinth," and the other for a weed, *Sida retusa*. The very fact of any person desiring to introduce the former into a country free from such a pest, would naturally fill any ordinary man with horror, for one has but to read of the large sums of money spent in Florida, not in its extermination, for that appears impossible, but in opening up tracks for the shipping to pass through, to realise what a terrible enemy it may soon become if neglected for ever such a short season. The weed forms itself into solid mat-like masses, through which it is impossible for other than specially constructed ships to force a passage. Propellers are frequently inextricably tangled up and broken, and ships disabled on their coming in contact with these detached floating islands of ropy vegetation. Nothing avails to eradicate it. Certain spiders have been found which do, to some extent, destroy it, yet they cannot be got in sufficient numbers to do much permanent good. Queensland tried it, and is suffering accordingly; and little wonder that Mr. McLean declined to lend a helping hand in adding yet another curse to India, overburdened as she is already with pests and blights of almost every description. The introduction of such a pest should be forbidden by Government, and the offence made liable to severe punishment. Many people will sacrifice the whole of an industry for the sake of gratifying a passing whim. The applicant for the Water Hyacinth merely wants it for ornamental ponds near Madras; so far so good. How long would it be before it got out of the ornamental ponds near Madras to ornamental ponds belonging to some friend in some part, who would not do as the present applicant promises, viz., take all precautions. Granted precaution was taken, how long is that going to last? Probably until the novelty of the thing has worn off, and the danger does not seem of such magnitude as at first. The Scotch in Australia and the Argentine, who longed to see the emblem of their country once again, caused seeds of the bonnie thistle to be sent out to them. The conditions were the exact antithesis to those of Scotland; the warmth of soil revolutionised the plant, and in a short while it became not the friend of his childhood but his deadliest foe. The sweet briar that lays waste thousands of acres of land was introduced as an ornament in Australia; the rabbit as a pet. How many squatters gaze with hopeless eyes on the barkless shrubs and bare ground in time of drought while they reflect that but for the rabbit the loss in sheep that year might probably have been two or three thousand less; and how many weary days and weeks does the farmer and grazier toil with his clearers and bullock teams, dragging up with great heavy chains the briar which renders his land useless? The applicant for noxious weeds and pests in general should reflect for a moment before introducing them into a country that as yet does not number them among its drawbacks, and should sacrifice his personal desire for the general good.

Tropical Industries.

THE LEEMING SYSTEM OF COFFEE CULTIVATION.

The proceedings of the United Planters' Association of Southern India for 1901 include a very interesting account of the method of coffee cultivation adopted by Mr. Leeming, a Madras planter, on his estates of Scotforth and Kooderoy Panjan on the Shevaroy Hills. Although the method has been called the Leeming system for convenience, Mr. Leeming does not claim to have discovered anything new. He says he has merely thought out and applied to coffee-growing the principles carried out by practical and scientific growers of fruit trees in various parts of the world, and his system, as it stands at present, is the result of careful observation and experiment carried on over several years. I was taken over every field in these two estates so that I might see for myself the effect of the system on both good and poor soils, Mr. Leeming answering all my questions without any reserve whatever.

The system may be said to have been instituted seven years ago when he ceased to either prune or handle, and allowed suckers to grow, the trees being left to Nature, but he continued to cultivate and manure the soil more carefully than ever. The result was that his crops increased and his trees suffered less from leaf disease, but it was apparent that they were so crowded that they could not give nearly as good crops as they might. In 1898 he began cutting out in field No. 10 of Scotforth, reducing the number of trees from 27,000 to 13,500, just half, and giving them a space of 12 x 12 feet in which to spread—*i.e.*, about 600 trees per acre. In 1899-1900 he picked 1,500 struck bushels of ripe cherry from this field, equal to nearly 7 cwt. per acre. Last season he picked 1,700 bushels, nearly a ton more than in the previous year, and in April he again thinned out the field to 10,200 trees, and the estimate for the coming crop is nearly 10 cwt. per acre. These figures I took from the estate books myself, and are unquestionable, and a better record than this can hardly be imagined. The other fields were similarly treated in 1899 and 1900, and now his object is to finally get about 300 trees per acre and no more. In field No. 3 of Scotforth this has been done. No sooner had the trees got root and air space, than they at once began to fill out laterally, and the long branches came sweeping down to the ground, thereby increasing the bearing area enormously, and suckers grew very slowly. What suckers there were grew before the thinning out process began.

These trees are now (writes Mr. A. M. Elder), who visited Mr. Leeming's estates and afterwards wrote this account of the system, 10 to 12 feet high, and the branches have a spread of over 15 feet, and I agree with Mr. Leeming in thinking it will take another five years to see them at their full development. I merely give the figures of field No. 10 because it was the first to be cut out, but those relating to the other portions are equally good. When thinning out from 600 to 300 trees per acre he first cuts off the primaries, leaving the suckers for a couple of years, thus giving air and some root space to the trees that remain, but he is not certain that it would not pay better to take them out at once.

When going over Kooderoy Plantation he took the same trouble in order that I might see part of each field. I remember seeing this estate some eight or nine years ago, when, although it grew very find oranges and silver oaks, the coffee was very poor indeed. Now, under this system, there is a complete transformation. Oranges, &c., have disappeared, and avenues of great coffee shrubs, healthy and vigorous, with dark, glossy leaves, and laden with crop, have taken their place.

When Mr. Leeming took charge of it eight years ago its crop was 1½ tons off 65 acres. Last year, off the same area with some little assistance from the young coffee, he picked 25 tons. For seven years he never pruned, and in 1898 he cut out to 600 trees per acre, and there is a good deal of it now thinned to 300 trees per acre.

The coming crop is estimated at 11 tons, and, judging from the wood now making, it should easily be followed by 30 tons. The way trees that were a mass of sticks from overbearing, both here and at Scotforth, are making new wood is simply marvellous.

The new clearings on both estates are planted 7 x 7 and 8 x 8 feet apart, and, beyond topping the trees that are intended to be permanent, they have never been touched with a knife. Those trees that are intended to be cut out eventually will have their primaries cut off, and a crop or two taken from the suckers. I have never seen finer clearings; soil, climate, and deep cultivation being all in their favour.

Regarding cultivation, Mr. Leeming believes in deep drains (3 to 4 feet deep), and 40 feet apart to enable those large trees to send their feeding roots deep into the soil; a 6-inch digging with quintaines (forks?) once a year, and ¾-lb. bone-meal, poonac, and nitrate of potash scattered evenly over the surface and dibbled in. The supervision of applying the manure has been very greatly simplified under the new system, and each individual tree can be studied and manured according to its needs.

He is also growing a legume (a creeping pea) in the middle of the rows, which, when growing, will cover the ground and act as a mulch in preventing wash and loss of moisture, and induce the earthworms to come up and make casts. I was shown examples of these casts as we went along. Just before flowering, the legumes will be dug into the soil and will enrich it with a cheap store of nitrogen. He very kindly gave me a supply of the beans to try in our district.

The advantages of the Leeming System as compared with our present method are:—Economy, in that no pruning or handling are required, and only half the quantity of manure is necessary. (Mr. Leeming believes in manuring at least once a year.) Improved quality of bean, as leaf disease is not nearly so virulent now that none of the leaves, which are the lungs of the tree, are sacrificed in pruning, and the crops are not only more regular, but are much better. These large trees are not nearly so easily affected by a bad blossoming season, although they will always do best in a good one. Mr. Leeming's figures speak for themselves; the results are, as Mr. Hodgson remarked at the Conference of the U.P.A.S.I., "simply astounding." Whether we in Mysore are ever likely to achieve such results is doubtful, as the Shevaroys are, generally speaking, much more favourably situated as regards soil, climate, and rainfall, but even if we only receive a third of Mr. Leeming's success we will improve our position enormously.

The system has been objected to on the score of "borer," but I find Mr. Leeming has had worse "borer" than we ever get, and yet he has no fears on that score. He says it is only destructive on the clearings, and that old trees are rarely attacked, as the branches are close and come down to the ground, thus protecting the stem; and this is borne out by the fact that those trees that have suffered have been bored near the top, where the damage amounts to very little. It has been alleged that if trees are neither pruned nor handled they will lose their primaries, but this is not the case if they get room to spread. In fact, the tree seems to change character and to adapt itself very readily to its new conditions. Mr. Leeming is in favour of the system on poor soils, even although the trees do not crowd each other, for although there may be plenty of air space, the roots want much more room in which to search for nourishment than in rich soils. I do not anticipate that the results from cutting out will show themselves nearly so quickly on our estates where the trees have been pruned and handled as on Mr. Leeming's that had been untouched for several years, and this is a fact that must be borne in mind.

Deep cultivation, fairly liberal manuring with earth mulching (if nothing else is available) in the shape of light diggings are absolutely indispensable to the success of the system, and, if possible, small doses of nitrate of potash in March or April; and the growing of leguminous plants as green manure should also be tried.

Mr. Leeming took Dr. Watts, the Reporter on Economic Products for the Government of India, over Scotforth when he visited the Shevaroys, and had the satisfaction of being told by that great authority on agriculture that *scientifically* his system of cultivation is the correct one. That it is a success from a commercial point of view the figures given above amply prove.

He has done the pioneering ably and well, and it is a satisfaction to his friends that, unlike some pioneers, he is reaping his reward.

From the Shevaroys I went with Mr. Leeming to Coimbatore to see the works of the United Coffee Growers' Company, of which he is manager. There he showed me the whole process of roasting, grinding, and tinning coffee, and during the process the product is not once touched by hand. The machinery is of the most up-to-date kind obtainable, the roaster being a German invention which roasts beans of all shapes and sizes evenly and thoroughly, and its being possible to do this now accounts in a great measure for the falling off in the price of "peaberry."

The tin for the cans is imported in sheets, and by means of three separate machines is manufactured into cans of various sizes in a very short time.

Considering that with the exception of Mr. Leeming and his assistant the whole process of manufacture is carried out by local native labour that had to be trained after the works were built and the machinery set up—*i.e.*, within the last few months—the smoothness and celerity with which the manufacture is carried out speaks volumes for the management, and augurs well for the future of the company.

What was perhaps of most interest to me from a planter's point of view was Mr. Leeming's method of testing the samples of the various coffees and learning their values from a roaster's point of view before buying on the open market. He spent the greater part of one morning showing me how he performed these tests. Four cylinders heated by gas and driven by a little hot-air engine can each roast ¼ lb. of raw coffee. Having selected samples of cherry and parchment coffee and laid them out on his table, he carefully roasted a small quantity of each, and we then compared the roasted beans, and I was shown how the finer samples differed from the others, the low-grade cherry containing a considerable proportion of pale-looking beans—"pales"—that are useless and almost tasteless, while those of a parchment sample were "shelly" and, containing more woody fibre, had less "body" than the finer grades. He then weighed out equal quantities of the roasted beans, and having ground them in a hand-mill put them into cups each of which were exactly of the same capacity. He then filled them with boiling water, stirred the contents, and allowed them to stand for a few minutes, then skimming off the froth the liquid was found perfectly clear. The tasting process consists of using a clean spoon each time and taking a sip of the liquid, drawing it well over the palate and spitting it out, each sample being tried over and over again. Even to an outsider like myself the variations between some of the samples was very marked, the most distinctive one being in the flavour of a high-grown Nilgri coffee, which Mr. Leeming informed me was very valuable for blending purposes. He says good Mysores contain these properties, which accounts for the high price they receive on the home markets. When the low-grade sample was tried, the liquor was distinctly inferior and lacking in "body," and one could easily understand how unprofitable such coffees must be where the proportion of "pales" is large. However, with an added quantity of Liberian to give it "body," he hopes later on to produce a cheap coffee that will suit the pockets of the poorer classes, and thus secure the great market that lies at our doors, and I hope the District Association will see their way to assist the United Coffee Growers' Company to develop this market, and enable us to dispose of our low-grade coffees in this country.

One experiment Mr. Leeming has carried out here has solved what has been a vexed question to many planters, viz.:—Whether or not it is necessary to pick absolutely ripe cherry. He finds that the bean is fully developed when the cherry turns colour, and should be picked as soon as it can be pulped, as the "foxiness," so often complained of, is frequently the colour of the cherry going through the parchment skin.

The other advantages of being able to pick three-parts ripe cherry are obvious to all planters. He also advises us not to pick any ripe fruit "billi hunnoo" as it is from this that so many "pales" come, and what so destroys the value in the dealer's eyes of otherwise good parchment coffee. Another piece of information he gave me, and which he illustrated from samples, was, that garbling ought to be more carefully done now than ever before, and that all beans, however slightly discoloured or irregular in shape, ought to be put into triage. He learned this from the dealers when going round the London market with them. This past season he got his curers to treat his Scotforth coffee in this way, and although it suffered equally with other Shevaroy estates from drought, the fact remains that it topped the prices by several shillings per cent. He says that it is possible his system way have had not a little to do with this improvement, the trees being stronger and better able to resist leaf disease, but the more careful curing no doubt assisted.

Another writer on the same subject says: I visited Scotforth, Shevaroy Hills, on the 12th June, 1901, and was conducted by Mr. Leeming over the whole estate. I am favourably impressed with the system in force there, of cutting out coffee trees by alternate lines wholesale, or alternate trees in one line diagonally, preferably the latter in the earlier stages, the trees thus left in freedom unhandled and unpruned showing up to immense advantage by their unchecked height and vigorous lateral growth. They are left entirely to themselves to carry all the wood they can make, and are never touched with a knife, the old wood after crop dying and breaking back to new wood, of which there is an unfailing active supply. Anyone verging on this system by allowing trees their heads, by allowing suckers and yet wanting in courage to "cut out" is only courting disappointment or disaster. Without freedom the trees running up in close order will only cause the lower frame of the tree to perish. It is beginning at the wrong end altogether; and no measure of success can possibly be attained unless one is prepared to face cutting out, and make room for lateral growth of the tree, which will quickly spread and shoot upwards at the same time. In Scotforth one stands in avenues of magnificent trees, with any amount of room to walk about in comfortably, no roads being needed, no difference being made as regards shade, beyond keeping it clear of the coffee. Cultivation consists of merely the application of artificials in large shallow pits, deep trenching and growing of leguminous plants and beans to the prospective expulsion of weeds, and digging in with quintaines. Although my visit is ill-timed as regards best appearance, subsequent to heavy cropping and dry weather and prior to application of manures, the trees are particularly healthy, of good colour, and evidencing truly striking vigour as compared with the old established dwarf cultivation. As regards crop, results are highly satisfactory. A field condemned by a V. A. and recommended to be abandoned is now in great heart, cropping freely. Another of 27,000 trees, disappointing in 1898, cut down to 13,500, gave 1,500 bushels cherry in 1899-00 = about 11 cwt. per 1,000 trees; cut down to 13,500, gave 1,700 bushels cherry in 1900-01 = about $12\frac{1}{2}$ cwt. per 1,000 trees; cut down to 10,000, promises well again this year. Another field of 6,500 cut down to 3,300 in 1899, gave 750 bushels of cherry last crop. I saw lines of twenty-four trees only in this field that it took three days for a coolie to get over. Mr. Leeming estimated that the field held 1,000 bushels cherry, but picking only 'ripe,' some cherry dried up and was lost by the time the pickers could come round; quality is in no wise affected, parch-

Note.—We should like to know how the coffee is picked from trees 10 to 12 feet in height.—Ed. *Q.A.J.*

ment running quite satisfactory, and the percentage of black being limited to a very small proportion. The estate is 80 acres mature coffee, now all brought under the new system, and 80 acres of young clearings planted 650 to the acre; the crop last year was 60 tons, and the promise for next year is very fair. Denuded of half of its trees, it has never given such a big crop or been worked so cheaply. On another estate worked by Mr. Leeming results are even more satisfactory. The owner left the Shevaroys in disgust, and was manager of an estate near mine for some time, as he was unable to make the place pay him; under the new system, he is at home in receipt of an income, although prices have fallen 60 per cent.! The main factor in favour of Mr. Leeming's system is the very appreciable reduction in working expenses, yielding a maximum crop on a minimum outlay, and although it does not appear to find favour with every planter on the Shevaroys, I am quite converted to it, *provided* conditions are in harmony with Scotforth, namely—elevation 3,000 to 4,000 feet, with sheltered aspect and fertile soil, especially in the face of present depression and possible low prices for many years to come, it being apparently the only method by which coffee cultivation may be made remunerative at £40 per ton.

I wish to record further, partly in response to inquiries, that the elevation of Scotforth averages 3,500 feet and the rainfall in normal seasons is 65 inches. Crop last season was practically ½-ton per acre, 80 acres. Old coffee all brought under the new system yielded 40 tons; 18 acres young coffee planted 8 feet x 8 feet gave 10 tons. Total crop just picked = 50 tons, which on half the number of trees is almost double of any previous one."

Another Shevaroy planter (Mr. Gompertz) said that, as regarded cutting down the whole estate, he did not think Mr. Leeming would like to advise everybody to do that. It was no use cutting down the trees on poor soil, where they are planted 6 feet apart and do not touch each other. "But," he said, "in your best fields it is worth while to harden your hearts and cut down every other tree. I did that, and found that the trees to be cut out were always the best; but, if you want a good crop, you must harden your hearts, and cut down every other tree."

CINNAMON AND COCOANUTS ON THE DAINTREE.

As cinnamon (*Cinnamomum verum*) is a native of many warm countries, notably of Ceylon, Java, Sumatra, Malabar, parts of India, and has been introduced and successfully cultivated in other countries where it is not indigenous, it would naturally be supposed that in the tropical parts of Queensland some attempt would have been made to form small plantations. Many years ago hundreds of cinnamon plants were distributed to gardens along the coast, but one never sees or even hears of a cinnamon tree.

On dry, sandy soil, success is almost assured in the cultivation of this tree, which will yield its first product in five years. The trees should never be planted in wet or heavy soils, for they will be much longer in maturing, and the quality of the bark is never so good.

Worn-out coffee and sugar lands, if dry and sandy, would be admirably adapted for cinnamon growing. North of Mackay there is no lack of such suitable land, yet we have only heard of its attempted cultivation on the Daintree

Like most other, if not all, industrial products of the soil, however, cinnamon has its deadly enemy in the shape of a black beetle, described by Mr. T. T. Pentzcke as being of the size and shape of a duck shot cut in two. There is a light bronze hue mixed with the black colour. It only attacks the plants when the latter are quite young and tender, and before they have either taste or smell. Our informant planted out twenty young cinnamon plants and they were all destroyed during this season. This confirms the late Mr. Cowley's recommendation, which was to plant them under glass and get them beyond the tender and dangerous stage. It is possible that when the scrub is all cleared there will be no danger from this pest, because they are persistent scrub dwellers, frequenting from preference the so-called hickory which is really a Flindersia, of which there are several varieties in the Daintree scrubs, some of gigantic dimensions.

One of the great troubles of cocoanut growers on the river has hitherto been the destruction caused by the natives, who cut steps in the trees to reach the nuts. The tree never bears after this mutilation. They have, however, had it explained to them that they are "killing the goose that lays the egg" by this proceeding, and that furthermore it is very displeasing to the white residents. They have consequently promised not to do this for the future, and will not allow their picaninnies to do it, so that there is now very little danger of loss by cocoanut planters.

When planting the nuts, all the protection they get is three stakes driven into the ground round the spot, to keep off horses. In cases where there is danger of fire, sweet potato vines are planted about the young trees, which are thus quite protected from that element. Once the trees have made wood, cattle, and even goats, may be allowed amongst them, as they never touch them, and trees under which cattle camp thrive better than others.

In planting cocoanuts, Mr. Pentzcke says, "I shall in future always plant them in an upright position with the eyes uppermost. The reason is that when a tree is sheltered, the nuts will remain in their place till the germ pushes the nut off (unless it is forced off from some extraneous cause), and if, in falling, it strikes the sand or soft earth it will stand upright and grow into a straight, upright tree. The nuts only turn on their side when they fall on hard ground. When the nut stands in the natural upright position, the gases or volatile oils float on the top of the contained liquid near the embryo, which liquid and oils serve the purpose of lubricating the kernel near the seed, and supply the germ with its first food and continue to do so till the young plant makes its appearance on top. Crooked growing plants should be removed, as they indicate the first stage in degeneration."

THE LARGEST SUGAR PLANT IN THE WORLD.

We have some of the best and most up-to-date sugar-mills in Queensland, capable of turning out from 6,000 to 7,000 tons of sugar in the season, as witness the Mulgrave and Mosman mills, but Cuba is to possess such a plant as has hitherto not been seen in any sugar-growing country in the world. This plant is thus described by the *New Orleans Picayune*:—

"Mr. R. B. Hawley, of Louisiana, an ex-Congressman, and sugar-planter in the Southern States, has become interested in a large enterprise in Cuba. A private syndicate, of which he is the head, has secured 64,000 acres of the finest land in Cuba, which they intend to plant in sugar-canes for export to the States. This has caused something of a sensation in planting circles, and the opinion has been expressed that the competition which will result will seriously affect the Louisiana sugar industry. According to the *Picayune*, Mr. Hawley has shipped to Cuba the largest sugar manufacturing plant that has been made in America, or, for that part, in the world. The name of the company is the Chapparra Sugar Company, its domicile New York, and the plantation is situated at Puerto Padre, Cuba, extending over many miles of territory, and embracing 100 square miles of the finest sugar lands on the island. The crushing plant was built by the Whitney Iron Works, New Orleans, and consists of six Corliss engines of 150, 250, and 30 horse-power, two of each size. Two sets of nine-roller mills, with Marshall crushers in each, the rollers 7 feet by 34 inches, fitted with hollow steel shafts, built at Bethlehem, Pa. This is only the crushing plant, and that alone was built here at a cost of something more than 150,000 dollars. The boilers were produced in New York. They are of 6,000 horse-power, of the Babcock and Wilcox type, forty-tube boilers. The refinery plant was bought in Philadelphia, with the exception of one machine, which was proprietary, and had to be produced in Europe. The refinery plant consists of three 13-feet vacuum pans, two sets of triple effects, of the Lilly type, twenty-four crystallizers in motion, and twenty-four water-driven centrifugals. The capacity of the mills and refinery is 3,000 tons per day, and it is proposed to increase the plant at the earliest moment, as it will not be sufficient for the needs of the company another year. The company has several locomotives, and a complete transportation plant on the island already, which will be extended as the land is gradually brought into cultivation. The Deming system of clarification is to be used in the refinery, and the inventor of the system is now building the plant for the company at the Payne-Joubert works in New Orleans. This is the largest single consignment of machinery that has ever gone out of the city, and it is to be followed by more from the same source for the same company. Altogether it will constitute the largest sugar-cane crushing plant on a single plantation in the world."

THE COTTON INDUSTRY.

By DANIEL JONES.

The subject of increasing the agronomic possibilities of the State is one that our Agricultural Department sets in the forefront of its many activities. At the present time, when our territory, from one end of its vast confines to the other, is in the throes of one of the most disastrous droughts yet experienced, the matter of adding to our rural industries any crop that holds out promise of success well merits attention. Perhaps one lesson outlined by our colonial experience, and emphasised more than another, is the need to diversify our crops. Scientific agriculture ever makes this a prominent factor of its teaching. The promulgation of ideas involving rotation of crops in the interests of the farmer, and the advantage accruing to the soil thereby, is one of the chief points implied in following out the system.

In Queensland as yet our selection of crops for rotation has been principally confined to hay, maize, tubers, and sugar-cane. These, no doubt, from the chemist's point of view, are in themselves of value by way of change, and restful to some extent in the demand they make on soil constituents that have previously had too great a drain made upon them by reason of growing the same or allied crops on the land for successive years. It is sufficient for my purpose, while refraining from touching on the view the agricultural chemist may take of the subject, to point out that in general habit cotton is so diverse in its character from other crops as to leave no manner of doubt in the mind of the practical farmer that the merits of the cotton shrub for rotation are undeniable.

I need scarcely remind many of our farmers that for a period of about fifteen years, in the sixties and seventies, so far as the Moreton districts were concerned, cotton was king. Why it was deposed from its regal altitude and suffered annihilation for a period is a matter of history, and is accounted for by many a good and sufficient reason needless to recount here. Nevertheless, confidence is still retained in the value of this crop by many of our farmers. This is evidenced by the many inquiries made from time to time, and by questions asked as to how to procure seed, and requests for an opinion of the quality of cotton submitted. These inquiries cover a range of territory west of Roma and north of Cairns, from which places excellent samples of fibre have been received, grown even during so dry a season as we are now experiencing.

In view of our more recent experience in the matter of cotton-growing in the West Moreton districts, and, from the cultural point of view, the unqualified success attending the vocation, I think this aspect of the industry hardly needs any comment from me. As a general thing the crop paid fully as well as, and in most instances far better than, the crops of maize or hay generally produced. The question of labour for picking, which is so formidable a one in most rural industries, never, in our experience, became a critical matter. I do not deny that labour difficulties may arise under certain conditions, but those conditions can be avoided by planters cultivating small areas. Cotton-growing is essentially the small farmer's crop. The intelligent planter will not cultivate more acres than he, with the assistance of his family or with the help of his neighbours, can cope with. To grow cotton on the huge plantation system, depending on hired labour exclusively, is not so likely to succeed for obvious reasons.

Farmers located near populous towns will have the advantage at the picking season of the services of the youths anxious for light employment. Cotton-picking for a few months in the year would be an ideal country holiday to hundreds of this class. The hop-picking season in Tasmania and the berry season in Victoria are responsible for a large exodus of boys and girls from the cities, and the change to a healthy rural vocation, with its sunshine and free life, is both a boon and a source of financial gain to them Cotton-picking, of all farm employments, suits the town children the best. It requires no skill, is clean, light work, demanding only attention in keeping dirt and leaves from the cotton-pod and a little deftness of finger. A good cotton-picker is sure of picking his 80 to 100 lb. a day, if the fibre is well out in pod.

Of course, farmers living remote from railways and centres of population will not easily get this class of surplus labour, and must trust to their own resources in dealing with the crop.

Those living in proximity to large towns can rely on getting labour. So far as this phase of operations connected with its cultivation is concerned, the question need not deter anyone from engaging in the business of cotton-growing. It is true that a demand may be made upon school children at critical periods to assist in gathering a fast ripening crop, but the demand upon the scholars' time need not be such as to materially affect the course of their education. The prospects of this crop coming to the front again in Queensland are very great. It is a crop that adapts itself to almost any soil, save the very fertile. There the shrub outgrows itself to the detriment of the yield of fibre.

It requires no special implements for tillage purposes.

It stands drought far better than any crop we now grow.

It is a crop that is moderately cheap to carry to market. In proportion to its weight it realises a higher value than most other crops.

It is not so exhausting to the soil by reason of it assimilating elements of plant food rejected by other crops usually grown.

The value of the by-products contained in the seed, thanks to chemical science and invention, now ranks high in the realm of agricultural products. Oil, soap, paper, lard and butter substitutes, cattle food of highest value, fertilisers, are all obtained from this source.

It has lately been stated in some American papers that, so useful has cotton seed become as an article of commerce, attention might well be given, not so much to the production of lint as to the yield of seed. I well remember hundreds of tons of seed being dumped on the banks of the Bremer, to ultimately rot or be washed away in the first flood.

The farmer who starts cotton-growing will find the demand for barn space far less than that required for maize, hay, &c. If his cotton has been gathered in fine weather, a few hours' drying in the sun on his drying tables will fit it to stow away in his barn or bale, and allow him to send it at once to the ginning establishment, there to receive the value of his product.

These facts all illustrate the adaptability of the crop to our State farming conditions. I am well aware that, owing to the cessation of cotton-growing in past years, many persons are prejudiced against its revival. However, it needs but an honest inquiry into the causes of the cessation to clearly show that when the farmers abandoned the growth of this plant it was owing to causes not so much connected with the cultivation as with the commercial side of the question. Given the ordinary commercial conditions that obtain between farmer and merchant, the position from the growers' standpoint is at once seen to be favourable.

What we now require to re-establish this industry is the presence in our midst of cotton-brokers, in the same sense as we now have wool and wheat buyers.

It is beyond dispute that the quality of cotton we grow here is equal to any grown elsewhere. Compare our upland or short-staple variety with that so largely grown in India, and our article stands in every respect far in advance of the Indian fibre.

In comparison with the best upland American varieties, it well holds its own.

The Sea Island cotton, judging by the specimens in evidence at the Bowen Park grounds, stands prominent for length of staple, colour, and strength of fibre.

The Egyptian varieties, so far, are not enough advanced to judge of their merits.

On the whole, there is every reason to believe that in some regions of our State these different varieties will soon assert their value if given ordinarily fair treatment. In our Southern districts, no doubt, the upland cotton will, as heretofore, prove itself better adapted to our climatic conditions (although its staple is shorter) than the varieties already named, and consequently a lower value is attached to the fibre. Still, the more abundant yield compensates for the deficiency in length of staple. Regarding this plot of cotton grown at the Acclimatisation grounds this season, the most remarkable feature of the crop is the drought-resisting qualities in evidence. While everything in the gardens has been suffering from the absence of rain, this cotton plot, consisting of various upland Sea Island and Egyptian sorts, has endured the trying season wonderfully well. Naturally, the growth has not been so robust and the yield will not be so great as in a propitious season, yet the general result is one highly satisfactory, more particularly in demonstrating that the crop can stand drought when other crops prove failures.

The outlook as regards demand for raw cotton is at the present time a most favourable one for Queenslanders. The Eastern question, in other than its political aspect, is one that must in the course of time materially affect Australian industries. Cotton has now for some years past maintained firm prices, and in America the rise in value has been remarkable in comparison with ruling prices some years since. The following quotation from an American paper gives the then local price. This, compared with the price paid to farmers for cotton in the seed (13s. 6d. per cwt. by the Ipswich Cotton Mill), shows a much better prospect for the grower:—"Cotton continues to come in, and those receiving same are kept busy. Saturday the rush was almost equal to that of a week previous. Giles and Co. bought off of wagons something over 12,000 lb., to say nothing of what he bought at the different stations and which came to town in cars. Geo. K. Robinson's purchases footed up 70,000 lb., of which two cars came from Oxford and one from Belleview, and went direct to Gainesville for ginning. Mr. Fausett also had a nice trade. The price, including Saturday, was 5 cents (2½d.) a lb. It was since dropped to 4 3-4 cents (2¼d.), while lint is only quoted at 18 cents (9d.) a lb."—*Fla. Baptist Witness.* Thus the hardening of American prices naturally affects the world's markets. The unprecedented manufacturing activity now characteristic of American home industries is responsible for the consumption of a great portion of the cotton crop grown in the States. This leaves the question of supply of raw cotton, necessary to keep the huge mills of Japan, China, and India supplied, a matter to be shared between this country, Egypt, and India.

The peculiar nature of Indian cotton is the shortness of the staple, which for that reason will not enable it to compete with ours in quality. Our experience of using Indian cotton at the Ipswich mills fully bears out this opinion. For the finer class of goods, our cotton will always have the preference of the manufacturer. The Egyptian cotton also will not, in my opinion, come in as a factor in competition. The staple of the Egyptian variety, being longer than that of our upland varieties, commands too high a price to be profitably used for the manufacture of the ordinary class of cotton fabrics. This staple is more in demand for yarns and thread, &c.—manufactures mostly carried on in the European countries, in England and America. Taking these facts into consideration, we have a prospect of an almost unlimited market for raw cotton in Japan and China. Japan now imports about £500,000 worth of raw cotton annually to supply her cotton-mills. As cotton-spinning in that country is an ever-expanding industry, there lies at our door an outlet for our product that must, if encouraged, prove very beneficial to our State. I may be pardoned if I point out that what I here advance is not in any sense suppositional. Statistics prove my contentions as to demand, whilst as to the commercial aspect I need only quote the result of a shipment of cotton sent to Japan by the Ipswich Company, which realised satisfactory prices, and was highly approved of by the spinners.

All that is necessary to re-establish cotton-growing in the Southern districts of Queensland is the assurance that the cotton will be bought when produced. Were any buyers to offer the farmers the ruling commercial prices of from 4 to 5 cents per lb. in the seed, many farmers would engage in the culture with profit to themselves.

The cotton-buyer would have a good margin of profit, not only from the values received in the Eastern markets, but from the by-products obtained from the expression of the cotton seed. Without looking afield and judging by our past knowledge, there is a fair market in Australia for raw cotton. Among our customers were many southern merchants who contracted for some hundreds of bales; perhaps this demand may have increased by now. However, I merely mention this to show that any enterprising merchant who would set up the necessary ginning plant need not fear any possibility of the cotton being left on his hands. The question may be asked: Why have I not mentioned the English and Continental markets in my suggestions? My reason, based upon actual experience, is that for the ordinary quality of upland cotton better prices can be obtained in Japan than in Liverpool. In Liverpool we are in competition with the low-freighted cotton from the States; while in Japan we are still in competition with the States, although on better terms as to freight, which, in this instance, we proved to our advantage. Should we ever succeed in developing a trade in the export of the Sea Island and Egyptian varieties of cotton, then we must look further afield for our markets. These varieties of cotton thus far have, unfortunately, not come up to expectation when grown in the Southern part of this State. The fibre is all that is expected, but the yield and somewhat greater cost of packing have, so far, caused a preference for the short-staple varieties. There is no reason to doubt that ultimately our experience may prove as satisfactory as the Americans have found it; for while, until recent years, the cultivation of the Egyptian cotton was looked upon as unsatisfactory, they have during the last few years succeeded in getting a variety of Egyptian cotton to grow which, according to their statements, is the means of saving one million sterling which otherwise would have left the country to buy the longer staple Egyptian variety. Perhaps our Acclimatisation Society may prove this for Queensland. Judging from the habit and promise of the variety at Bowen Park, the society have every reason to hope that they have a long-staple cotton that may be the article long wished for.

One feature of the Bowen Park experiments deserves prominent attention, and that is the success obtained in combating the worst of pests affecting the cotton shrub—viz., the boll worm. This foe to the plant in years past was the cause of considerable loss to our growers. Attacking the pods, as it does at all stages of the growth, it destroys practically all that it succeeds in boring. Hundreds of thousands of pounds annually in the past have been the loss sustained in the crop in America and elsewhere by this insidious pest, while our own losses in our early cotton-growing days in some bad seasons aggregated half the crop. Now, however, the production of Paris green so cheaply has put in the hands of the planter an effective and cheap means of destroying this enemy. The experiment conducted in the cotton plot at Bowen Park has substantially proved that the boll worm need no longer be feared as formerly. An application of Paris green mixed with fine wood ashes or flour is used. In Bowen Park an experiment recently tried, and proved satisfactory, was a simple application of Paris green and lime dusted over the plants. This process can be performed cheaply by mechanical means, or, as is often done in the States, by filling a couple of bags made of some coarse material with the arsenite (1 part to 50 and 100 is recommended) mixed with flour or wood ashes. Tie each bag on the end of a short pole. This, with a boy straddled on a mule or horse, dusts two rows at once by the lad riding between the rows. By this means a considerable area can be dealt with in a day Another form of applying the poison is to dissolve 1 lb. Paris green to 40 gallons water. This sprayed over the plants is also effective. In combination with dairying, this industry should succeed. It is not advisable to pick cotton in the early morning when dews are settled on the shrubs. Now, this being usually the morning milking period, the family energy is bent in that direction, and subsequently, as the day advances, the sun's action dries the cotton, and the process of gathering is carried on under pleasanter conditions. The picking being usually over by May or June, the fields may then be used as a grazing area for the farmer's stock. This will usually be regarded as a good adjunct to his winter provision for the stock. In the old cotton-growing days our horses and cattle, when turned into the cotton-fields foraging among and on the bushes, got into the pink of condition, and what would have otherwise been a period of short-commons to them resolved itself into one of plenty. The farmer has thus until October the run of the fields without detriment to the crop, even if he determines to prune rather than plough and re-seed the area.

American growers attach much value to this feature of grazing, for not only does it serve the purpose of helping the milk yield of the cows, but the pasturing of the area diminishes to some extent the insect pests that find breeding-room in the immature pods and foliage that remain on the shrubs, which are all eagerly devoured by the foraging animals privileged to revel on the feed.

I will conclude my paper by a few brief references to the important value of cotton seed as now recognised in the world's industries, as this has a prospective value to us in Queensland especially. The *Florida Agriculturist* in a recent issue says:—

Cotton seed is more rich in that which makes food than wheat. People are getting informed upon the subject, and are giving cotton seed its position with other grain. Here is a comparison and values of cotton and wheat. It is an instructive table:—

Wheat, protein, 11·87; carbohydrates, 73·69; fat, 2·09; value, 1·00 dollar. Cotton seed, protein, 17·57; carbohydrates, 10·82; fat, 20·19; value, 1·39 dollar.

The above table gives the number of pounds of food components and the analytical value of 100 lb. each of wheat and cotton seed, according to the methods in use by the agricultural experiment station. It shows the surprising fact that, pound for pound, cotton seed has a greater intrinsic value than wheat. Neither is the bulk of the cotton-seed crop by any means significant as compared with wheat. There is raised in the southern States alone five-sevenths as many bushels of cotton seed as there are raised bushels of wheat in the whole of the United States. Last year there was a large acreage of cotton and wheat. Men who thought they were wise shook their respective heads and thought they looked wise and predicted dire things to happen because cotton and wheat in all things did not agree. Here are the figures representing the acreage and yield of each:—

Wheat, acres planted, 39,465,000; bushels, 539,000,000; yield per acre, 13·43. Cotton seed, acres planted, 24,319,500; bushels, 363,261,000; yield per acre, 14·9 bushels.

From those figures one would think that in the commercial world cotton seed had not received sufficient attention.

As a food cotton seed is of more value than wheat, and is to be a greater factor in commerce than wheat. In fact, cotton is one of the most important factors in business both north and south. The growth of the cotton-mill industry within the United States within the last ten years has been large. Here are the figures taken from the *Textile World*, of Boston:—

Value of the Crop.

When we consider the prices paid to the farmers for seed last season, the value of the meal and hulls converted into first-class beef, the oil shipped to all parts of the world, and the fertilisers manufactured from the meal, the figures run up into the hundreds of millions of dollars. Every dollar so converted is so much added each year to the wealth of the South, both from an agricultural and industrial standpoint. The meal cake, aside from its use as a cheap source for deriving ammonia to make up complete fertilisers, is being used by the hundreds of thousands of tons in fattening beef cattle both in this country and in Europe. Meal cake has become a strong and active competitor in England and Germany against linseed meal for cattle feeding in those countries, and each year many shiploads are sent across the Atlantic to cattle-raisers in the old country. The oil is being largely used as an article for food, taking the place of butter, lard, and olive oil. It is clean, wholesome, and nutritious. Yet the possibilities of these by-products of our cotton fields are yet in their infancy, and expert oilmen tell me that the time is not far distant when a ton of cotton seed will sell for more money to the farmer than a 500-lb. bale of middling cotton. The time will come when the farmer, by studying the true value of his seed, will sell only the oil to the mills, and by intelligently utilising the meal and hulls on his farm, double and treble the present prices now being received. Our people are still in too big a hurry to sell their seed for what they are offered in the open markets, without a knowledge of its true value, merely to get a little ready cash to pay for ginning and picking out the next bale of cotton.

Healthfulness of Cotton-seed Oil.

The State Analyst of New York, having been requested by the secretary of the State Board of Health to give his opinion with regard to the wholesomeness of cotton-seed oil, and of lard and lard compounds into which this oil enters as a component part, replied: "I am clearly of the opinion that cotton-seed oil, whether used singly or comingled with other oils or fats, is a perfectly wholesome and nutritious food, and is as easily digested or assimilated as any of the commonly employed fats. In support of this view, the opinion of numberless writers upon the subject, and of experts in chemistry and physiology, might be adduced. Throughout the cotton-growing States it has been for a long time very largely used, and the medical faculty of Arkansas say that it is preferred to the other fats in many respects, agreeing with the most delicate stomachs, whether used in baking or frying; and that not one instance has ever been given of the health being in any way impaired by the use, however free, of cotton-seed oil in food. They say that thousands of hands employed in the cotton oilmills are in the habit of making their dinners on the crude oil by dipping their bread into it, and some of them actually drink it, and yet from this free use of it nothing has ever resulted but the best of health."

While the unfortunate decision of the Federal Parliament to place calicoes and similar goods in the free list, or subject to a minor duty, has given a disastrous blow to the prospects of reviving the manufacture of cotton goods in this State, and thereby deprives the whole Commonwealth of so valuable an industry as this form of textile manufacture, we must not lose sight of the fact that in our hands we have the possibilities of making a splendid market in the Orient for the raw cotton. The value of the by-products, as instanced from American sources, will also be to us a factor of profit not to be ignored. In once again presenting this, to me, familiar subject to the notice of the readers of the *Journal*, I trust my presentment of these facts, founded as they are more on experience than opinion, will prove of service in attracting attention to an industry that must in the natural order of things at no remote date once more prove itself to be one of the soundest and most profitable of our agricultural pursuits. It may not be generally known that in the year 1871 this State exported to England 2,602,100 lb. of ginned cotton, realising £79,317, the ruling price then being 7½d. per lb. Taking into account the value of by-products then wasted, the profits should figure out very nearly the same. In that year the area under crop in cotton is given as 12,962 acres, years after the bonus had expired.

NOTES ON THE QUEENSLAND RICE INDUSTRY.

By FRED. WM. PEEK, Loganholme.

Since my last communication on this valuable industry, the notes of which appeared in the December number of the *Journal*, we have experienced a very trying time in the rice fields, and there is no gainsaying the fact that owing to the protracted drought our rice-growers have had one of the worst seasons for the growth of this cereal ever experienced. In the Logan district especially the crops have suffered very severely, particularly the experimental patches of new varieties which had been procured in the hope of obtaining a rice more suitable to our general conditions, both as regards climate and our methods of cultivation, and it is fortunate that a small parcel of each variety obtained was held over from immediate planting in case of failure for further testing under different conditions. I am also pleased to state that in response to my inquiries and request I have received further samples of rice seed, which have come safely to hand, and which I shall be happy to distribute at the proper time to those willing to undertake the careful cultivation necessary to obtain accurate results from the experiment.

So far, one thing has been proved—that is, that several of the so-called swamp varieties have done well, even with a small amount of moisture and without the inundation that was deemed necessary for such varieties. I have also received most valuable information from the Director of Lands, Records, and Agriculture, of Assam, C. Sarma, Esq., and from the Director of Lands and Agriculture, Burmah, A. Gaitsdell, Esq., as to the varieties of seed forwarded, which I here give for general information, together with a list of the new varieties.

NAME OF RICE SEED FROM KAMRUP, ASSAM: FOUR VARIETIES RECEIVED.

1. Rangjuli Ahu.
2. Tengrai Ahu.

Particulars for Both.

"Grown on dry land and requiring no inundation. Usually sown broadcast; period of growth, four months."

NAMES OF RICE.

3. Tulasi Ioha.
4. Bar (sali) or Bardhan.

Particulars for Both.

"Raised from seedlings; requiring water at its roots from time of transplanting to time of flowering; period of growth, about six months."

From Rangoon, Burmah, the following information has been received:—"I have the honour to forward you eleven packets of paddy seed from the Hanthawaddy, Prome, and Mandalay districts."

Particulars of Rice Seed.

The seed from Hanthawaddy and Prome, where the rainfall averages 100 inches and 50 inches respectively, is not irrigated, as a sufficient water supply is obtained from the rainfall. The seed is sown in July in a nursery, which in this country (Burmah) is neither manured nor irrigated, and the paddy (rice plants) is transplanted in August, when the plants are $1\frac{1}{2}$ to 2 feet high. The plants are planted out about 10 inches to 1 foot apart in a clay soil. The crop ripens in December.

The seed marked "Ngaseingyi," and also the seed marked "Toungdeikpan," is from Mandalay, where the rainfall is about 30 inches; this is sown in irrigated nurseries, manured every two or three years. About the middle or third week of August, it is transplanted, when the plants are about 18 inches high, into a clay soil. A distance of 9 inches is preserved between the plants, and the crop is reaped in the middle of December.

The seed marked "Lè" comes from the Maymyo district (about 4,000 feet above sea-level); this is sown in May or June, transplanted in July, when the plants are 1 foot high, and the plants are planted 6 inches apart. The crop is irrigated. The rainfall is about 60 inches.

The seed marked "Ta," which comes from the same neighbourhood as the variety marked "Lè," is sown in cleared spaces of jungle (the scrub lands of Queensland being somewhat similar), the vegetation of which is burnt off in April and planted in May or June, and reaped in November. It is not irrigated. It is generally planted on hill slopes. The cultivation is of a temporary nature, the seed being of an inferior kind.

The system of irrigation is by dividing the patches, or areas, of cultivation into sections of about 30 feet in width, with ridged sides banked up to keep the water in.

A sample of seed received from A. Sanzier, Esq., British Consul, Tamatave, Madagascar, of the upland variety, and good large grain, was accompanied with a description of the primitive methods employed by the natives in cultivating this cereal in that dependency, as follows:—Mr. Sanzier says: "There are two kinds of rice cultivated here—the upland and swamp varieties. The methods employed and the implements used are of the most primitive and simple kind. The rice is generally planted about the end of October or in the first days of November, when the wet season sets in.

"The natives first clear the ground of all weeds and bushes, which soon dry up in the scorching sun, and are burnt off. They then, with a long pole of hardwood, sharpened at one end, make holes in the ground, about 6 inches apart, in which two or three grains of rice are dropped, which, as they move on, are covered by their feet with a slight quantity of earth.

Another method is to drive a herd of oxen into the drained swamp land they intend to cultivate, leaving them there until they have trampled down the weeds, and have turned over the soft mud or ooze.

The marsh (or swamp) is then quickly planted broadcast with the rice seeds, which, with the first rains, begin to shoot up. This ground is always kept moist, either by the rain or by small streams of water, which the natives direct into it. The crop (upland) ripens in from four to five months, being all harvested by the end of May.

You will thus see that the methods employed are very rudimentary, but still excellent results are obtained as regards the crop. The sample of seed to hand is similar to Japan seed in shape of grain and colour.

I have also received a communication per favour of His Excellency the Governor of Mauritius, promising to forward samples of seed rice from there as soon as available, together with the information as to the methods adopted in Mauritius for the growth and cultivation.

I feel sure that amongst the varieties that are now to hand and awaiting the next planting season to further experiment with some will be found suitable for the various districts and various climatic conditions of Queensland.

TAPIOCA OR CASSAVA.

By the EDITOR.

There are two species of cassava, the sweet and the bitter. The plant much resembles the castor-oil plant, so much so, indeed, that a bed of it was lately shown to the writer, when at Cairns, as a bed of castor-oil plants. The farina for which it is grown is obtained from the roots, which have the appearance of the tubers of the Bermuda arrowroot plant. They attain, however, a much larger size, being, under exceptionally favourable circumstances, from 3 to 4 feet long, and weighing as much as 30 lb. each.

The tuber of the sweet cassava (*Manihot Aipi*) is perfectly innocuous and has somewhat the flavour of a raw sweet potato. It may be boiled or baked, and eaten as a vegetable without any previous preparation.

The tubers of the bitter variety (*Jatropha manihot*), on the other hand, are exceedingly poisonous, but the poison is entirely confined to the juice. When that is expressed, the pulp is rendered harmless, and any trace left in the latter is easily driven out, as the poison in the juice is exceedingly volatile and soluble, and is dissipated by roasting the ground pulp. So volatile, indeed, is the poisonous principle that the tubers may be sliced, exposed to the sun, and fed to cattle with no ill effects.

The juice is sweet to the taste, and, strange as it may seem, may be boiled with meat and eaten without danger. In Brazil and in the West Indies, a kind of soup is made with it called "Cassareep." Cassareep is really, however, the extracted juice boiled into a concentrated state resembling molasses. It is the basis of the celebrated West Indian "Pepper pot."

CULTIVATION.

There is no more difficulty in cultivating cassava than in growing corn, and it is less troublesome than cane, coffee, or cotton. It is enormously productive, an acre of cassava being equal in produce to 6 acres of wheat.

The best land for its successful cultivation is a loose, dry, well-drained sandy loam of considerable depth. Heavy lands with a clay subsoil are to be avoided.

When the land has been properly prepared, make cuttings about 2 feet long of the stem of the plant if it be intended to plant them upright, but only 6 inches long if they are to be planted horizontally. In Queensland the writer has successfully grown cassava by the latter mode. In a few words, plant cassava as you would plant sugar-cane, but take the cuttings from the mature wood. They will begin to shoot in about a fortnight after the planting. Keep the ground well cultivated and clear of weeds until the plants are high enough to cover the ground. In eight months after planting the tubers will be ready to dig. Should the plants show a tendency to become too luxuriant, such tendency may be checked by disbudding. There is no need to dig the whole crop at once if it is not required for immediate use. The tubers may be left a whole year in the ground after they are ready for use, and will improve in that time rather than deteriorate.

The height to which the plant will grow depends naturally upon local conditions, but from 4 to 6 feet is the average height. It thrives best near the sea or inland under the influence of a sea breeze. As it is a very exhausting crop, it should not be planted more than two or three times in succession on the same land. The latter should then be put under some surface-rooting crop, and fresh land taken in for cassava.

Preparation of the Farina.

For a full description of the method of preparation of the farina, we are indebted to Mr. Lewis A. Bernays, who gives the process described in "Rhind's Vegetable Kingdom" in his work on cultural industries in Queensland.

There is a simple way of preparing it, which a West Indian manager of the writer's sugar plantation demonstrated to him. The cassava tubers were dug up and washed. They were then subjected to pressure by passing them through the rollers of a small experiment mill. Then the pulp was put into a large frying-pan and roasted very slowly, the drying flour being constantly stirred with a stick. Gradually the operator worked it into a flat, round cake, about a quarter of an inch thick, and when this cake was firm enough to be lifted, a most delicious bread was ready to be eaten.

The process in British Guiana, as described by Mr. Bernays, is as follows:—The root is rasped on large tin or wooden grates fixed on benches, behind which the women employed in making it stand in rows. A sufficient quantity having been rasped for one time—for any surplus would ferment and spoil—it is put into long circular baskets of plaited rushes, about 10 feet long and 9 inches in diameter called "mangueras." These are hung up with weights attached to the lower end, which draw the plaited work tight together, diminishing its capacity and squeezing out the juice. When all the fluid is extracted the mangueras are emptied of their contents on raw hides laid in the sun, where the coarse flour soon dries up. It is then baked on smooth plates made of dry clay, with a slow fire below. This is the most difficult part of the process. The coarse flour is laid perfectly dry on the hot plates, when the women, with a dexterity only to be acquired by practice, spread it out in a round and very thin layer, nearly the size of the plate it is laid on. This they do merely with a piece of calabash, which they keep in constant motion, pressing gently every part of the surface, until the heat has united the meal into a cake, without in the least altering its colour or scorching it. Their method of turning a cassava cake of that size resembles sleight of hand, for they effect it with two pieces of split cane without breaking it, though scarcely as thick as a dollar, and only as yet half-cemented together, and of a substance always brittle, especially when warmed. This bread is very nourishing, and will melt to a jelly in a liquid, but it is dangerous if eaten in any quantity when dry, as it swells, on being moistened, to many times its original bulk. It will keep good for any length of time if preserved in a dry place. The expressed juice deposits, after standing for some time, a fine white starch, which, when made into jelly, is not to be distinguished from that prepared from arrowroot.

The cassava farina constitutes the tapioca of commerce when heated on hot plates, which causes the grains to swell, many of them bursting and the whole agglomerating into irregular masses or lumps. The finest are sold as tapioca, the intermediate sample being used for starch and for cooking, and the coarsest made into flat cakes for bread as above described.

The plant does not require much moisture except in the early stage of its growth, as too much humidity causes the roots to decay and perish.

Advantages of the Crop.

Nine staple field crops are produced in Queensland. These are sugar, wheat, coffee, rice, maize, potatoes, onions, lucerne, and oaten hay. There are other and minor crops, but we take these as most generally grown by farmers throughout the State.

The usual system (?) adopted by the agriculturists as a body is to put the whole of the arable land under sugar-cane, wheat, corn, &c. The result is that, if the grub in the North or the frost in the South destroys the cane—

rust ruins the wheat or dry weather the maize—the farmer has nothing to fall back upon. His time, money, and labour have all been expended upon a crop which fails him at the moment, perhaps, when his prospects of a good harvest were brightest. There are many crops which could and should be grown by Northern, Central, and Southern farmers, as a stand-by in case of the failure of any one crop. Cotton, for instance, will stand such dry weather and yield a good crop as would destroy the maize crop. But I need not tell farmers what they already perfectly well know, what they are all agreed about, but what only the minority practise. Here we have a crop—cassava—which grows to perfection in the North and equally well in the far South. Its cultivation and preparation are, as I have shown, exceedingly simple. Tapioca is a valuable article of commerce. It is used all over the world. Brazil exports some £30,000 worth per annum. But to the Queensland farmer it is a stranger. Its cultivation is looked upon in the light of an experiment, and farmers do not care to make experiments. But for that very reason the Department of Agriculture has established experiment farms, where the farmer may profit by both failures and successes. The production of the cassava plant has, however, long since passed the experimental stage. It has been proved that it will grow in this State on the whole seaboard as well as in Brazil or in the West Indies.

What should hinder any farmer from growing 1, 2, or 5 acres of cassava?

What the total value of the export of manioc or tapioca from Brazil is to-day we are not in a position to say exactly, but one small State of that country—Para—exported, in 1901, 168,000 bushels. The price of tapioca in the London market is 2½d. per lb., and the production per acre is about equal to that of sweet potatoes in weight of tubers.

Here, then, is one extra crop which might be grown with the certainty of a good market.

The Divi-divi tree thrives well in the North. Such trees as I have seen at the State Nursery at Kamerunga, Cairns, are now loaded with ripening pods.

Here, again, the South American States do a large trade. Barranguilla, in Columbia, exported last year 5,946 bags, valued at £2,271. There is very little trouble connected with the production of the Divi-divi. The trees might be planted as an avenue or on the borders of the farm. For the former purpose they are admirably suited, as they form a dense shade, and the flowers emit a most exquisite perfume. The gathering of the pods is simply done by sweeping a clear space beneath the trees and collecting them as they fall.

There are several other crops, which we shall mention in future issues of the *Journal*, which could be grown by farmers without interfering with the staple crops of the farm, and which would bring in good money when all else failed.

TOBACCO—NOTES AND CLIPPINGS.

BY R. S. NEVILL.

In the following clippings from *The Weed* on tobacco-growing, I would call attention to the stress laid upon the thorough preparation of the land before transplanting. In order to get the ground in the best condition it should be ploughed as soon as the crop is taken off, that it may get the benefit of the winter rains and frosts, and again broken deeply just before transplanting time.

The United States Government is now engaged in some important investigations in connection with tobacco soils, and particular varieties of tobacco for a given soil, which may result in giving to growers some valuable information.

The annual production of cigars in Cuba is from 250,000,000 to 300,000,000, and in the United States from Cuban tobacco 500,000,000.

It is said 95 per cent. of the cigars made in Cuba are controlled by a trust that is practically in English hands, and the tobacco lands are more or less also controlled by them.

Preparing the Seed Beds.

To be successful with this crop all admit that without proper care in preparing the tobacco beds, in which to germinate the seed, the crop will be a failure. Therefore in the fall or early spring the ground that is to be used for these beds should be very carefully prepared. The most successful tobacco growers claim that if you will break or fallow this ground in the fall and cover thickly with tobacco stalks, removing them in the month of February; then, or at any time thereafter, when the soil is sufficiently dry (never when too moist) lightly burning the top or surface so as to destroy all weed and grass seed; then fallow thoroughly, and sow one quarter of an ordinary teaspoonful of seed to 10 square feet of bed; canvas well, and see to it that all side draft is cut off, then there should be no failure in plants, if you allow 20 square feet of bed for each acre of tobacco desired.

Importance of Early Plants.

The importance of early plants has been most generally recognised by farmers for the reason that we no longer have fresh, virgin soil, upon which to grow tobacco. My motto is "Be ready."

Transplanting.

Transplant all your tobacco in the month of May, if possible. Prior to transplanting be sure that your ground has been thoroughly prepared. Thoroughly pulverize it, so that when the plant has been transplanted the little roots will have no trouble in finding food for their nourishment. A quick start means much for the crop.

Topping.

As soon as what is commonly termed the "button" begins to appear it is ready to top. However, it is generally conceded that in order to get a regular crop it is best to make about two toppings, say one week apart. However, never under any circumstances permit a "bloom patch." If you do it largely destroys the body of the leaf.

Cutting.

After topping let it stand at least six weeks; then it is ready for the knife. It has been said that any man can raise a crop of tobacco up until cutting time; from that time on until it is safely housed is where it requires the farmer's best judgment. Be sure the plant is ripe; be careful with the knife, and that no leaves are broken.

Housing.

Be careful in hauling it to your barn, that no bruise is made upon the leaf. Be careful in placing it in the racks. See to it zealously that each stalk is separated evenly upon the stick. Lastly, be careful that you have plenty of side and bottom ventilation while curing. Then you can feel assured that you have done your part in raising and caring properly for your crop of tobacco.

The excise authorities are at present investigating a singular case of fraud in Dundee, Scotland. By a number of persons in that city experiments have been carried on lately in ground wood, and in connection with a process through which the material was put, it was suggested that it might be possible to utilise it as tobacco, particularly in the manufacture of cigarettes. An English wholesale firm, on having their attention called to the matter, reported it to the authorities, with the result that the Procurator Fiscal at Dundee has arranged to have witnesses summoned in order, it is understood, to institute a prosecution.

NOTES ON THE CASSAVA PLANT.

By JAMES PINK.

Very *à propos*, Mr. James Pink kindly supplies us with the following notes on cassava, which will doubtless prove of great interest to farmers generally:—

A report recently issued by the Jamaica Board of Agriculture on the products of Florida and Jamaica shows that the cassava possesses great capabilities both for manufacturing purposes and for the feeding of stock, especially in the raising of pork.

The cassava is adapted for growing in our dry and sandy districts, as it does well in the arid districts as well as in the humid regions of India. Fourteen inches of rainfall will secure an abundant crop of tubers.

There are nine species of cassava (*Jatropha*), two only of which are cultivated for food—the bitter cassava (*Jatropha manihot*) and the sweet cassava (*Jatropha Janipha*). Both of these are being grown in Queensland as ornamental plants. They make handsome shrubs from 5 feet to 10 feet high, with woody stems which are used as cuttings; they strike root freely, and in the tropics can be planted at any time. The tubers are formed at the roots, and are spindle-shaped—something like a parsnip—from which starch and tapioca are manufactured; also, by a certain process, the pulp is converted into flour from which a very nourishing bread is made which forms the principal food in several of the South American States.

Starch is being largely manufactured from cassava tubers in Florida, according to the Jamaica report. A great factory has been erected at Lake Mary for the manufacture of cassava starch. Over 1,000 acres of cassava are being cultivated to supply the factory, and its cultivation is being extended rapidly, the growers selling the tubers to the managers of the factory at $5 (£1) per ton. On a very poor soil the average crop per acre is 9 tons; the yield of starch from the tubers is about 20 per cent.

The manufacture of tapioca and dextrine from cassava is being taken up. The professor of the Florida Experimental Station says that, all things considered, cassava comes nearer furnishing the Florida farmers with a more profitable crop, and can be more cheaply converted into staple and finished products, and can be produced for a smaller part of its selling price, than any other crop.

It is unquestionably true that cassava comes nearer supplying a perfect ration for farm stock than any other concentrated food produced upon a Florida farm, and the high yield of starch by the cassava places it before the manufacturer as a probable new material for the great glucose industry, at present dependent on corn. The experiments in the feeding of stock at the Florida Experimental Farm prove cassava to be the best and cheapest ration which can be used for fattening purposes. The most astonishing fact, however, is the great difference demonstrated between the cost and the result of feeding corn and feeding cassava, the difference being almost two-thirds in favour of the latter. The cultivation of the cassava plant (says the Jamaica authority) is exceedingly simple; it thrives under the most diverse conditions of climate, on dry plains, on rocky hillsides, as well as on the humid plains and hills, whereever the soil is friable or gravelly. To obtain a large crop it should be planted annually by cuttings; it may be planted twice a year in Jamaica. The tubers can be dried and stored to keep for some time, thereby reducing the weight for transport to the distant factory, and thus the factory can be kept going most of the year. It is impossible to exaggerate the importance of the great cassava industry in Jamaica. As a matter of fact, an acre of cassava is worth more than an acre of sugar-cane.

Seeing then the great capabilities of the cassava plant both as a food product for stock and a producer of the raw material for certain manufacturing purposes, it cannot fail to become a factor in the commercial world. Seeing also the great benefit that has resulted from the culture and manufacture of cassava both in Florida and Jamaica, there is no reason that this plant should not prove a valuable addition to the products of the agriculture of Queensland.

Plate XXIV.

Topping the Coffee Tree.

COFFEE CULTURE IN QUEENSLAND.

No. 10.

By HOWARD NEWPORT, Instructor in Coffee Culture.

TOPPING AND SUCKERING.

The necessity for topping has, perhaps, come home to growers in this country least of any of the works in connection with the cultivation of coffee. To those starting the cultivation of a commodity they have little or no experience of, such a matter is not likely to occur, and in the cultivation of fruit, into which category coffee must naturally fall, though the necessity of pruning may be thought of, topping down is contrary to the general run of the fruit-grower's epitome of field works.

Topping has, nevertheless, been found, from the time coffee has been taken up as a cultural industry and extensively grown, a very necessary and advisable operation.

Technically, it may be recognised better, perhaps, under the term of "heading down" of the English gardener, but in coffee culture "topping" is the term in general use for this operation of cutting off the head or main stem of the coffee shrub when it has attained a certain or desired height.

The tendency to allow the coffee-tree to grow as it pleases, and to any height, is a natural one; but when numbers of them come to be worked, some order and regularity must be maintained among them as among human beings, if the working is to prove a financial success.

For this reason we plant in rows at stated intervals (see Article No. 7, *Queensland Agricultural Journal* for April, 1901), and we prune, handle, and pick systematically (see Article No. 6, *Queensland Agricultural Journal* for March, 1901), and we also *top* our coffee-trees.

The effect of not topping coffee is to entirely disorganise the work of the estate. It is not in mere looks that this is apparent, but in regularity of cropping. An untopped tree grows thin and tall, and thereby allows the weeds to grow between the trees; it blossoms at all and any season, and irregularly—*i.e.*, some seasons heavily and some seasons scarcely at all. It enhances the cost of picking by this as well as by bearing the major portion of its crop out of reach; it bears a poor and small berry, and ripens its crop spasmodically; and also, as the tree gets taller, it kills off the lower or middle primaries—a special failing in Queensland—and so not only really reduces the crop-bearing area, but exposes the estate to serious damage in windy, not to mention cyclonic, seasons.

The objects of topping are, therefore, it will be seen, to restrict the height of the plants within limits for picking (see Article No. 6, *Queensland Agricultural Journal*, March, 1901), to enable the pruning, &c., to be more readily and regularly done, and thereby to increase not only the quantity of crop, but the size and quality of it; for protection in exposed situations; for the creation of lateral growth and the covering of the ground to the saving of weeding and prevention of undue atmospheric evaporation of moisture from the surface of the soil; and for the encouragement of strong, sturdy, thick-stemmed and hardy trees. Nor need the grower be afraid that by topping he will lose growth or restrict the bearing area of his coffee-trees, for a good tree in a fair soil will not be restricted, and, if prevented from growing tall, will grow broad, and he will gain more thereby than ever he lost by preventing its skyward growth.

Height to Top.—With regard to the methods of carrying out this work as well as the height at which it should be put into effect, there is a great diversity of opinion. The height at which to top the trees is, however, the first point to be considered. This depends upon several matters, such as protective situation of the estate from wind and weather generally, quality of soil, distance apart of the trees, and to some little extent to the fancy and experience of the grower.

To study an untopped tree, one will find generally that the lower primaries are fairly strong (unless the tree is old or the coffee very close together), the middle branches scanty and whippy, and the top like a tuft, thick and top heavy. (For reason of this, see Article No. 5, "*Disbudding*," *Queensland Agricultural Journal*, February, 1901.) The height at which it would seem to require topping (generally about 3 feet) will appear obvious, and this height—*i.e.*, where the stronger lower primaries cease, and higher ones look thin and sick—is the point at which Nature often does her own topping by breaking off the stems. Although the height at which to top may seem obvious in such cases, the tree can be grown higher with safety, for on looking at such trees again, another point will be specially noticeable, and that is that, however tall a tree, unless especially well situated, it will only carry a given amount of bearing wood or a certain number of primaries. And this amount is made up of the lower or good portion of the tree, and the tuft at the top. Should the tree grow higher, the neck or non-bearing stem increases, but the amount of green bearing wood does not. Now, these vary, of course, but will be found to aggregate on the average from 4 to 4½ or perhaps 5 feet. This then gives us the answer to our first question, and it will be generally found that from 4 to 4½ feet is a good average height at which to top coffee.

While this may be taken as a general rule, variations of it are necessary, when the soil is especially rich or the situation specially protected, when greater height may be allowed, say from 5 to 5½ feet, and under inverse conditions it must be lowered to 3½ to 4 feet. I have known poor and exposed ridges, even when planted as closely as 4 x 5 feet, to be topped, and pay to be kept topped, at 3 feet; but this is exceptional. Again, trees planted close together, say 6 x 6 feet, may generally be topped higher than those planted 8 x 8 feet, as it will be obvious that less spread is available.

In fixing on a uniform height at which to top his estate, the grower must not be led away by the apparent ease with which he can reach the top of a coffee-tree when it is young, but remember that, when the young top primaries (perhaps only a few inches long when topped) are 4 to 6 feet long, even a 4-foot tree would be quite sufficiently difficult to reach over in picking.

When to Top.—The season of year when the trees may be topped is not a very vital point. Some authorities advocate topping just before the rainy season sets in, some just after it, some just after the crop—*i.e.*, pruning season—and some say that coffee should not be topped until the wood at the point at which it is intended to be cut is matured. With respect to the former question, I would say do not top at, or about, blossoming time, because the retarding of the vertical growth has a tendency to bring out flush in the place of spike, and, though this may occasionally be no disadvantage on a young estate with an inclination to over-bear, it is, as a general rule, not advisable to hinder the formation of spike and blossom.

With regard to the latter point, the maturing of the wood at the point at which topping is determined on necessitates an extra growth of 1 foot to 18 inches, which has subsequently to be cut off, and besides this the flow of sap having become habitual the tendency to sucker is great. Experience has shown that allowing a young plant to produce this foot or more of stem and branches merely to be cut back involves a waste of vitality not otherwise compensated for.

Therefore, I would advocate topping the trees just as soon as they have attained the desired height, whatever time of year it may be, with the one exception mentioned.

Against this early topping it may be argued that the growth of fruit-bearing wood is unduly forced, but practice has not found it to be so. When nipped off while quite young and green, the tree does not feel the operation to the same extent, and the subsequent growth of suckers is proportionately far less, and lateral expansion is quickly noticeable.

How to Top.—There are several ways in which the topping may be done. The most general is perhaps the one whereby the top of the tree is cut off between the knots or eyes on the stem, either just under or just above young primaries. This is to be deprecated, because the stump left very soon dies off, and the tree when it gets older, possibly not till it is ten years or more old, is liable to split from the weight of crop or other causes; and once split, with moisture in the pith, the tree soon dies back, and even if recovering the two top primaries at least are lost.

The next method is to cut one young primary with the stem, allowing the other to grow (see illustration). This leaves life in the knot of the stem and a natural top to the tree of one primary, obviating the chance of splitting. This method may be adopted on steep land, the single primary being left on the upper side from which, in after years, it may be more readily reached. In windy localities it is, however, inadvisable, as the primary is apt to be twisted and broken. I have seen this system adopted when coffee has been topped low and subsequently raised with good effect. The third method is for general purposes the best. This is to cut off two primaries as well as the stem at the required height, leaving three points like a trident at the top of the tree (see illustration); on level land this is most satisfactory. Apart from the mere appearance, it will be found that a tree so topped will keep the knot green for a comparatively long time, can be suckered with less trouble, and the field of coffee will present a more even surface to wind and weather and suffer less in consequence.

In a young estate, especially one growing abnormally fast, it may often prove advisable to top down to a height of 3½ or even 3 feet, allowing the tree six months or a year later to grow a sucker which may then be topped at the desired height. This strengthens the stem, and makes the tree sturdy and broad, so that it quickly covers the ground. The accidental topping of a young tree in this way—as mentioned in Article No. 9, *Queensland Agricultural Journal*, June, 1901—will often demonstrate this point far more vividly to the grower than my description will do.

The foregoing may be said to have reference only to young coffee. The operation of topping is seldom mentioned with respect to other than young coffee, because the work is invariably carried out during the second and third years of the life of a modern estate. As older coffee may, however, have to be dealt with, and it may be decided that it would be advantageous to bring into order an old or overgrown field, the subject may be mentioned here. The height will have to be determined by the natural growth of primaries, as mentioned earlier, which will show in most cases a very distinct falling off at a certain point. The top must then be severed by a clean cut, care being taken not to splinter or split the stem in the process.

Although this height may be lower than the coffee can safely be grown at, it is better to cut right back to this point, and to allow a sucker to make a new head than to immediately cut to the contemplated height, and leave even a few inches of bare stem or stem carrying weak and debilitated primaries.

Coffee that is allowed to grow in its natural state and untopped from the time of planting out will be found in course of time to have no lower primaries at all, and in most cases several stems. This is what is known as "native" coffee. The crop from such trees is small and poor in quality, and, from the height of the trees, is difficult to pick. The recovery of areas that have gone as far as this (*i.e.*, to have no lower primaries) is difficult and often not worth while, were it desired, these would have to be stumped rather than topped, and subsequently treated as young trees.

Suckering.—The effect of topping is, as we have seen, to strengthen the stem and encourage the lateral growth of the coffee. The first and immediate effect that will be noticed, however, is the growth of young, tender, and quick-growing shoots from the stem vertically, from immediately below a primary, and while mostly towards the top of the tree often all the way down the stem. These are called "suckers"; and, however, the term may have come into use, do literally suck the sap and vitality of the tree.

These, if left, would constitute separate and distinct stems; would complicate the pruning and picking; weaken the tree; make a thick, impregnable bush of the tree that would bear no crop, except on the extreme tips of the branches; and reduce the quality of the crop if left, and they must therefore be removed.

Suckers may be pulled off when young, and, until they become so old and tough that the main stem is damaged by their being pulled away, the knife should not be resorted to to remove them.

If pulled off, the eye will come with the shoot and no harm be done to the tree, but if cut they only induce new growth.

The natural tendency of the coffee-tree is to grow taller than the more or less artificial method of culture permits; therefore the efforts of healthy trees to grow upwards by means of these suckers must be expected. To allow these to grow, however, means ruining the trees on the estate, and far more harm is often done by neglecting the centering and suckering than even by neglecting pruning. This, however, will be dealt with separately.

It is a good plan when possible to take the suckers off whenever weeding or chipping round a tree. On newly topped coffee, suckers should never be allowed to grow to more than 3 or 4 inches in length before being removed. When very young—*i.e.*, only half-an-inch to an inch long—nothing is gained by removing them, for they only come again at once in the same way as blossom-buds, as mentioned in Article No. 5, *Queensland Agricultural Journal*, February, 1901. But when older some time will elapse between the removal of a growth of suckers and the appearance of others.

In suckering coffee it will be found, as with many of the other field works, the heaviest work is while the trees are young; as they get older the tendency to produce this kind of growth is materially less.

THE ARGENTINE PORTS REOPENED.

The *Farmer and Stockbreeder* says:—A brief telegram from the Argentine, per Reuter's Agency, conveys the welcome information—which we trust will be officially confirmed—that the Argentine Government has reopened its ports to British pedigree stock. This will be welcome news to breeders. For a period of eighteen months the ports in that country have been closed, owing to the prevalence of foot-and-mouth disease within the Argentine, contracted, presumably, from a European source—not British. The Argentine authorities concluded that for a time their ports should be shut; and although the fact that we had to take similar action with regard to Argentina cattle imported alive and slaughtered at the port of debarkation about the same time gave colour to the suspicion that the measures taken were retaliatory, yet the Republic was undoubtedly acting on precisely the same policy as influenced His Majesty's Government. Now that this country has shown a clean bill of health, so far as foot-and-mouth disease is concerned, for a lengthened period—no outbreak being recorded since March—it was generally anticipated that the Argentine authorities would act up to the spirit of their law and reopen the ports when we could give the necessary assurance that foot-and-mouth disease was stamped out. The expectation was very prevalent among breeders that the reopening of the ports would have taken place about November, but the belated declaration of the Board of Agriculture probably postponed the action of the South American authorities. Now that the embargo has been withdrawn, we may anticipate a keen demand at the spring bull sales and for those breeds of sheep particularly concerned.

Forestry.

THE EFFECT OF FORESTS ON THE CIRCULATION OF WATER AT THE SURFACE OF CONTINENTS.*

The whole of this subject is exceedingly complicated, because it depends targely on a number of elements liable to vary widely within narrow limits of lime and place. It is thus difficult to frame any rule of general application, and for the present the inquiry must be limited to defined localities in the hope that a large number of observations continued for a long series of years and the progressive improvement of scientific methods may eventually permit of their being combined into one harmonious whole.

The subject, "Circulation of Water at the Surface of the Soil," must be understood to include movements in the atmosphere as well as in the soil and on its surface. The water in the soil may be more or less stagnant if the subsoil strata are level and impermeable.

It may now be considered a fact that large forests in the plains do indeed act like hill ranges as regards the precipitation of moisture.

Numerous experiments carried out by the Ecole Forestiere of Nancy in the Foret de Haye, by M. Fautrat in the forest of Halatte, by M. de Pous in the forest of Troucais, also in Germany, Austria, Russia, and even in India, show clearly that more water falls on forests than on the open lands adjoining. The difference is not very great, but may be 12 to 20 per cent.

The additional height due to the trees seldom exceeds 130 feet, and is often only half as much. The effect is, nevertheless, noticeable. Throughout the year, but especially during the moisture seasons, the forests evolve a considerable amount of humidity into the atmosphere, and so render valuable assistance to the surrounding crops. If this were visible as fog, it would be seen that, apart from wind, each forest gives rise to a moist and cool layer, extending, as shown by ballooning experience, as high as 4,500 feet. Resinous species liberate more water than broad-leaved ones. The tree crowns prevent a portion of the rain from reaching the ground at all. This quantity, instead of being carried away by the streams, is re-evaporated and passed on further in the atmosphere, and so does double duty. Sooner or later this mass of moist air meets a current at a different temperature, and the result may be that the same water falls a second time as rain in a different place. Hence a country possessing a fair share of forests can pursue agriculture under much more favourable conditions, and a country without forests, like the Deccan, Central Asia, and parts of America, is in a fair way to become a desert. Consequently the creation of forests in the plains is hardly less a measure of expediency than in the mountains, and the expediency is greater when the plains have naturally a light rainfall. Engineers, even of eminence, especially if interested in irrigation, will dispute this, but they do not know everything any more than foresters do, and the foresters' side is the side of safety. The question divides itself into two parts—plains forests and hill forests. In the former the benefits desired are largely atmospheric; in the latter they are rather in the direction of protecting the soil itself and of regulating the flow.

I.—Plains Forests.

What becomes of the atmospheric precipitations?—

(*a*) Part is retained and evaporated from the trees, &c.,

(*b*) Part is evaporated on or in the soil,

(*c*) Part flows away along the surface and streams,

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* Derived principally from an article by M. E. Henry in the *Revue des Eaux et Forets.*

(*d*) Part soaks into the soil up to saturation point,
(*e*) Part is absorbed by plants for their growth and transpiration,
(*f*) The remainder sinks to lower levels, where it either forms subterranean reservoirs or percolates till it again comes to the surface as springs.

Calling R the total rainfall—

$$R = a+b+c+d+e+f.$$

On a level plain there is no surface flow, and the equation becomes—

$$f = R-(a+b+d+e).$$

In the simplest case, that of a perfectly bare plain, *a*, *c*, *e* become zero, and the equation is—

$$f = R-(b+d).$$

Of all these factors the only one that can be measured with anything like accuracy is the portion *a* evaporated off the trees. Even this factor, according to the Mariabrunn observations, is liable to very considerable errors of determination, since no two rain-gauges will give the same readings even under the same tree. It is necessary to employ a large number of rain-gauges, including some embracing the trunks of the trees. Even employing 20 rain-gauges, totalling 10 square feet of opening, the probable error is at least 1 per cent. of the fall. The measurements should be made either (1) for each individual shower, (2) for a long series, (3) by grouping the showers according to their intensities.

It has been found in Europe that a broad-leaved forest prevents 1 to 3 tenths, and a conifer forest as much as 5-tenths, of the total precipitation from reaching the ground at all. But these figures hold good only for those localities where they were obtained. In countries where the rainfall is heavy and continuous, the forest soil in any case will be about as thoroughly watered as a bare soil.

All the other fractions, *b*, *c*, *d*, *e*, *f*, composing the total fall, are still very undetermined in forests and other lands alike, and they vary so much with every possible local difference that they are hardly likely ever to be capable of satisfactory measurement.

Reasoning from the known facts that, in spite of obstruction by the crowns, the forest soil is as well watered as the soil outside, and that the evaporation in a forest is much less as proved by the greater moisture of the surface soil, it was supposed that forests contributed more than anything else to the maintenance of subterranean supplies (level plains are still referred to). The results obtained in Russia, therefore, came as a great surprise. Soundings taken during the growing season (1st June to 1st September) inside and outside the forest of Chipoff (Government of Woronej) showed that the water level below the forest was some 32 feet lower than outside. In the Black Forest (Government of Kherson) the level was some 12 to 16 feet lower. Presumably these figures are extremes for the following reasons:—(1) The measurements were taken at the season when transpiration is greatest; (2) they were made in localities where the rainfall was only 12 inches in the year, where there was as a probable natural consequence of the dryness an almost complete lack of natural forest, and where consequently the forest would have to pump all it could in order to maintain itself. An increase of forest area would probably reduce the necessity for so much pumping by the roots. The experiment was repeated by M. Ototzky much farther north, under the 59th degree of latitude, in the Government of St. Petersburg, where the climate is cooler and moister and the rainfall averages 20 to 30 inches. The subterranean water is plentiful, yet again the forest lowered the level, but this time only by 20 to 46 inches. In order to check the Russian results, an experiment has been started by the French forest officers in the forest of Mondon, near Luneville. It is a level forest of about 5,000 acres, situate on a low plateau formed of alluvial sand, gravel, and pebbles. Eleven sound-holes were bored in 1899—six in the forest and five outside. The water level was found to be lower in the forest by 6 to 64 inches during the season of active growth. This result confirms the Russian observations, and accords with the known facts concerning the action of forests in drying up swamps and *stagnant* subsoil waters.

Nevertheless, it would be a great error to jump to the conclusion that plains forests always and in all countries lower the level of subsoil waters. It has, in fact, been shown by Mr. Ribbentrop that near Trichinopoly wells, 6 to 10 feet deep inside the forest, held water throughout the dry season, whilst the river beds and wells, 15 feet deep outside, were dried up. Each locality must be studied under its own conditions. In a general way, it may be said that plains forests render service of various kinds :—

(1) They dry up swamps and malarious places—as, for instance, the Landes, the Sologne, the Pontine marshes, and many others.

(2) They suck up from great depths water which is otherwise not utilisable, and cause it to again circulate in the atmosphere, where it forms fresh rain.

(3) They do not injure the springs, since there are none in level plains where man is obliged to have recourse to irrigation. They may lower the subsoil water level to a degree which is seldom serious if the rainfall is enough to be of any practical use to the crops.

(4) They cool and moisten the air, and render showers more frequent during the growing season.

MOUNTAIN FORESTS.

A rainfall chart bears a great general resemblance to a contour or relief map, the more the hills, the more the rain. In reality the rainfall is more complicated. All mountain chains show rain maxima, and these maxima are very generally proportionate to the elevation. There is more rain at 6,000 feet than at 4,000, and more at 4,000 than at 2,000, and so on. Even small elevations suffice to attract an appreciable maximum. Wooded mountains are still more effective, especially in the summer months. Mountain forests are mostly coniferous, and conifers exercise an influence even more powerful than that of broad-leaved forests. A forest is always covered by a great layer of moisture which is there none the less, though it is not visible as mist. Whence comes all this vapour? Is it due to evaporation from the leaves, or is it produced by some action of the millions of points of the pine needles? Science cannot tell, but the effect is certainly not due to transpiration alone. Transpiration is indeed less active in conifers than in broad-leaved species, and it would consequently be expected that the former would give rise to a smaller layer of invisible mist than the latter, but the contrary is the case. The cause must therefore be sought in the soil or in some other unknown factor. One cause may be the soil, but another is surely to be found in the greater portion of the rainfall that is intercepted by conifer crowns. It was shown in France that in 1876 the conifer forests intercepted and restored to the atmosphere over 100,000 cubic feet more water per acre than the broad-leaved forests. Other years have given even greater differences, and there are no means of making exact measurements, but there is no doubt that wooded mountains attract more rain than bare ones.

In all Europe, Spain is the country that gets least rain. Notwithstanding the great mountain chains running up to 10,500 feet in Grenada, Murcia, &c., the rainfall of July and August is not half-an-inch. If these mountains were wooded instead of being absolutely bare, the south-east of Spain would not suffer so much from drought, and the country would not have had to deplore the disastrous floods produced in Murcia by the Segura. Spain is at last awake to the fact, and has undertaken a series of reboisement works, an account of which was read at the International Congress of Sylviculture of 1900 in Paris by M. Ricardio Codorniz, chief engineer thereof. There is plenty of moisture in the sea breezes, but nothing to condense it on to the hot mountains. In the mountains the rainfall is divisible into the same kinds of fractions as in the plains, with this difference, that the proportion of surface flow, being zero in the plain, becomes considerable on the mountain. The quantities *a*, *b*, *d*, *e*, may first be examined. The quantity *a* has not been directly determined, and the plains results cannot be quite applicable on account of the preponderance of snow, and the great differences of intensity and distribution. The evaporation from the soil surface *b* must be less than in the plains, because the temperature becomes lower as the altitude increases. For the same reason the water fixed in or evaporated by the plants, *e*, is also less, as may be verified by the proportion of ashes. The growing season is shorter and heat less great. Consequently the transpiration is less and the quantity of organic matter formed annually per acre is smaller. At Aschaffenburg (400 feet) a thousand beech leaves will cover about 35 square feet, while at 4,000 feet, near the upper limit of the species, the same number of leaves will only cover about 9 square feet. The percentage of ashes and the total weight are also less, being 4·03 per cent. for beech and 3·58 per cent. for spruce, against 9·91 and 10·19 respectively. Even the grass at high levels contains one-half less ash than in the valleys.—*Indian Forester.*

REMOUNTS FROM AUSTRALIA.

The possibilities in connection with horse-breeding for military purposes are daily increasing. It only needs that the right stamp of horse be bred—not tall, weedy animals which spend half-a-day in bucking, and the afternoon in recovering from their exertions, or animals which can do a spin of a mile or so in quick time, and are then too knocked up to do more than a crawl. What is wanted for active and effective military work is a strong well-built pony, such an animal as was lately commended in South Africa by the remount officer who denounced the majority of one of the last shipments of horses from Australia. The nuggets, he said, were excellent animals in every way. Apart from South Africa and India, another market is now opening up for our horses. We learn that the Netherlands-India Government has sent Captain A. Posno, a remount officer for that Government, to Adelaide, with the view of inquiring into the prospect of obtaining remounts for the Dutch Army in Java. There is a large standing army in that island, and several cavalry and horse-artillery regiments. Australia has been selected as a country from which remounts may be obtained. Captain Posno has already arranged for a trial shipment of ponies from New South Wales, and, should this prove a success, arrangements will be made for further shipments as they are required. The style of animal required is what our Government has aimed at obtaining for the latest contingents for South Africa—good, well-bred ponies of about 14·2 hands, preferably "nuggets," which can stand hard work without knocking up just when they are most needed.

There is no better country in the world for breeding horses of all classes than Australia, and Queensland which now furnishes large number of horses to the army in South Africa, as well as to that of India, can on her wide pastoral lands raise horses enough to supply the heaviest demand. It is merely a question of price. From the *Adelaide Observer* we learn that the Netherlands-India Government paid from £13 to £15 per head for the ponies from New South Wales, Captain Posno stating that his Government want good saddle-ponies of the small thoroughbred sort. "We want a first-class animal, and will pay good money for it."

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1901.										1902.		
	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
North.													
Bowen	8·26	4·75	0·94	0·19	0·10	6·36	0·18	0·93	0·92	0·71	0·19	2·19	2·01
Cairns	14·93	8·87	13·18	0·57	0·89	2·53	1·82	2·34	5·23	2·78	3·79	12·90	11·43
Geraldton	37·64	26·10	26·72	1·21	2·58	11·77	3·37	3·85	6·45	1·60	3·78	16·87	7·55
Herberton	10·95	2·87	3·80	0·18	0·64	2·53	1·04	4·92	1·13	1·30	0·57	5·77	3·86
Hughenden	2·82	1·74	3·48	0·03	Nil.	0·33	Nil.	0·31	0·29	1·43	1·57	2·02	0·53
Kamerunga	13·09	9·57	13·18	2·09	2·60	1·94	1·72	1·19	5·74	2·16	2·58	10·59	14·24
Longreach	3·09	2·56	5·95	0·09	Nil.	0·37	0·58	Nil.	Nil.	1·71	0·87	0·27	0·18
Lucinda	15·78	9·16	8·63	2·89	2·17	5·89	0·30	2·59	Nil.	0·32	3·55	11·38	2·67
Mackay	10·13	6·80	1·32	0·25	1·07	5·14	2·29	1·35	1·85	0·71	3·78	8·43	4·41
Rockhampton	5·53	2·84	0·79	0·24	2·29	3·04	1·78	0·51	0·41	0·19	4·79	1·36	1·68
Townsville	4·95	3·13	0·74	0·32	0·19	1·87	0·14	0·90	0·16	0·61	2·24	3·14	1·61
South.													
Barcaldine	3·70	1·90	2·21	0·82	0·63	0·25	0·51	0·54	0·55	0·09	2·30	0·07	0·37
Beenleigh	11·44	4·17	4·55	4·15	1·34	4·49	0·70	3·35	1·35	0·14	2·41	1·82	0·68
Biggenden	6·19	6·35	1·47	1·56	0·74	2·81	2·11	1·35	0·47	0·92	2·12	0·83	1·80
Blackall	2·28	3·96	3·80	0·90	0·55	0·44	0·88	0·60	0·97	0·32	1·68	0·34	0·34
Brisbane	11·70	3·10	2·29	3·29	1·31	3·71	1·30	3·25	1·41	0·75	1·38	2·67	0·76
Bundaberg	3·17	10·27	1·14	0·74	2·01	5·59	1·80	2·18	1·28	Nil.	6·33	0·75	1·99
Caboolture	11·53	4·64	3·34	2·27	3·70	3·18	1·55	5·01	3·17	3·45	2·29	2·66	1·29
Charleville	1·10	2·61	3·28	0·93	1·27	0·92	0·32	0·04	0·65	0·96	0·47	0·22	0·42
Dalby	4·77	3·12	1·12	3·59	2·83	1·66	1·11	4·09	0·15	0·42	1·65	0·20	0·30
Emerald	3·25	0·88	1·31	0·63	0·90	1·74	1·11	Nil.	0·09	0·63	3·28	1·11	0·97
Esk	8·36	4·11	1·78	2·45	3·01	3·03	1·72	4·87	1·08	2·20	1·81	1·06	0·75
Gatton College ...	6·73	3·86	1·55	2·93	1·53	3·23	1·06	3·02	0·86	0·26	2·27	1·58	0·26
Gayndah	4·22	3·97	0·97	2·32	2·29	Nil.	1·91	2·39	0·04	0·38	2·54	0·51	0·99
Gindie	2·07	0·44	1·21	0·84	1·34	1·77	1·81	0·53	0·02	0·57	1·35	1·46	0·78
Goondiwindi	3·53	1·82	1·90	1·73	2·30	1·55	0·67	2·83	0·21	0·20	2·06	0·75	1·20
Gympie	18·56	3·89	3·38	2·82	3·40	3·39	1·34	1·91	1·34	1·25	1·49	1·65	2·33
Ipswich	7·01	3·38	1·43	3·16	0·97	2·47	3·54	3·98	1·17	0·35	1·45	2·80	0·32
Laidley	6·94	3·81	1·47	2·54	2·00	5·32	1·22	3·37	1·10	1·65	1·79	1·94	0·39
Maryborough	11·76	5·58	4·09	2·22	3·07	5·02	1·05	1·54	1·84	1·54	1·29	0·75	0·96
Nambour	18·01	3·33	7·25	3·33	6·80	4·42	0·98	3·89	2·85	3·89	1·30	2·06	1·61
Nerang	14·91	5·12	5·42	5·34	0·79	5·41	0·88	4·57	2·70	0·46	3·98	4·54	0·65
Roma	1·77	1·11	1·11	2·66	2·26	0·98	0·43	0·71	0·54	0·83	2·72	1·11	0·54
Stanthorpe	3·95	2·13	0·77	2·74	1·52	4·22	1·42	2·93	2·22	1·67	3·17	0·51	0·56
Taroom	3·15	1·88	1·70	2·19	2·74	2·34	2·11	0·92	0·42	0·31	0·53	1·82	1·30
Tambo	1·66	2·75	2·85	1·47	0·73	0·74	1·47	0·51	Nil.	0·16	1·73	0·35	0·68
Tewantin	20·33	11·70	12·20	5·45	8·34	4·61	2·71	3·26	1·66	2·70	3·09	1·13	3·44
Texas	4·58	1·46	1·10	1·87	1·00	3·06	1·47	1·47	0·26	0·43	1·95	1·62	0·42
Toowoomba	6·84	6·59	1·04	3·57	2·22	5·57	1·85	4·45	1·10	0·87	3·46	1·20	Nil.
Warwick	5·56	2·91	0·82	3·47	1·57	5·74	2·05	3·12	1·19	0·71	3·48	0·65	0·55
Westbrook	4·37	3·38	0·74	3·48	1·64	6·50	1·75	2·27	0·59	0·31	3·21	1·04	0·06

CLEMENT L. WRAGGE,
Government Meteorologist.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER (duty free).—Market for colonial, steadily improving. Brisk demand for inferior qualities. Australian, choicest, 110s. to 112s.; Danish, 114s. to 116s.

CHEESE (duty free).—American, 49s. to 50s.; Canadian, 51s. to 52s.; New Zealand, 50s. to 51s.; Australian, 47s. to 49s. per cwt.

CONDENSED MILK.—18s. 6d. to 20s. 5d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. ; refined, 4s. 2d. and ¼ per cent.).—Refined, £16 10s. to £18 per ton ; German beet, 88 per cent., 6s. 9½d. per cwt.

SYRUPS (duty, 2s. per cwt. and ¼ per cent.).—Finest, 14s. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—5s. 9d. to 8s. per cwt.

RICE (duty free).—Rangoon, £8 to £14; Japan, £12 to £17; Java, £19 to £24; Patna, £17 to £21 per ton; Queensland paddy, local price £7 10s. to £9 (Pimpama Island clean), valued at £18 10s. in the London market.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, small to good middling, 40s.; peaberry, 75s.; Santos, 30s.; Mocha, 65s.; Jamaica, finest, 100s. per cwt.

ARROWROOT.—St. Vincent, 1½d. to 4½d.; Natal, 5½d. to 8d.; Bermuda, 1s. 3d. to 1s. 6d. per lb.

WHEAT.—Australian, white, 29s. 4½d. to 31s. 6d.; New Zealand, white, 29s. 6d. to 30s.; Duluth, red, 33s. 6d.; Manitoba, red, 33s. 3d. per 480 lb.

FLOUR.—Australian, 20s. 6d. per 280 lb.

MALTING BARLEY.—English, 28s. to 38s. per 448 lb.

OATS.—New Zealand, 25s. to 31s. per 384 lb.; Canadian, 16s. to 28s. per 320 lb.

SPLIT PEAS.—48s. per 504 lb.

GINGER (duty free).—Calicut, good medium, 80s. to 100s.; medium, cut rough, 39s.; small, cut rough, 30s. to 34s.; Japan, rough, 42s. to 43s.; Jamaica, good bright, 60s. to 70s.; middling to fair, 40s. to 56s. per cwt.

TAPIOCA.—2½d. to 6d. per lb.

PEPPER.—Capsicums, 16s. to 80s.; chillies, 35s. to 38s. per cwt.

TOBACCO.—American. Messrs. Thomas H. Edwards and Co., Liverpool, report as follows on the Tobacco Market:—

31st January: Stocks on hand, 95,074 hogsheads and tierces, representing approximately 95,074,000 lb.

STRIPS.	1902.	LEAF.	1902.
WESTERN—		WESTERN—	
Fillers	4½ @ —	Common export	— @ —
Rather short	5¼ „ 6	African export	— @ 5 @ 6½
Very middling to middling	6¼ „ 6¾	Short trade	— @ 4
Good to fine	7 @ 8 @ —	Medium to good trade ...	4½ „ 6
BURLEY	6 „ 9 „ —	BURLEY	7 @ 7½ @ 8
VIRGINIA DARK—		VIRGINIA DARK—	
Fillers	5 @ —	Common export	— @ —
Rather short	— „ 6	Short trade	— „ —
Very middling to middling	6½ „ 7½	Medium trade	4 „ 5
Good to fine	8 „ —	Good to fine trade	5½ „ —
VIRGININA AFD CAROLINA BRIGHT—		VIRGINIA AND CAROLINA BRIGHT—	
Semi-dark	— @ 7½	Common or semi-bright ...	6 @ 7
Semi-bright	8 @ 9 @ —	Medium or mixed	8½ @ 10 @ —
Medium or mixed	10 @ 11	Good to fine	11 „ 12 „ 15
Good to fine	11¼ @ 12½ @ 14		

After a week of quietness our market settled down to a steady general demand in January, without, however, the exceptional activity which characterised the business of the closing months of the old year.

Virginia and North Carolina brights were scarce in first hands, consequently no great volume of business in them could be looked for. Western strips met with increased attention, and some lines of considerable size were sold, the better classes receiving more inquiry than for some time back.

NOTE BY R. S. NEVILL, Tobacco Expert.

There is reported to be a shortness in the crop of the United States, and prices are ruling high, and the imports into the United Kingdom for 1902 will probably show a falling-off, and at a higher figure than the imports of 1901; and if the fight continues between the American Tobacco Co. and the Imperial Tobacco Co. prices are likely to go higher in Great Britain.

Wine.—Australian Burgundy: Wotonga 13s., Waratah 18s., per dozen.

Green Fruit.—Apples, Tasmanian, 9s. to 12s.; New York pippins, 12s. to 15s. to 17s. Australian realised 11s. to 16s., and some Cleopatras 18s. per case. Oranges, Valencia, from 7s. to 8s. for common sorts to 26s. to 46s. for finest selected per 420; lemons, finest selected, 20s. to 22s. per case of 420; bananas, 8s. to 14s. per bunch.

Cotton.—Clean upland, 5½d. per lb. In America, seed cotton, 2½d.; lint, 11d. per lb. S.S. Island cotton, 2s. 1d. per lb.

Cotton Seed.—£6 10s. per ton.

Cotton-seed Oil Cake (decorticated).—£4 15s. to £4 16s. 3d. per ton.

Cotton-seed Oil.—Crude, £23 to £23 10s. per ton.

Linseed.—55s. to 60s. per 416 lb.

Linseed Oil.—£32 per ton.

Linseed Oil Cake.—£8 6s. 3d. to £8 12s. 6d. per ton.

Manila Hemp.—£25 to £30 per ton.

New Zealand Hemp.—£33 10s. per ton.

Wool.—Bidding at the last sales was active and competition brisk. The advance on February sales was:—Merinos, 7½d.; fine crossbreds, 10d.; other wools ranging from 5d. to 10d. Lambs—Crossbreds, 10d.; merinos, 5d. A reason given for fine crossbreds ranging high is that the New Zealand supply has fallen off owing to New Zealand breeders having turned their attention so largely to mutton rather than wool.

Frozen Meat.—The following are the latest quotations for the various descriptions of frozen meat mentioned (last week's prices being also given for comparison):—

New Zealand Mutton.

(Crossbred Wethers and Merino Ewes.)

	March 28.	April 5.
Canterbury	$3\frac{11}{16}$d.	$3\frac{3}{4}$d.
Dunedin and Southland	$3\frac{7}{16}$d.	$3\frac{1}{2}$d.
North Island	$3\frac{5}{16}$d.	$3\frac{3}{8}$d.

Australian Mutton.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3d.	$3\frac{1}{8}$d.
Light (under 50 lb.)	$3\frac{3}{16}$d.	$3\frac{3}{16}$d.

River Plate Mutton.

(Crossbred and Merino Wethers.)

Heavy	3d.	$3\frac{1}{4}$d.
Light	$3\frac{1}{4}$d.	$3\frac{1}{4}$d.

New Zealand Lambs.

Prime Canterbury (32 lb. to 42 lb.)	$5\frac{1}{2}$d.	$5\frac{7}{16}$d.
Fair average	$5\frac{1}{16}$d.	5d.

(The quotations for New Zealand lambs are for old season's.)

Australian Lambs.

Prime (32 lb. to 40 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
Fair average	$3\frac{11}{16}$d.	$3\frac{11}{16}$d.

New Zealand Frozen Beef.

(Fair Average Quality.)

Ox, fores (100 lb. to 200 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{2}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$4\frac{1}{4}$d.	$4\frac{1}{2}$d.

Australian Frozen Beef.

(Fair Average Quality.)

Ox, fores (100 lb. to 200 lb.) ...	3d.	$3\frac{7}{16}$d.
Ox, hinds (180 lb. to 200 lb.) ...	$3\frac{7}{16}$d.	$3\frac{7}{8}$d.

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations for New Zealand and Australian lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 7s. 6d. to 9s. 3d.; Danish, 8s. to 12s. per 120.

BACON.—Irish, 55s. to 61s.; American, 45s., 48s. to 54s.; Canadian, 46s. to 56s. per cwt.

HAMS.—Irish, 86s. to 108s.; American, 44s. to 52s. per cwt.

HIDES.—Queensland heavy ox, $5\frac{1}{2}$d. per lb.; light ox, $4\frac{3}{4}$d.; cow, $4\frac{5}{8}$d. New South Wales heavy ox, $4\frac{3}{4}$d.; light ox, $4\frac{3}{8}$d.; cow, $4\frac{1}{4}$d.

TALLOW.—Beef, fine, £33 10s.; medium, £30; mutton, fine, £37 10s.; medium, £32 per ton.

MARSUPIAL SKINS IN THE LONDON MARKET.—It may be of interest to kangaroo-shooters and other dealers in marsupial skins generally to compare the values of such skins in the British market with those ruling here. Messrs. Anning and Co., London, reporting on their January sale of Australian opossum and other skins, write:—There was a good supply of all classes, except bearskins, which were very short. With a strong demand, practically everything was cleared. Opossums realised 5 per cent. advance on the closing prices of October, while bears were 30 per cent. and wallaby 15 to 20 per cent. higher on average. For good parcels of Sydney the demand was especially keen, and they sold relatively better than the commoner descriptions. Victorians and Tasmanians also realised high prices. The best lots of silver bearskins sold at the highest prices that have been touched for many years, while the commoner selections were also considerably dearer. Swamp wallaby advanced 10 per cent., and Tasmanian sorts 20 to 25 per cent. Furriers' kangaroo also sold to advantage. Offered.—Opossum, 934,675; bear, 31,687; wallaby, &c., 166,746; kangaroo, &c., 3,066; fox, 6,394; emu, 319; total, 1,142,887 skins. Sold.—Opossum, 934,675; bear, 31,687; wallaby, &c., 166,746; kangaroo, &c., 3,066; fox, 6,394; emu, 319; total, 1,142,887 skins. The prices realised are as follow:—First extra large blue, 1s. 4d. to 1s. 10d. per skin; second ditto, $10\frac{3}{4}$d. to 1s. 2d.; first blue, $10\frac{1}{2}$d. to 1s. $4\frac{1}{4}$d.; second blue, $8\frac{1}{4}$d. to 1s.; small ditto, $7\frac{1}{2}$d. to $10\frac{1}{2}$d.; first extra large red, 1s. 1d. to 1s. $8\frac{1}{2}$d.; second ditto, $8\frac{1}{4}$d. to 1s. $3\frac{1}{2}$d.; first red, $9\frac{1}{4}$d. to 1s. $0\frac{3}{4}$d.; second red, $6\frac{1}{2}$d. to $9\frac{1}{2}$d.; small red, $5\frac{3}{4}$d. to $8\frac{1}{4}$d.; thirds, 3d. to 7d.; first Victorian, 2s. 9d. to 3s. 7d.; second and small Victorian, 1s. 1d. to 2s 5d.; third Victorian, 9d. to 1s.; grey Tasmanian, 1s. 4d. to 3s.; black Tasmanian, 2s. 11d. to 6s. 9d.; bear, silver large, 11d. to 1s. 11d.; ditto, red, large, 8d. to 1s. 3d.; ditto, small, $3\frac{3}{4}$d. to $4\frac{1}{4}$d.; swamp wallaby, large, 1s. 1d. to 2s. 7d.; ditto, middling, 8d. to 2s. 1d.; ditto, small, 8d. to 1s. 9d.; rock wallaby, $1\frac{1}{2}$d. to $6\frac{1}{2}$d.; Tasmanian wallaby, 2d. to 2s. 3d.; kangaroo, $6\frac{1}{2}$d. to 1s. 7d.; ringtails, 1d. to 4d.; native cat, 4d. to 1s. 2d.; house cat, 2d. to 8d.; wallaby, 1d. to $8\frac{1}{2}$d.; emu, 1s. 7d. to 3s. 6d.; fox, 6d. to 3s. 6d.

Agricultural Patents.

PATENTS ACCEPTED.

Pneumatic Cane or Weed Cutter.—Classes 30, 66—(2 Figures)—6292: Ralph Herbert Paul, of Brisbane, Queensland, Judge's Associate. "A Tool for Cutting Sugar-cane, Prickly-pear, and other Vegetable Growths." Dated 30th October, 1901. (Drawings, 7s. 6d.; specification, 12s.) A special tool of the type described in Specification No. 5561. The pneumatic percussion motor is of the valveless type and is grasped by a hollow lateral handle; the chisel or hoe-like cutter has a polygonal guide-stem to prevent rotation; the body has a prolonged axial shaft hinged to an arm-plate for strapping against the operator's arm near the elbow; the cutting tool may have a prolonged stem for cutting cane close to or below ground without stooping, and for reaching amongst cactus plants; the exhaust air passes through the hollow handle and is discharged as a cooling jet against the operator. (9 claims.)

Adjustable Harrow.—Class 28—(9 Figures): The harrow has one or more sections which carry spring (or other) teeth on cross-bars that may be adjusted by a lever and rack on the main frame. The front end is carried by a central shoe or skid, which may be adjusted for height by changing bolt-holes on the draft-bar. A pair of carrying wheels at the back corners are attached to arms on a rocking cross-bar, with shifting lever and rack, the arms being adjusted by serrated surfaces, through which the connecting bolts pass; this rocking cross-bar also carries a row of trailing teeth that may be adjusted for depth by rocking the bar. (4 claims.)

Transport Attachments for Implements.—Class 28—(4 Figures)—6143: D. M. Osborne and Company, of No. 24 Genesee street, city of Auburn, county of Cayuga, New York, U.S.A., manufacturer (Assignee of Charles Stephen Sharp, of 62 Genesee street, Auburn, Cayuga, New York, U.S.A.) "Improved Transport Attachments for Harrows." Dated 29th July, 1901. (Drawings, 40s.; specification, 8s.) To enable cultivators or other implements of any construction to be lifted clear of the ground on to travelling wheels, the said wheels are mounted at the ends of a deep-cranked axle, the transverse part of which is journalled across some convenient part of the cultivator frame. During the use of the cultivator the legs of the cranked axle with the wheels are turned up, but for travelling are turned down and linked to the cultivator by suitable catches; by using the pole as a lever the operative parts of the cultivator are raised and brought forward so as to be fairly balanced over the axis of the carrying wheels. (5 claims.)

Combined Depilatory and Fire Brand.—Classes 08, 36—(11 Figures): To enable the brand to penetrate through wool or hair and actually touch the skin, the outlined surface is constructed of pointed combs attached to the surface, with peforations in the surface near the roots of the comb teeth, so that a depilatory or colouring composition may trickle down the teeth to the skin. The depilatory composition is composed of equal parts of sodium sulphide, slaked lime, resin, and boiled linseed oil incorporated to a solid waxy cake. The colouring matter is similarly a waxy cake of equal parts of resin, linseed oil, and colouring matter. The waxy material is placed in a metal pan or case attached to the back of the brand; and may be heated intermittently by hot sand or melted lead, or may be continuously heated by a special vapourising oil-burner of the "Primus" type so arranged as to act in any position, and with a reservoir pipe (with stopcock) passing through the handle so that the reservoir may be refilled without cooling the burner; the main oil-vessel is also made of a curved shape to screen the handle from the radiant heat. (15 claims.)

CASTRATING CLAMP, WITH KNIFE.—Classes 36, 81—(2 Figures)—6030: Edgar Hale, of Kereru, Hawkes Bay, New Zealand, station hand. "Improved Appliances for use in Castrating Lambs and other Animals." Dated 25th May, 1901. (Drawings, 7s. 6d.; specification, 4s. 6d.) A pair of metal serrated jaws are used, one fixed in a metal frame and the other movable in slides operated by lever and toggle link; the frame is attached to a handle so that by pressing the link against handle the jaws are closed. A knife-blade fixed to one end of the handle may be folded into a slit when not in use. (4 claims.)

PERCUSSION BAG-SHAKER.—Class 58—(3 Figures)—6166: The Cotton Seed Company, Limited, of 37 Old Jewry, London, England (Assignees of John Charles William Stanley). "Improvements in or relating to Bagging Apparatus." Dated 16th August, 1901. (Drawings, 10s.; specification, 4s.) Improvements on Specification No. 6050. The four posts may be adjusted to suit various bags by being placed in different holes in the platform; the guide-sockets have enlarged bottoms to prevent jamming with dust; the elastic pads are placed at the four corners on the guide-sockets instead of at the centre. (4 claims.)

AXE-HEAD AND HANDLE.—Class 72—(5 Figures)—6178: Robert Henry Carter, of Kimbolton, New Zealand, farmer. "An Improved Axe-head and Handle therefor, and for other analogous Implements." Dated 24th August, 1901. (Drawings, 7s. 6d.; specification, 4s. 6d.) The axe-head is formed solid, and in place of the eye is a projecting tapered tongue which fits in a slit in the handle; a tapered ferrule is driven over the handle and a lock-bolt passed through all three parts. A rubber layer is put at the upper edge of the handle under the ferrule. (5 claims.)

NATURE'S REMEDIES.

There seems no excuse for the continual use of drugs if the same remedial effects are to be found in the more palatable form of vegetables and fruits.

Does the system demand sulphur? We find it in turnips, onions, cabbage, cauliflower, watercress, and horse-radish. The much-maligned potato is rich in salts of potash. French beans and lentils give iron. Watercress contains a sulpho-nitrogenous essential oil, iodine, iron, phosphate, and other salts, and spinach salts of potassium and iron in such quantities that the French term it "the broom of the stomach," and food specialists rate it as the most precious of vegetables, says an exchange.

In cases of anæmia, cabbage, cauliflower, and spinach prove distinctly beneficial. "Love apples," our modern tomato, stimulate the healthy action of the liver. Asparagus is beneficial in kidney troubles. Celery is said to be a cure for rheumatism and neuralgia. The carrot forms blood, and adds to the beauty of the skin. Beets and turnips keep the blood pure, and improve the appetite.

Watercress, like asparagus, is good for the kidneys, and is a stimulant to mind and body.

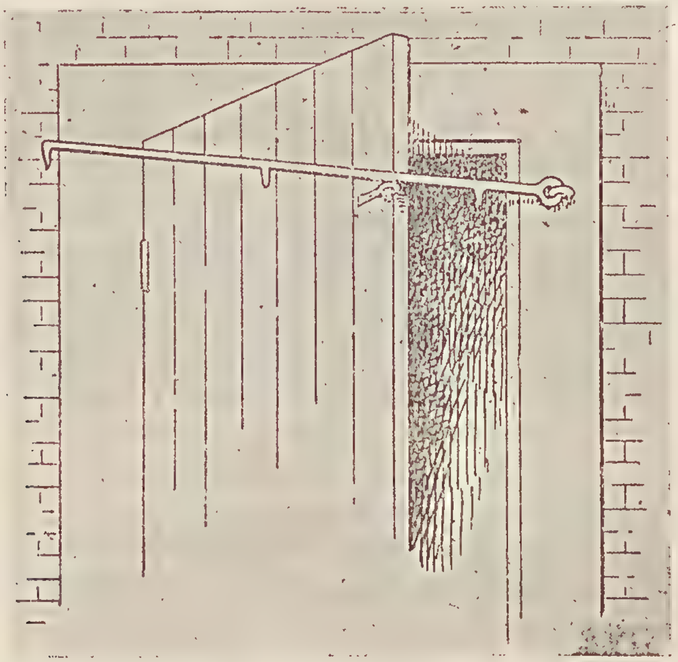
Lettuce is extremely beneficial for tired nerves, and the lassitude peculiar to spring.

Parsley proves an excellent tonic, and also clears the complexion, while the whole array of "greens"—mustard, cowslip, horse-radish, dock, dandelions, young beet tops, and even stalks of the milk weed—are religiously added to the spring-time bill of fare, to clear the blood, regulate the system, and remove that tired feeling so closely associated with the vernal season.

General Notes.

CONTROLLING DOORS OF FARM BUILDINGS.

The following sketch from the *American Agriculturist* shows how a door may be conveniently kept ajar as widely as required for ventilation or otherwise:—



A blacksmith can fashion the ironwork in half-an-hour, and we are sure it will be money well spent. The rod can be attached either to the inside or outside of the doorway. The use of ⅜-inch round iron is recommended, and the staples should be attached to door and post sufficiently high to allow a person to walk under the rod when it is in use.

A PETRIFIED FOREST IN THE TRIPOLI DESERT.

That great desert in the forbidden hinterland of Tripoli, Northern Africa, which has not been visited by Europeans for fifty years, has now been explored by Mr. Edward Dodson, a young Englishman who went out last March. The members of the expedition experienced much difficulty with the authorities; at one place they were put under arrest, and on two occasions threatened by Arabs, who prepared to ambush them.

One of the most notable things on the journey to Murzuk was the great petrified forest. For ten hours they travelled across an area of petrified trees varying in circumference from 7 feet to a few inches. Every branch of this forest was, of course, lying prone, and this together with the presence of marine shells showed that this part of the Great Sahara had at one time been submerged.

One night they were surrounded by thunderstorms. No less than five distinct storms were in progress all round, and the guns and spears of the party became surrounded by a halo of phosphorescent light, which greatly alarmed the superstitious attendants, who regarded this as a further judgment upon them for travelling with "unbelievers."—Reuter, *Daily Mail*.

HOW TO GROW WATERCRESS.

Excellent watercress can be grown without running or even standing water. The plants should be treated like celery plants. Dig in plenty of good, old, well-rotted manure into the bottom of the trenches, and sift a little fine soil over it. Dibble the cuttings in at about a foot apart, filling up with rich mould. Give the whole a good watering, not a dash from a bucket, but a gentle, steady sprinkling from a fine-rose watering pot, which will fall "like the gentle rain from Heaven." In a month or six weeks the cress can be cut. After cutting, give the bed a good dressing of manure all over and water well. Repeat this treatment at every cutting. Watercress will also thrive well and yield good crops if sown amongst weeds on a creek bank or on the edge of a waterhole or swamp.

THE HEALING OF WOUNDS.

Wounds may heal so long as the sap is circulating, but most readily during the late spring and early autumn. Cold and wet, as well as great heat and drought, act against the movement of the sap, and in its absence the bark on the sides of wounds is liable to be killed. Keep wounds clean and smooth if you would have them heal over. Apply no mineral poisons, such as red or white lead, or ordinary wood paint. Vegetable oils, lard, or other animal fat, or grafting wax, will serve to keep out damp and disease germs, toadstools, insects, and extremes of heat and cold; so that any sap brought to the margin of wounds will remain alive to formulate new bark.

THE ADIRONDACK FORESTS.

The College of Forestry, connected with Cornell University, is defended by Director B. E. Fernow in answer to misstatements made recently in the *New York Times*. Instead of "denuding" 500 acres of Adirondack land, it has "cut over" this area; and it planted 255 acres out of 300 acres requiring replanting, though some of the "cut over" territory cannot be planted the same year. The purpose of the forester is so to arrange this whole 30,000 acres that it can be harvested continuously; growing a young crop and cutting out old trees every year. The reproduction of wood crops and earning a revenue therefrom are the purposes for which the college was organised. While the hunter's interests are of secondary consideration in the very small part of the Adirondacks affected, Mr. Fernow claims that the change from open old timber to a young plantation is rather an advantage to the breeding of deer.—*Engineering News.*

THE AGRICULTURAL BANK.

The establishment of a State Agricultural Bank is now accomplished, and three gentlemen have been appointed trustees to carry out the provisions of the Bill. The object of the institution is to help intending settlers on the land.

The main provisions of the Agricultural Bank Bill are as follow:—The sum of £250,000 is to be raised by Government debentures for the purpose; a manager and trustees are to be appointed by the Governor in Council; advances from the bank to borrowers may be made up to £800, which loans will be secured by mortgages upon the land and by first mortgages only. Interest is to be paid by the borrower at the rate of 5 per cent. per annum for five years. Half-yearly payments of £4 0s. 3d. will be required for every £100 lent, and the whole amount advanced will have to be repaid within twenty years after the five years' period has expired, but any borrower able and desirous to repay before that time can do it. On default of payments the trustees can take possession of the land and sell the whole or part of it to meet their demands, and failing to secure a purchaser the land will revert to the Crown.

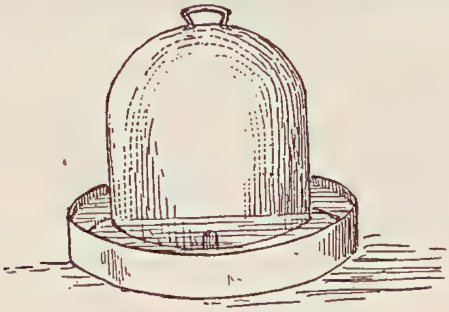
ELECTRIC DIET.

A member of the medical faculty of the University of Michigan has discovered that a galvanic current promotes the growth of tissue, or, in other words, increases the amount of flesh. That electricity exerts a beneficial influence upon the growth of plant life has long been known. Perhaps this circumstance suggested the idea of electrically stimulating animals.

Two cages of guinea pigs, six to the cage, were experimented with. The guinea pigs were all exactly the same age. Through one of the cages an electric current was passed day and night. The other cage was in no way electrified. For a stated period the animals in both cases were fed with precisely equal quantities of food of the same quality. The experiment proved that guinea pigs who lived in the electrified cage gained in weight during a measured time 10 per cent. more than those in the non-electric cage. If, as a result of these experiments, electricity be applied on a large scale to the fattening of animals used as food, we may some day hear of "electric bacon" or "electric beef," which will command a special price.

WATER TROUGH FOR FOWLS.

Mr. J. Lambert, Aitkenvale, describes his method of providing water for his fowls, by which the birds are always supplied with fresh water, and the chance of chickens being drowned is completely avoided. He uses a 14-inch stump cap into which he inverts a kerosene tin full of water. The water runs out sufficiently to always keep the dish full. One tin will serve seventy-five fowls for a day. In Vol. I., p. 443, of the *Journal* for 1897 we described and illustrated a similar contrivance, which we still have in use. It acts precisely in the same manner, a small square hole at the bottom of the zinc dome allowing the water to escape into the dish. We reproduce here the apparatus—



DESICCATED SWEET POTATOES.

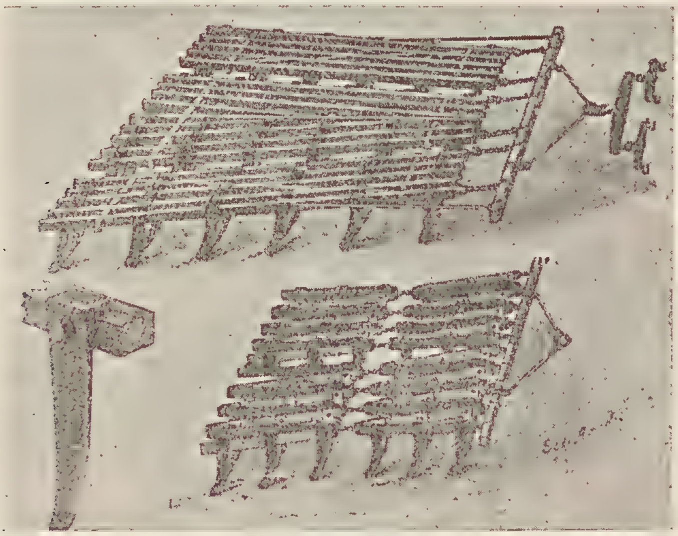
The *West Indian Bulletin* gives the following description of a method of preserving sweet potatoes for use as a table vegetable:—

Uncooked sweet potatoes may be sliced and then dried either in the sun or in evaporators. They are prepared for the table by soaking and baking. Dried sweet potatoes were exhibited among the products of Japan at the Columbian Exposition. Their preparation is described as follows:—"Cleanly washed potatoes are placed in a suitable basket and immersed in boiling water for a short time: when taken out of the basket they are cut into thin slices and spread over mats and exposed to the sun for two or three days. In order to make a superior quality, the skin of the potato is peeled off before slicing." As an indication of more recent developments it may be mentioned that a company has been lately started in New Jersey, America, with a capital of 1,000,000 dollars, to make flour from sweet potatoes. The early results are reported as being very successful, and it is proposed to erect mills all through the sweet potato growing region. The more important States in this region are North and South Carolina, Georgia, Texas, Alabama, Mississippi, Virginia, and New Jersey.

A NOVEL HARROW-TOOTH.

A harrow-tooth, that will cut and therefore will not clog, is an invention for which Mr. Augustus H. Schaffer, of Ontonagon, Mich., has received a patent.

The tooth is made of flat spring-steel, is tapered, and is formed with a rectangularly-extending flange at its upper edge, which flange is intended to fit snugly over a harrow-tooth bar. The one side face of the tooth is convexed and the opposing side concaved. Furthermore, the front cutting edge of the tooth is sharpened and convexed, and the back concaved. Teeth of this form



cut through the ground and do not clog, but form sharp furrows. After a harrow fitted with the teeth has been passed over a field the surface of the ground is thoroughly sliced, but still smooth and level.

Mr. Schaffer intends to apply his invention to harrow-frames of peculiar construction. One of his harrow-frames is made of 2 x $2\frac{1}{2}$-inch hardwood, with longer dimension upright. Six teeth are fitted to each full-length piece. A beam, the length of which is as great as the average width of the harrow, is attached to the front of the harrow by means of hooks and links. At each end of this beam a rod extends backward along the side of the harrow, and is attached at a point near the centre of the outside piece.

Another form of frame is made of steel sections, bent zig-zag and connected by links. The beam running across the front of the frame is hinged at the middle.—*Scientific American.*

THE TICK PEST.

The Stock Board has had under consideration the present position of matters in regard to the tick pest. The advisability of maintaining the present buffer area near the South-eastern border, in view of the outbreak at Nerang, was carefully discussed, and it was decided to recommend that the buffer area be maintained, with a slight modification, which will exclude Nerang. Consideration was given to the outbreak at Warwick, but it was concluded that this was a matter for the administration of the department. An area 2 miles square is to be declared infected, and in this, although all the stock have been hand-treated, it is declared that they must also be dipped, for which purpose a dip is now under construction. As this is an isolated case, it is hoped that the pest will be stamped out. Three applications were received for placing Northern stations out of quarantine, but the permission was only given in the case of Clonough Station.

FEEDING THE SITTING HEN.

A sitting hen should only be fed once a day. If her appetite is decent, she should get hard grain only, and for preference maize. The latter keeps up the heat of her body much better than any other kind of grain, although a feed of barley may be given twice a week as a change. If she will eat little or nothing, then she must be tempted with soft food. A little oatmeal, with some barley-meal, is best, and as soon as she will take to hard grain it is better that this alone should be supplied. Green food should not be given, as this has a tendency to relax the bowels, which is undesirable. Sharp grit should be in a box at hand, although sitting hens seem to pay little attention to it, and a supply of pure water should also be given. It is better to give them their corn first, however, as they are likely to drink so much water that they will eat very little afterwards.

A dust bath should always be waiting them after they come off the nest. This is most necessary for their comfort, and should never be omitted.

NOTES ON THE CAIRNS AND HERBERTON DISTRICTS.

These will appear in the next number of the *Journal.* Pressure on our space precludes their publication in the present issue.

AGRICULTURAL CONFERENCE.

The next Agricultural Conference will be held at Toowoomba on the 10th, 11th, and 12th June.

NATIONAL AGRICULTURAL AND INDUSTRIAL ASSOCIATION OF QUEENSLAND.

Entries for the Twenty-seventh Annual Exhibition of the Association will close on 15th July. Late entries will close on 19th July.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

COWS PER MILKER.

DAIRYMAN, Walloon—

Question.—How many cows should a man be able to milk at a sitting?

Answer.—Not more than twelve, if so many. By long working certain muscles become tired, and they cannot extract the milk properly from the udder. Don't put too much on your hired man. There is no economy in it.

SHEEP ON THE JOHNSTONE RIVER.

T. S. NEYMAN, Goondi—

Question 1.—Will sheep for the butcher thrive in a country like the Johnstone River, where the rainfall averages 150 inches per annum? The country is high and ridgy.

Answer 1.—Sheep will not thrive on such country; but fat sheep, purchased for slaughter, may keep fair condition for a few months.

Question 2.—What breed of sheep would you recommend? Where are they procurable? Would cattle ticks affect them?

Answer 2.—Cross-bred sheep would be the best for such country. Romney Marsh sheep are the best fluke and rot resisting breed of sheep for coastal districts. Procurable in Victoria. Write to the Chief Inspector of Stock, Melbourne, for information.

WORMS IN HORSES.

A FARMER—

Question.—Can you kindly give me the symptoms indicating the presence of worms in a horse? What treatment should grass-fed horses receive for this complaint?

Answer.—Mr. P. R. Gordon, Chief Inspector of Stock, has kindly supplied the following information:—

Symptoms.—Two kinds of intestinal worms are commonly found in the horse, namely: First, the *Ascaris megatocephala*, or long round worm (sometimes 12 inches long), which we frequently discover in the dung; secondly, the *Oxyuris curvula*, or pin worm. This worm is usually white in colour, and about half-an-inch long.

In some cases the presence of worms may be detected by their being excreted along with the dung, whilst in other cases their presence can only be suspected by a peculiar hard, dry, unthrifty appearance of the coat, or at others by fragments whisking off the tail and by some dry brownish matter adhering round the anus.

Worms may also exist for a length of time without presenting any outward appearance which might lead to their detection.

In some cases they injuriously affect the health of the horse, whilst in others they seem to do no harm.

Treatment.—A dose of 2 oz. of turpentine given in a pint of linseed oil will effect a temporary clearance.

Worms, however, notwithstanding the temporary clearance effected by medicine, are apt to appear after a time.

Preventive Measures.—See that the water supply is good, and pour boiling water on all worms passed.

WINE PER TON OF GRAPES.

J. WILLIAMS, Gympie—

Question.—How much wine should I get from a ton of grapes?

Answer.—It all depends on the kind of grape, the season, and the district in which they are grown. *Garden and Field* happens to have answered the same question in its February issue, and says the following may be taken as an approximate statement:—

Carbeanet would yield from 100 to 110 gallons to the ton.
Shiraz up to 130 gallons.
Mataro from 130 to 150 gallons.
Dorodillo from 170 to 180 gallons.

TO PREVENT RUST IN IRON TANKS.

E. T. SMITH, Tiaro—

Question.—Can you inform me if there is any material that may be applied to the insides of iron tanks to prevent rusting, and at the same time will not spoil the water? How should it be applied?

Answer.—Paint the inside with red oxide (iron) paint. This is the best known preventive of rust.

FLAX CULTURE.

ULSTER MAN.—We shall be pleased to hear from you on the subject of flax culture. As you have given no address, and write under a *nom de plume*, we cannot reply to your letter. Please note that we require your name and address, which will not be published without your consent.

GUMMING IN PEACH-TREES.

JACK, Charters Towers—

Question.—Please inform me what causes peach-trees to discharge large quantities of gum from the roots (the leaves all fall off nearly), and what will prevent it? I found the gum when looking for some cause for the leaves falling off, as I had already sprayed them with Bordeaux mixture, but it did not seem to do much good.

Answer.—The gumming in peach-trees may be caused by any one of the following things:—

1st—Severe attack of scale insects, such as San José. Remedy in this case: Cut back the tree, and either spray with sulphur, lime, and salt-wash in winter, or paint with sulphide of lime or a good stiff whitewash.

2nd—Root borers. Remedy: Clear soil away, and after inspection for borers paint well round butt and top of roots with sulphide of lime.

3rd—Bad drainage and consequent sour condition of soil. Remedy: Drain.

FIGS FALLING OFF.

E. T. SMITH, Yarrabine, Tiaro—

Question.—I had a sucker of the White Genoa fig given me, which I planted near some other figs in my garden. It grew well, but the figs fell off before they were fully grown. Is there any cure for this?

Answer.—The only remedy is to work over the barren tree with a variety that fruits well in the district. The working over is done either by means of budding or grafting.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MARCH. Top Prices.
Apples, per half-case	8s. 6d.
Pears, per quarter-case	7s. 6d.
Pears, per half-case	14s.
Plums, per quarter-case	5s.
Lemons, per half-packer	7s. 6d.
Oranges	9s.
Mandarins	8s. 6d.
Persimmons, per half gin case	7s.
Quinces	5s.
Mangoes	8s. 6d.
Tomatoes	3s. 9d.
Pineapples, rough	5s. 6d.
Pineapples, smooth	5s. 6d.

AVERAGE TOP PRICES FOR MARCH.

Article.		MARCH. Top Prices. £ s. d.
Bacon	lb.	0 0 8
Bran	ton	5 11 8
Butter, First	lb.	0 1 $1\frac{2}{3}$
Butter, Second	,,	0 0 11
Chaff, Mixed	ton	4 6 8
Chaff, Oaten	,,	4 8 4
Chaff, Lucerne	,,	6 11 8
Chaff, Wheaten	,,	3 8 4
Cheese	lb.	0 0 $7\frac{1}{2}$
Flour	ton	7 15 0
Hay, Oaten	,,	4 3 4
Hay, Lucerne	,,	5 15 0
Honey	lb.	0 0 $1\frac{5}{6}$
Rice, Japan (Bond)	ton	14 16 8
Maize	bush.	0 4 4
Oats	,,	0 2 9
Pollard	ton	6 3 4
Potatoes	,,	6 1 8
Potatoes, Sweet	,,	3 3 4
Pumpkins	,,	6 8 4
Sugar, White	,,	20 15 0
Sugar, Yellow	,,	18 10 0
Sugar, Ration	,,	15 0 0
Wheat	bush.	0 3 1
Onions	cwt.	0 6 0
Hams	lb.	0 0 11
Eggs	doz.	0 1 $1\frac{1}{2}$
Fowls	pair	0 3 0
Geese	,,	0 4 9
Ducks, English	,,	0 3 3
Ducks, Muscovy	,,	0 4 0
Turkeys, Hens	,,	0 5 9
Turkeys, Gobblers	,,	0 12 4

ENOGGERA SALES.

Article.	MARCH. Top Prices.
	£ s. d.
Bullocks	9 18 4
Cows	7 16 8
Wethers, Merino	0 12 4
Ewes, Merino	0 7 8
Wethers, C.B.	0 12 0
Ewes, C.B.	0 11 6
Lambs	0 9 11
Baconers	1 14 9
Porkers	1 9 10
Slips	0 14 3

Orchard Notes for May.

By ALBERT H. BENSON.

The hints given in the notes for March and April on the gathering, handling, and marketing of citrus fruits apply equally to the present month, with this difference, however, that even more care is required, as the riper citrus fruits become, the more readily are they bruised and injured. May being usually a more or less dry month on the coast, the opportunity should be taken of cleaning up all weeds and rubbish that may have accumulated during the summer and autumn, and getting the surface of the land into a good state of cultivation, so that the comparatively small rainfall of the winter months may be conserved in the soil for the trees' growth. Unless this is done, fruit trees, especially citrus, are apt to suffer, especially if growing on shallow or badly drained soil with a retentive subsoil. Where not already done, all dead or worthless trees should be dug out; and if fresh trees are to be planted in the same place, then the holes from which the trees have been taken should be allowed to remain open, and the soil should be well exposed to the action of the atmosphere and be well sweetened. Land intended for planting during the winter should be got ready, more especially if it is new land, as it is a mistake to delay the preparation of the land too much, or to plant the trees in a raw, unsweetened, and improperly prepared land. What planting has to be done, see that it is done well, as an acre of land properly prepared will pay better than twice or three times that quantity treated anyhow.

Towards the end of the month, slowly soluble manures, such as boiling-down refuse or coarse bones, may be applied to the land, as they will become slowly available; and when the spring growth starts, the trees will get the benefit. Quickly soluble manure should not be applied now, but should only be used during a period of active plant growth, otherwise they are apt to be lost. Where possible, don't destroy the weeds and refuse of an orchard unless the same is diseased, or is likely to form a harbour for injurious insects, but rather form it into a compost heap, preferably with lime, and allow it to become well rotten, when it will be found to be a valuable manure for citrus and other trees in many soils; as, though our soils, as a rule, are great producers of weeds, many are actually deficient in vegetable matter, so that it is a mistake to burn off all weeds, grass, or other rubbish. This deficiency of organic matter in the soil is a serious consideration, as soils deficient in organic matter are usually deficient in nitrogen. and also they are deficient in the power to retain moisture—a matter of extreme importance in a country like this, where we are subject to such long spells of dry weather.

In the colder districts the pruning of deciduous trees may be commenced towards the end of the month, but in other parts of the colony it is better to wait longer, as the leaves are not off and the sap is not down. Pineapples, where at all subject to frost, should receive a light covering of grass or other similar material as a protection, or, where practicable, as in the case of scrub lands subject to slight frosts, they should be covered with a light framework covered with palm leaves or similar material.

Palm stems or saplings resting on forked posts, placed on either side of the bed to be protected, make a good framework; and with palm-leaves, tea-tree bush, or other similar material laid across from sapling to sapling, a very cheap and efficient protection against frost is obtained.

Gather and destroy all infested guavas, oranges, custard apples, &c., so as to destroy the larvæ of any fruit flies or peach moths that may be in them, as if these insects are well killed down now there will be many less to deal with next spring, and there is a chance of the earlier fruits being harvested without much loss.

Farm and Garden Notes for June.

FIELD.—Since the frosts will have occurred in many parts of the South-western district insect life will no longer be so rampant, nor will the growth of weeds much hamper the farmer, who will hence have a good opportunity to sow lucerne, rye, prairie, and other grasses without fear of their being choked by weeds. It has frequently occurred that lucerne sown at the end of April or in May during a dropping season has been choked by the dense weed-growth which the warm moist weather has called forth. Sow wheat, oats, barley, rye, vetches, and set to work to get the land ready for maize, millets, sorghum, panicum, &c. It is as yet far too early to sow maize in the South and West, although some do so in very warm sheltered situations with fair success, provided no frosts occur. It should be remembered that the winter only begins on the 24th of this month, so that maize would have to run the chance of at least three months' frosts. Our advice is not to sow, but to get the land ready and in good tilth for August and September sowing. Some farmers plant early potatoes in June, but they should only be planted next month, and then only in very sheltered positions. Arrowroot may shortly be taken up, as the bulbs will now be filling out rapidly. Dig sweet potatoes, yams, and ginger. If you wish to keep the potatoes for any length of time, store them in sand in a cool place. Never store them until they are perfectly ripe.

KITCHEN GARDEN.—There will be plenty of work in the kitchen garden this month. Keep the hoe constantly going. Transplant horse-radish, eschalots, rhubarb, seakale, and asparagus, using plenty of well-rotted manure. Water-cresses may also be planted. Running water is not an absolute necessity. Dig over the old rhubarb beds; give new asparagus beds a second digging.

All European vegetables may be sown during the month, but it is too late to sow onions. Towards the end of the month sow tomatoes in a frame, where they will be protected from the frost. Plant out cabbages, cauliflowers, and lettuces as soon as they are large enough.

FLOWER GARDEN.—Take up and divide herbaceous plants. Prune roses and cut off all superfluous, straggling, and dead branches of trees and shrubs. Sow candytuft, poppy, larkspur, dianthus, nasturtium, foxglove, Canterbury bells, &c. Plant bulbs as recommended in March. Dianthus will give a mass of bloom the whole year round if sown now. By pruning and cutting off all dead blooms, the plants will remain in full vigour.

Agriculture.

FIRST STEPS IN AGRICULTURE.

8TH LESSON.

THIRD STAGE.

BY A. J. B.

ROTATION.

Before reading this chapter, turn to the 6th Lesson of the Second Book. There you will find the meaning of the word ROTATION, and the OBJECT OF ROTATION, and certain RULES to be observed in the practice. The lesson concluded with an example of the FOUR-COURSE or NORFOLK ROTATION.

There are two cases in which ROTATION of crops is unnecessary. One is when you are in a position to supply the crops with a sufficient quantity of the manure exactly suited to their requirements.

The other is when the soil is of such surpassing richness that the same crops may be grown year after year on the same land without apparently diminishing its fertility.

The last condition is a common one in Queensland. The rich virgin scrubs, the extensive fertile plains of the table-land, and the level tracts lying between the coast and the Main Range are examples of lands on which rotation is not needed.

The first case is one which seldom occurs inland, especially at a distance from railways. The carriage by wagon, and even by rail for long distances, acts as a bar to a constant supply of manure.

Here then is where, by a good system of rotation, you may raise certain crops to advantage, even with a very limited supply of manure.

Many of the farm lands taken up forty or fifty years ago are also benefited by alternating the crops.

All books on scientific farming lay great stress on the value of rotation, and with good reason. It does not require a very brilliant intellect to understand that it is most damaging to any soil to continue growing the same crop year after year. The particular plant-food required for that crop is gradually used up, and then the farmer who puts all his eggs in one basket declares that the soil is worn out. If he would only think a little, and think in time, he would come to the conclusion that whilst one crop requires a great deal of nitrogen, another will restore nitrogen to the soil, and by alternating even two crops, the land will last all the longer.

It is not possible to lay down a law of rotation which is applicable to all soils alike or even to the whole of one district, but some rotations there are which are generally beneficial in most countries.

A very useful rotation is a crop of cow-peas followed by corn, and this again by a root crop. It is considered a good thing to interpose a grass rotation, and to follow the grass with corn and then to go back and begin again with peas, and follow the next grain crop with clover. But climate has a great deal to do with successful rotation. In some European dry climates the crops most suitable are wheat, barley, and beans; in damp countries, grass, oats, turnips, and rape are grown.

Wheat, sown after potatoes or turnips, produces heavier crops and plumper grain in a moist district than after clover or grass.

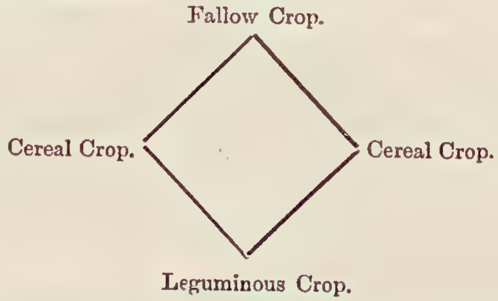
But, according to the state of your land, you may successfully stick to a rotation of grain and green crops, or you may grow wheat, barley, or maize even several times in succession. This, however, means that in no case must manuring be neglected. Now that artificial manures are so easily obtained it might be said that rotation is no longer necessary. But this is not actually the case. You may manure and grow grain crops successfully, but by and by a limit is reached, and you find that it will not pay you to stimulate the crops of wheat to a high productive point, so the next best thing is to grow grain crops in rotation with something else.

There are two general rules to be followed when rotation is practised, and I have outlined them already.

One is: Keep crops which require the same ingredients for their growth as far as possible from each other in a rotation. The other is: Do not follow a root crop with another whose habit of root growth is the same. I explained to you in the 6th Lesson of the Second Book that some plants are SURFACE FEEDERS, others *deep rooters*. As the deep rooters draw up plant-food from the subsoil in greater quantities than they need for their own growth, the succeeding crop should be a surface rooter, like turnips for instance.

In that lesson I also gave you an example of the four-course or Norfolk rotation. By the frequent growth of fodder crops and thorough tillage the fertility of the land is kept up.

Now look at this four-course rotation in another form as given by Professor Hedger Wallace in his book on Agriculture for Students. He represents it in this manner—



and then describes how several kinds of plants may be grown in the rotation:

(1.) An autumn-grown cereal.—Wheat.

(2.) Fallow crop.—Roots, turnips, mangel, cabbage, potatoes, &c.

(3.) Spring-sown cereals.—Maize, rice, imphie, setaria, &c.

(4.) Leguminous crops.—Peas, beans, clover for hay.

Now let us follow him through this rotation for a light soil. First of all the old wheat stubble is broken up by the plough, and the land receives a good manuring with farmyard manure and a little phosphate of lime in a very slowly soluble form. The manure should be well rotted so that it may not take up much room in the soil, and should be applied just before sowing time, because light soils are not retentive enough to hold the soluble matters of the manure for any great length of time before the crop is able to make use of them.

A fine tilth is then obtained by means of roller and harrow, the weeds are collected and burnt, and the fallow is ready (in England) for Swede-sowing in May and turnip-sowing in June. All through the summer the soil is kept hoed between the rows, and thus the dormant food in the soil is gradually made soluble by the action of the rain and air, and the roots greedily feed on the active plant-food thus produced, as well as upon the manure which was applied, and the nitrogen carried into the soil in autumn by the rain. And by cropping the fallow with roots, the active plant-food produced in the soil by fallowing is prevented from escaping into the soil.

Now, here is where sheep come in.

In winter these roots will be consumed by the sheep on the land, and so the plant-food that has been collected by the turnips from the various sources just mentioned will be again added to the surface soil in a slowly soluble form for the barley crop of the following year. Clover will be sown with barley in spring, and although at first it will take some little surface food from the barley, its roots will soon go beyond the roots of the barley and feed in a lower layer of soil. After the barley has been harvested, the clover should have a top dressing of well-rotted farmyard manure to give it a good start in winter. Its roots will continue to spread and search for food all the next spring and summer, and so prevent any loss of plant-food by drainage; and after the farmer has removed the first crop of clover as hay, and penned his sheep on the aftermath, he will plough the clover stubble up in autumn for wheat. The wheat will find a supply of food at the surface, in its first stage of growth, from the sheep manure and decaying clover stubble and leaves, and in the subsoil, in its later stage, from the decay of the clover roots.

This rotation may be lengthened into a five or even six course by keeping the clover down for one or two more years before ploughing it up for wheat; it would then be: ROOTS, BARLEY, CLOVER, CLOVER, WHEAT; or ROOTS, BARLEY, CLOVER, CLOVER, CLOVER, WHEAT. What is here called clover would there probably be a mixture of sainfoin, white clover, perennial (not common) red clover, and trefoil, as these succeed better for a few years together than common red clover along with grass seeds.

The Five-course or Berwick Rotation is: WHEAT, ROOTS, BARLEY, SEEDS (hay), SEEDS (pasture). In Scotland oats follow clover, and the usual rotation for a light soil is: ROOTS, WHEAT OR BARLEY, CLOVER AND SEEDS (hay), CLOVER AND SEEDS (pasture), OATS.

The above is given by Mr. Wallace as the rotation for a light soil.

Heavy clay soils being expensive to work and difficult to reduce to a fine condition, are not touched by Queensland farmers, so I need not say much about rotation on them beyond this, that the best rotation for a clay farm, well drained and deeply cultivated, is: FALLOW CROP (vetches, cabbage, mangel, or rape), WHEAT, CLOVER, WHEAT, BEANS; that is a five-course rotation.

I think that you will now have a very fair idea of the meaning of the word ROTATION, and of the value and objects of the system. If you turn to Lesson 6 of the Second Book once more, you will there find that I gave you seven advantages to be gained by alternating the crops on old land. You should bear these well in mind, for although, when you take a farm in this State, it is not likely that you will take up anything but new, virgin land, still it may happen that you will continue to work "the old farm" which your father has worked for a long series of years, and you will probably find it necessary to keep up the fertility of the soil by manuring or by rotation, therefore it is of advantage to you to have the knowledge which will enable you to do so.

Questions on Lesson 8.

1. In what cases is a rotation of crops unnecessary?
2. Can any general rule be laid down for carrying out a system of rotation in all districts?
3. What crops would you alternate with each other on a fair Queensland soil?
4. Name some crops suitable for—(*a*) a dry climate, (*b*) a moist climate.
5. What must not be neglected in a system of rotation on a poor soil?
6. What two general rules apply where rotation is practised?
7. Draw up a diagram and table for a four-course rotation.
8. Describe the method of carrying out this rotation.
9. Of what value are sheep on a farm?
10. Show how a four-course rotation may be lengthened into a five or six course.
11. What alternate crops would form a good rotation for heavy clay lands?
12. What should you always bear in mind regarding rotation?

9TH LESSON.

THIRD STAGE.

We will begin this lesson by looking up the 7th Lesson of the Second Book. I there told you something about "Green Manuring," and you heard that some farmers do not believe in this method of renewing the fertility of the soil, and the reasons were given for their unbelief. One was that they think it better to harvest the crop of cow-pea, velvet bean, maize, or peas, and feed stock with it than to plough it in as green manure.

Well, if a farmer keeps a fairly large number of dairy cattle, a flock of sheep, a number of horses, pigs, &c., then no doubt he would be acting wisely by growing crops with which to feed them, and thus obtaining sufficient manure for his cultivated land.

The methods adopted for feeding stock on a farm are pasturing and growing crops of maize, oats, barley, rye, and sorghum, which are mown before they come to maturity, or cow-peas, vetches, and such like plants, which are cut green and are daily given to the cattle in the cowyard or in the milking-shed.

This latter method is called "soiling" the cattle. The two systems have been very much debated in the old country, and even now I think it has been shown that they are both pretty evenly balanced. It must be largely a question, first of climate, and next of the adaptability of the land to certain crops, as to which is the right plan to adopt.

Let us see where the advantage of soiling lies. In this country we grow a large area of lucerne, which is not particularly well adapted for pasturing, but you know what an immense amount of fodder, either green or in the form of hay, is taken from a fertile, deep soiled lucerne field.

At the present time of writing, whilst the dreadful drought continues (April, 1902), the value of lucerne is such that, were it not that valuable dairy stock must be kept alive, it would pay the farmer better to sell it than to feed it to his stock. In really good seasons, when the rainfall has been regular, the lucerne springs up after cutting so rapidly and so luxuriantly that it may be cut within five weeks of the last cutting. At such times, when made into hay, it has been sold as low as 25s. per ton. In consequence of the drought, however, it has been bringing £8, £9, and even £10 per ton to those farmers who are fortunate enough to have fair crops, and it pays them to sell it and feed the cattle on wheaten chaff and maize "ENSILAGE" (of which I shall write by and by).

Experiments have been made by scientific men to find out how much nutriment can be got out of a field of lucerne, clover, or grass by the method of pasturing, and how much by soiling. But it was difficult to arrive at any certain conclusion, because when cattle are turned into a field to graze they waste a great deal of fodder by trampling it into the ground, and often they discover some particularly sweet patch which they will linger on until they have eaten it bare. Again, much grass or lucerne is destroyed by the dung falling on it.

Still, the results showed that where a field could be mown even three times a year it would be better to soil the cattle on the produce than to allow them to eat it down, whereas, if only two cuttings could be made, pasturing would be the better plan.

Now with our lucerne fields, which can be mown eight times a year, it would be obviously a mistake to turn cattle in to eat it down. Far better to mow it and feed it to them green, or as hay, or as ensilage. Then, if the cattle are properly housed or yarded, and the manure regularly collected, an immense amount of farmyard manure—the very best of fertilisers—would be the result, and the farmer would have the further advantage of being able to distribute the manure as he pleased and to distribute it evenly. Pasturing in the open field always results in unequal manuring of the land, because some parts, such as those where the cattle camp at night, are much over-manured, and other parts get no manure at all.

Taking everything into consideration, we must say that, so far as our grazing paddocks are concerned, whether on the farm or elsewhere, the farmer takes little or no trouble to keep them up or to renovate them. He leaves it all to Nature; and if Nature is unkind and withholds the rain, the cattle must take their chance, unless their owner has been wise and has laid up a store of

ENSILAGE.

For many years it was the custom, principally in foreign countries, to preserve certain kinds of cattle fodder in pits, treading it down, and then covering it with earth. This receptacle was called a "SILO," the process of packing in the green fodder without first turning it into hay was called "ENSILAGE," and the preserved material received the name of "SILAGE." For some time it was difficult to persuade farmers that packing together great masses of succulent green fodder like maize could result in anything but great fermentation and speedy rotting of the fodder. But within the last dozen years farmers all over the world have recognised the enormous value of SILAGE; and on every large farm, green fodder of various kinds is preserved either in special buildings, which, as I told you, are called SILOS, or else in stacks.

The old plan used to be to fill a pit with a green crop and weight it down heavily with earth. Then it was found that a few boards were sufficient, and eventually it was proved that no weight at all is required, merely a covering of some rough straw or grass being placed on top of it. The fermentation is set up, and in a few weeks a dark-looking substance is produced by it, which may be either SWEET or SOUR SILAGE, according to the amount of fermentation it has undergone.

What is the principle of the SILO? It is the exclusion of the air from the mass of green herbage.

Take the case of a dung-heap. The more tightly the heap is pressed together the less amount of air can penetrate into it, and, consequently, fermentation goes on much more slowly than if the heap were loosely thrown together. Now, the principle of the silo is based on our knowledge of what goes on in the dung-heap. If the fodder is closely pressed together, and the exterior air excluded, oxidation is almost prevented, and the fermentation which ends in decay is avoided.

Remember that the more you exclude the air from the silo the better will the silage be. I will explain to you afterwards how a silo should be built. Meanwhile let me tell you that a specially-built brick, wooden, or stone silo is not absolutely necessary. You may put your green maize into a stack. The bigger the stack the better, although some farmers have made stacks measuring only about 50 tons. You build your silage stack by piling up the green fodder, constantly trampling it down, especially at the sides. When it is finished, cover it with some kind of thatch, or boards, to keep the rain out of it, and keep everything in place by a few turns of wire made fast to the foundation.

Now, see what a great advantage to the farmer is this possibility of making silage in a stack. He can build it right in the field and so save a great deal of carting. If rain should come on when he has a quantity of lucerne cut, and it is likely to spoil before he can make it into hay, all he has to do is to build a silo stack with it, and he has saved his crop.

Of course you must not expect that you can save as much fodder from a stack as from a building, because the air *will* get in at the sides, and a good deal will be spoilt in consequence. The loss is reckoned at from 5 to 10 per cent. of the weight of the fodder. Still, that is better than losing perhaps 50 or 100 tons of your crop.

In a well-built silo, on the other hand, fermentation is very slow and often ceases altogether when the air which got in with the forage has been used up.

Maize or any other green crop may be put whole into the silo, but most people are agreed that it is better to chaff it first, and chaff it fine. You can see the reason for this. Fine-cut forage will lie closer than rough-cut or whole plants, and therefore there is less space for the inclusion of air. It can also be trodden down much firmer. This treading down must be performed thoroughly, especially at the corners and sides. Some people put a horse into the building to tread it down. The silo should not be filled all at once. Fill in three to four feet, tramp this well down and wait a day or two before filling in another layer. The first one will have settled down considerably, and will have heated to 125 degrees Fahr. Proceed in the same way till the silo is full. Then put on a covering of cut straw or coarse hay, packing it well in at the sides.

The value of the silage depends entirely upon the temperature to which it has been subjected, and the temperature depends upon the amount of pressure you have given it.

A silo should not be opened for six or eight weeks after storing the forage. By that time all fermentation will probably have ceased. Silage deteriorates very little with age. Maize silage has been kept for years without suffering in the least. And here is where its great value comes in. At a time of plenty tons of silage may be made which may not be required for two or three years. Suddenly a great drought like the present one comes on. Now is the time when the enormous value of the stored fodder is proved. Dry fodders, under even the best conditions, lose in feeding value continuously with age until they may have lost quite 50 per cent. of their food value. Again, the storage space required for silage, per ton of dry matter, is only about one-third of that required for hay. The capacity of a silo increases more rapidly than its depth. For instance, a silo 36 feet deep will contain nearly five times as much silage as one only 12 feet deep. Doubling the diameter of a silo increases its capacity a little more than four times, whilst, if you treble it, the capacity increases nine-fold.

A silo should always be fed from the top, as it spoils more rapidly when fed from the sides.

The weight of silage is slightly less than that of the green fodder it is made of.

One cubic foot of silage weighs about 45 lb. Every 50 cubic feet of the volume of a silo will hold 1 ton. If dairy cattle have the run of grazing paddocks, 1 cubic foot or 45 lb. of silage is sufficient for a day's ration per cow, but if the cows are fed in stalls then 60 lb. are needed, together with some hay or other feed. About 5 per cent. of the silage in a silo is waste, but on occasions cattle will eat even the waste. This is what Mr. Walter Madden (Victoria) says:—"Suppose you have 50 acres of green stuff, which would produce 100 tons of hay at a cost of £1 per ton for making. The same acreage would yield 300 tons of silage at a cost of 2s. per ton for making, and the 300 tons of silage would be worth at least double the amount per ton that the hay would be worth. Ten tons of green fodder equal 3 tons of hay, but 10 tons of green fodder will make nearly 10 tons of silage. The hay would feed a beast for 120 days, and the silage for 400 days, and, in addition, the silage-fed beast will milk better than the hay-fed one. The milk produced by silage is richer in cream, the butter is sweeter and of a better colour, and the cost of feeding is about one-half as compared with bran and chaff. Maize and barley make the best silage. A stack of 50 tons will take about six weeks to reach a maximum temperature of 160 degrees Fahr. It will then gradually go down until in about four months the normal temperature is reached.

"A building 20 feet long, 12 feet broad, and 10 feet high to the eaves, with an additional height of 6 feet from the eaves to the ridge, will contain 2,880 cubic feet. As each 50 cubic feet of silage weighs 1 ton, this gives 57 tons 12 cwt. as the capacity of the silo."

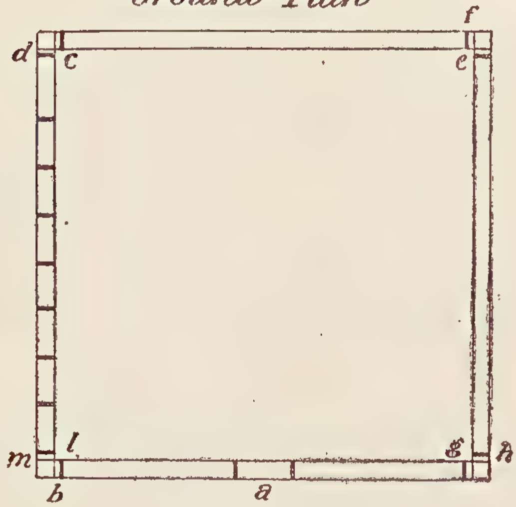
HOW TO BUILD A SILO.

Silos can be of any size you like, but for a small farmer a 50-ton or 60-ton silo would be large enough to begin with.

Say you decide to build one 14 feet long, 14 feet broad, and 14 feet high. This, when properly filled, should hold from 50 to 60 tons of silage. The

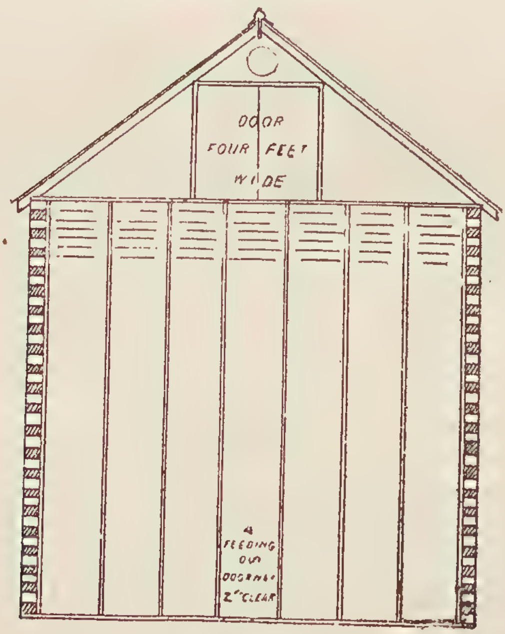
Sketch A

Ground Plan



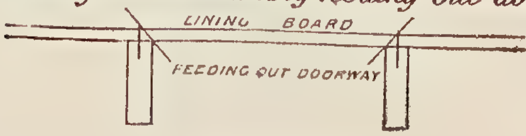
Sketch B

End Elevation.



Sketch C

Shewing mode of cutting feeding out door.



A Silo Building.

timber for this would cost in Brisbane about £12, and in timber districts where saw mills are established much less. Hardwood is to be understood.

Make the wall-plates and ground-plates of 8-inch by 2-inch hardwood. The 2-inch plates are to avoid the necessity for mortices and tenons, which lead to decay. Make the studding of the same dimensions. Now set a bottom plate on edge, and the corresponding wall plate, also on edge, opposite to it. Fit your studs, which should be 13 feet 8 inches long, and spike them through the top and bottom plates with strong spikes. The plates should be 15 feet 4 inches long, so as to overlap each other at the corners.

Observe, that there are no corner posts in the building. The studs nearest the corners are to be fitted exactly an inch away from the corner, so as to let every second lining-board through and be nailed to the broad side of the stud, and thus form a kind of dove-tail.

When you have fitted the studs and spiked them as directed to the plates, put the frame for each wall in place, upright, and fit them together and then spike the plates together, both top and bottom. The studs must not be more than 20 inches apart from centre to centre. If a little less, all the better. On one side under the gable put one pair of studs 2 feet apart in the clear. This is for the emptying or feeding-out door.

The Sketch A attached shows the sills, the position of all the corner studs, of the studs along one side, and of the feeding-out door studs *a*.

Now the framework of the silo is complete. What about foundation and floor? The foundation may be anything solid and level—blocks of wood, bricks, concrete, or stone, if handy. The floor may be of earth, ant-bed, or, if you like, asphalt or concrete. Earth or clay well rammed will do very well, especially if covered with a layer of ant-bed. The site should in any case be free from springs or wet.

The lining consists of one layer of hardwood, tongued and grooved. As this timber shrinks a good deal, it should be well seasoned.

The chief thing is to have the building as air-tight as possible. Each lining-board should be 14 feet 7 inches. The first board should reach from the outer edge of the stud at *b* to edge of stud at *c*, the second from *d* to *e*, the third from *f* to *g*, and the fourth from *h* to *l*, thus making one complete round of the silo. They should each be so fitted as to cover the 2-inch sill as well as 1½ inches of the studs, and be nailed to both sill and studs. Each board to be nailed firmly to all the studs inside the building that it touches, and to the broad face of the corner stud from which it starts. The second round of lining-boards begins at *m*, and goes round the opposite way. In this way every alternate board is fixed like a dovetail to the studs near the corners, and the building is made so strong there that it would take a great earthquake to burst it open.

I recommend 4-inch by 1-inch hardwood tongued and grooved lining-boards. They cannot shrink much.

In fixing the boards put the groove uppermost. This is not the usual way. When the first round of boards is finished, fill the groove with boiling tar. Put the next row of boards in position and force the tongue down into the tarred groove, using a clamp for the purpose. Do not drive them down with a hammer or mallet, or you will send the tar flying out in your face. When you have put in all the lining-boards, give the whole of the inside a good coating of boiled tar. The tar should be well boiled; it can be done in a kerosene tin if care be take to prevent it from catching fire.

The coating of tar will not hurt the ensilage; on the contrary, it will check moulding, preserve the wood, check its shrinkage, and improve its quality as a non-conductor of heat or cold. Tar is cheap, and need not be sparingly used.

Put a 2-inch or 3-inch fillet in the corners well coated with the tar.

It is not necessary to enter into details of roof. Any roof that will keep out heavy rain will do; but a door must be left in the gable above the wall-plate through which to fill in the greenstuff. It should be large enough to let a man get in and out beside the carrier, or there may be a door in each gable—one for the carrier, and the other for a man to go in and out by.

The feeding-out door need not be cut until the ensilage is wanted for use.

Sketch B shows end elevation with filling-in door 4 feet wide in gable, also feeding-out doorway 2 feet wide in the clear, and also the 4-inch boards dovetailing at the corners.

Make a saw cut diagonally across the boards towards the right and left, as shown in Sketch C. Take out the boards so cut out, and, numbering them, put them so that they can be replaced next season when filling commences. They will fit back in their places, and, if necessary, they may get additional support by an inch strip of stuff nailed near the edge of the studs.

For a moderate-sized dairy farm, for an outlay of less than £50, a silo and cutting plant can be obtained according to the following estimate:—

60-ton silo ... ... costing, say	£20
No. 11 Ohio ensilage cutter (capable of doing 3 to 4 tons per hour), with elevator 20 feet long ... ... say	15
Sweep, 2-horse power, geared with power jack ... ... say	9
Total	£44

The above is a description of a silo built by the Hon. A. J. Thynne on his farm at Westbrook. The cost of the silo is given at £20, but many farmers are very handy with tools, and could build it with their own hands much cheaper.

I have now given you sufficient information about ensilage and silos to enable you to appreciate the value of silage.

In the next lesson I will deal with dairy stock, dairy buildings, and utensils, pigs, and poultry. I do not propose to say anything about implements, because you will have no difficulty in finding out what implements your neighbours are using, and in deciding on which are the best.

Questions on Lesson 9.

1. What is meant by "soiling" cattle?
2. What are the advantages of soiling?
3. What are the disadvantages of pasturing cattle?
4. What crops would you feed to housed cattle?
5. What is the meaning of "silo," "ensilage," "silage"?
6. What is the principle of the silo?
7. How would you build a silage stack? What advantage has a stack in certain cases over a building?
8. How should a crop of maize be placed in the silo? Why?
9. Describe how you would fill the silo.
10. To what temperature will the silage rise?
11. How long should the silage remain before being used?
12. On opening the silo what part of it would you feed from? Why?
13. What is the weight of a cubic foot of silage?
14. How much is a ration for a cow daily?
15. What would the produce of 50 acres of greenstuff produce in hay? What as silage?

AGRICULTURE IN THE FAR NORTH.

BY THE EDITOR.

Comparatively few of the farmers, sugar-growers, and residents generally of the Southern portion of Queensland, and still fewer of the inhabitants of the Southern States, have any idea of the work that is being done in the far North by the pioneers of agriculture in the vast scrubs on the rivers of that portion of the State. The general notion is that the people there grow sugar and cut timber. Beyond that, people know nothing of Northern industries nor of the great development of the various districts in agriculture, sugar, coffee, and rice growing, mining, timber-getting, &c.

I cannot do better, to enlighten our Southern friends on these and other matters connected with the North, than by describing the country and the industries of one of the grandest agricultural districts in the far North extending from

Cairns,

on the coast, to Kuranda, Mareeba, Atherton, and Herberton inland, and from Cairns to the Mulgrave and Russell Rivers, and so on to the Johnstone River, Geraldton, Ingham, and the Herbert River.

The town of Cairns is situated on an inlet of the sea, on flat country surrounded by mountains. It is well laid out with wide streets bordered with fine shade trees, and possesses several very fine hotels and public buildings. The inlet is sheltered and deep enough to allow the largest coasting steamers to lie at the various wharves. There is direct steam communication between Cairns and Townsville and the intermediate ports of Geraldton, Mourilyan Harbour, Cardwell, Halifax, &c., also northwards to Port Douglas and Cooktown.

The name of the Barron Falls is no longer new to Australian ears, hundreds of southern tourists having been attracted to the district by the fame of their beauty and magnificence. There is no need therefore to describe them minutely here. There is one matter, however, in connection with these falls which has long since been mooted, but has come to nothing. That is, the utilisation of the falling water for the purpose of motive power, either directly through the force of the water, or for the production of electric power.

A very small stream falling upon or passing under a water-wheel will suffice to turn it, and set mill machinery in motion. When we consider what has been achieved in other countries, notably in America, in the way of utilisation of the power of waterfalls, it seems surprising that the people of Cairns, with three exceptions, have as yet done nothing with this natural power at their very door. There are fine long stretches of the river above the falls. Here, as was once proposed, a large dam could be constructed, from which turbines could be driven, and no loss of water ensue, as it would pass into the river again after doing its work. Even during the present dry season, the upper and lower reaches of the, river are full of water, although no very large body passes over the falls. There is always sufficient supply in the high ranges to keep the river perpetually running. In addition to the Barron Falls there are others, notably one passed on the railway line—the Stony Creek Falls—which descend in three beautiful, foaming cascades, passing under a spider-web-like railway bridge to join the Barron.

The scenery along this marvellous railway line as far as Kuranda is most beautiful, and to a certain extent awe-inspiring. The line, cut out of the side of the mountain, curves and winds in numerous sinuosities along the edge of fearful depths a thousand feet below. The mountains through which the line passes are clothed from base to summit with scrub of great height and density, but the whole country is a mass of rock and loose stone which, in addition to the steepness of the declivities, must render it useless for agricultural purposes. Still the richness of the volcanic soil is demonstrated by the quantities of wild papaw trees, mangoes, oranges, &c., which grow in profusion along the edge of the line.

At Kuranda and a mile or so further on, at Myola, there is a fair amount of land under coffee. Frost, however, occurs which does some damage. Nevertheless, I saw several plantations of well-grown trees in full bearing, and promising to yield crops of from 6 cwt. to 10 cwt. per acre. One grower, Mr. Street, has a splendid crop ready for picking. He manufactures his coffee on the farm, and puts it up in very attractive form in tins, which meet with ready sale. The township of Kuranda is over 1,000 feet above sea-level and enjoys a delicious climate; indeed, at the time of my visit (March), the air was keen enough to make it desirable to dispense with light clothing and substitute some warmer wearing apparel.

As I shall have to return to this place on my way to Mareeba, and wish to record my ideas on the coffee areas of the district, I will take the reader back to Cairns, and set out for the Mulgrave by what is designated a tramway, but what, in reality, is a railway owned by the Cairns Divisional Board. The gauge being the same as that of the Government lines, the engines and carriages can be used on them as well. The line passes through very fertile country, mostly under sugar-cane. At the Mulgrave Central Mill the directors kindly placed an engine and tram trolly at our disposal, and we were taken through several miles of fertile country, on which the cane was thriving well notwithstanding the dry season and the presence of the pestilential grub. The work of this insect is easily seen in the appearance of the cane plants, all affected patches having the appearance of having been badly frosted. The sugar-mill is a very fine building replete with modern machinery equal to turning out a crop of 6,000 tons of sugar during the crushing season.

From the Mulgrave to Aloomba much the same class of country is passed over, large areas are in a high state of cultivation, mainly under sugar, coffee, and maize. It is rather disheartening to hear the prognostications of evil times to come for the sugar-planter when the kanaka shall no longer be available. Still there are many hopeful planters who decline to cross the bridge till they come to it, and hope for the best.

At Aloomba, horses were kindly provided by Mr. P. Petersen, and I, accompanied by Mr. H. Newport, Instructor in Coffee Culture, rode to Hillville on Babinda Creek, a tributary of the Lower Russell, the property of Messrs. De Moleyns and Butter, a distance of about 26 miles. The estate is most beautifully situated between Mounts Bellenden-Ker and Bartle Frère. The house is picturesquely placed on an eminence overlooking the Russell River, which is here fairly wide and ripples in a clear stream over a pebbly bed, affording a perfect counterpart of a European mountain stream. Here there are some 118 acres under coffee at various stages of growth, much of it bearing for the first time, and some being seven years old and bearing heavily. Most of the trees I examined were laden from the crown to the ground with ripening fruit, all the lateral branches being closely packed with the cherry. There was not the slightest sign of disease, all the trees having a healthy bright green appearance.

The land, which consists of a sandy, loamy, granitic soil, is very undulating, some of the trees being planted on steep slopes. Evidently the soil is well adapted to the production of coffee. Naturally drained, no stagnant water can remain to injure the plants, yet there appeared to be plenty of moisture to keep the trees in vigorous growth. They are all topped to a convenient height for picking, and this work was going on at the time of my visit, the principal pickers being aboriginal blacks, who had a large camp pitched in the bed of the river on a dry sand-bar. They perform the work very well, and stick to it steadily. The price paid is a 1d. for 3 lb. of cherry, and as the pickers can average from 60 to 100 lb. a day, they and their pickaninnies earn what may be considered very fair wages for such light work. I gathered, from conversation with several coffee-growers, that they did not view with great alarm the threatened cessation of black labour so far as coffee-picking is concerned, as the work can be performed by whites as well as native blacks. Add to this that the crop is harvested during the cool weather of March, April, and May, and it will be understood that there is no such hardship in doing this work as in trashing cane during the hot months of the year.

Water-power is here made use of for driving the necessary machinery. The mill is built on a hill-side, and water is brought by pipes to a large water-wheel, which drives pulpers, hullers, winnowers, roasters, and grinding mills. Everything is done by gravitation, so that there is very little handling of the coffee. The finished article is made up in neatly labelled 1-lb. tins, which find their way all over the Southern States. Two varieties of coffee are made up for sale. One is absolutely pure, containing no admixture of chicory; the other contains from 6 to 9 per cent. of chicory, many people not being as yet educated to drinking the pure article. When the whole of this estate is in full bearing, which will come about in between two or three years, it will be a most valuable property, without any further expense being incurred. Coffee once planted will last for fifty years, and it is in full bearing in the sixth year. Three-year-old trees, however, always bear a certain quantity. Suppose a crop to reach only 10 cwt. per acre, selling at £80 per ton, the crop from 118 acres would be worth over £4,720 each season, so that a well-grown plantation of healthy trees in full bearing provides a handsome income, without entailing the enormous expenses attached to a sugar plantation and sugar-mill.

For many miles round this estate there are vast tropical scrubs, with a rich soil such as is rarely seen in the Southern scrubs. The road to Aloomba, which is merely a track cut through the scrub, is intersected at frequent intervals by rippling streams of ice-cold, clear water, broken by miniature cascades, reminding the traveller of the mountain streams of Switzerland and Germany. The timber is much like that of the Atherton scrubs, and, although it is very tall and of large girth, yet it does not inspire the beholder with the idea of immensity and magnificence imparted by the vast trees of the Herberton district. The scrub verdure is, however, very varied and beautiful, every tree being clothed from top to bottom with splendid creeping ferns and flowering vines of such varied form that none but a botanist could pretend to name a thousandth part of them. On the way to Hillville I was shown the proposed sites for a new central mill, the building of which, however, has been indefinitely postponed. I spent the better part of two days at the delightful and hospitable plantation, and rode back on the second day to Aloomba, getting a thorough good drenching from a rain storm, which suddenly came up and caught us in the scrub. For a considerable portion of the latter part of the track to Aloomba the work of building a continuation of the Cairns Tramway is being carried on, the rails being already laid to some distance. Everything going to Hillville has at present to be packed on horses or mules, the track being impassable for wheeled traffic, so that the tramway, even though reaching within only 12 miles or so of the plantation, will prove a great boon to the residents.

Arrived at Aloomba, I took the tram for Nelson, and delivered a lecture on cotton-growing to a number of farmers who met in the public hall. At the close of the meeting a tremendous downfall of rain occurred. This has been no uncommon occurrence all through the drought, which has so disastrously affected the Western and Southern districts, and fully accounted for the rich green appearance of the abundant grass in the open, the rich foliage and vegetation in the scrub, the healthy-looking crops, and the fat dairy cattle, where there were any.

Next day and night were spent at Hambledon, the property of the Colonial Sugar Refining Company, under the management of Dr. Reid. That gentleman provided me with a horse, and, under the guidance of Mr. Clark, who has charge of the important experiments being made with seedling canes, I visited several of the farms in the district. Cane, corn, and sweet potatoes were the staple crops. On our return we called at the Messrs. De Moleyns Sugar Plantation, which is under the management of Mr. Swallow.

Here we again had evidence of the damage done by the cane grub, many acres showing the russet brown indicative of its labours. In marked contrast to the damaged cane were several rows of New Guinea canes which stood perfectly upright and green without a sign of any attack from the grub. The explanation was, that these canes produced such masses of roots that there was an ample supply to feed both the plants and the grubs without damage to the former. If it is proved that these new canes contain as high a percentage of crystallisable sugar as the varieties usually planted, it may be that the grub will cease to be such a great source of loss to the planter as at present.

Efforts have for years been made to produce new varieties of cane-plants from seed without success. But after several years of vain experiments, Mr. Clark has been successful, and thousands of plants have been raised by very simple means. One thing Mr. Clark noticed was that, when he took the seeds from fields of one variety only of cane, failure resulted. Then it struck him to try seed from a field containing several varieties. These were sown under glass, and Dr. Reid advised a screen of red linen. The result was that numbers of seeds were raised. These have been planted out, and some of them are from 6 to 8 feet high, being very thick canes, more like suckers of the old Bourbon than like canes for the mill. All these will be carefully tested, and it is hoped that the results will be satisfactory.

At Mr. Swallow's, chicory was being prepared by sun-drying. It appeared to be of very good quality, and should be of much value in a coffee-growing district.

Leaving Mr. Swallow's hospitable gates, we returned to Hambledon, and in the evening I met a number of farmers who appeared to be greatly interested in the matter of cotton-growing. I understand that some have since written to the Agricultural Department to inquire as to the means of obtaining seed. I was shown cotton bushes on several farms, which gave evidence of the suitability of the soil and climate for the production of Sea Island cotton. I am convinced that if the farmers would agree to put in from 2 to 5 acres each on land which no longer produces heavy crops of cane, they would be no losers, especially in the case of farmers I met, who had from nine to eleven sons each. Dr. Thomatis, of Smithfield, near Cairns, has planted 15 acres of cotton, and expects to obtain a yield of 9 lb. of Sea Island cotton per tree. This seems a large order, but the doctor says that he knows this to be the yield, from his own experience. If such a crop can be obtained, it means 3 lb. of clean lint per tree, and as he plants them 7 feet apart every way, he will have 881 trees per acre, yielding 2,643 lb. of clean lint, worth from 2s. to 2s. 6d. per lb. Besides this, there will be 5,286 lb. of seed, worth £4 to £5 per ton. I shall decidedly watch this experiment, for such a return has not been heard of in Queensland to my knowledge, and I sincerely hope the doctor's anticipations may be fully realised.

I was introduced to a farmer named Petersen, close to Hambledon. He was a successful cane-grower and a believer in white labour, so I asked him how the loss of the kanaka would affect cane-growers. His reply was ambiguous in the extreme. He is the father of nine fine sons. The eldest of these boys help him to do all the work in connection with his sugar crop. Why should he employ black labour? The young men, I suggested, earned white men's wages. Well, there was the rub. He could not afford to pay his sons the wages they could earn in other capacities or as regular farm or mill hands. It was not fair to the boys, but what could he do? "Employ black labour while you can get it," was my natural suggestion. But this would be against his principles as a believer in the Labour Party. The natural inference was that rather than employ black labour, and being unable to pay proper wages to his sons, he would throw up the farm, only he did not say so, and I did not press my inquiries further. It is wonderful what men will do for the sake of a principle. He has a beautiful farm, a comfortable home, rich land, and a good crop, and yet —— but I eschew politics.

After a day's travel through various plantations, in the course of which trip I met and conversed with several farmers, who all promised to meet that evening at O'Brien's Hall at Hambledon Junction, we returned to Hambledon, and I paid a visit to Mr. Binnie, who owns a cane farm 9 miles from Cairns. He had kindly arranged for the use of the hall for the evening, and had sent out messengers to notify the farmers, with the result that there was an excellent attendance that evening, and, as a consequence of my lecture, several farmers expressed themselves as willing to add a few acres of cotton to their cultivation provided suitable seed could be obtained. I must here express my obligations to those gentlemen in this and other districts of the North who took so much trouble to show me round the country and to make my visit profitable and enjoyable. Wherever I went horses and vehicles were willingly provided, and it is entirely owing to the efforts of the planters and others to assist me that I was enabled to see so much of the country and of the industries carried on there during my short visit.

My next trip was to Atherton, which is reached by train *viâ* Kuranda and Mareeba. The trip to Kuranda has already been described. After leaving that beauty spot, the landscape in a few miles alters for the worse. The country passed through is particularly uninteresting, the soil is poor, and the grass and timber not particularly good. As far as Myola, however, and for some distance beyond it, the country is rather pretty, and the line runs parallel with the Upper Barron River, which presents some fine reaches.

Mareeba is a pretty little town, the main street being built only on one side, the other being an open level space. There is a rather pretentious two-storied hotel not far from the railway station (the Federal). This is also the booking-office for Cobb's coach to Atherton. Making only half-an-hour's stay at this place, I took the coach for Atherton, distant about 26 miles. The road, apparently level, rises gently as far as what is known as the "Jump Up," a short, steep pinch, after which it is level for miles. Here, again, the surrounding country is flat and uninteresting, the soil volcanic, and strewn with basalt boulders. The timber is very poor, consisting of small gum, ironbark, and Moreton Bay ash. The railway line has been surveyed and cleared almost to Atherton, but for some reason, stated to be a difficulty in connection with the purchase of private property, through which the line must pass, the working gangs have been dismissed, and the undergrowth is springing up rapidly on the earlier cleared sections, which will necessitate a second clearing when work is again started. There is no water apparent on this route until Rocky Creek is reached. Near this spot was a railway survey camp in charge of Mr. Stringer. His assistant, Mr. Guinneth, was about shifting camp to Atherton.

The appearance of the country now undergoes a great change for the better. Level for many miles, it is lightly timbered and well grassed. There were no signs of a protracted drought, the grass being as green as during a wet season, and all the cattle I saw hereabout were fat and healthy-looking, although the ticks have been very bad in the district.

That the soil is well adapted for agriculture and fruit-growing is proved by the splendid crops of corn obtained on the few selections along the road-side. At one place especially the corn was from 10 to 12 feet high, and cobbing well. Mangoes, oranges, lemons, and other fruit-trees were growing vigorously.

The soil should be very suitable for cotton and wheat-growing. There are thousands of acres of this land which requires little clearing to enable the plough to be used in cultivation. Water is obtainable in several never-failing creeks, and I was told that plenty may be got in shallow wells. On my asking why more of this land was not taken up for agricultural purposes, the reply was that selectors preferred taking the scrub lands, one reason being that they contain quantities of marketable timber, which pays for the cost of clearing. As there are still thousands of acres of these scrubs available, it is unlikely that the rich forest land will find selectors. Yet here is an ideal place on which to settle large numbers of immigrants. With good soil, wood, water, and a railway at their very doors, a good market for produce at Cairns, Chillagoe, Herberton, and other places, with a good average rainfall, what more could young able-bodied working farmers desire? I feel sure that if Messrs. Muller and O'Donoghue, the delegates from the distressed South Australian farmers, were to visit this portion of Queensland, they would be satisfied that the forest and scrub lands around Atherton cannot be equalled throughout Australasia, and would come to the conclusion that their search for a suitable location need go no further.

Leaving the forest we enter upon a broad, cleared road through the scrub. Beholding the latter for the first time, one fails to realise the vastness of the vegetation, a sort of sense of awe is the first feeling predominating. The tremendous height of the trees, their great girth and symmetry, their vast numbers, together with the dense and varied undergrowth, combine to astonish and delight the visitor. All along the road lay red and white beech, cedar, and crow-foot elm logs of great size, which had been drawn on wagons and trolleys out of the scrub ready for despatch to Cairns and the South. Several saw-mills are established in the district, and all do good business.

There are several good hotels at Atherton. The one I put up at (Mr. McCraws) was an excellent one. A number of residents and visitors from Herberton had assembled to meet me, and it was not long before Mr. J. Thomas, manager of the Herberton Tableland Timber Company, and owner of several saw-mills, harnessed up a couple of horses, and drove me and two other visitors through the scrubs for several miles. Everywhere was to be seen the same magnificent growth of timber—cedars, beech, and kauri pine were on all sides. There is another timber here which some call white pine, and which runs up to 100 and more feet before branching, attaining a diameter of from 4 to 5 feet. The timber, however, Mr. Thomas informed me, was not of great value for building purposes either inside or exposed, as it is liable to be attacked by borers. Every now and then we came upon a clearing where for the present only corn is grown, the stumps not yet having rotted out. There are wide clear stretches of splendid corn to be seen in some parts extending as far as the eye can reach, the growth testifying to the fertility of the soil. With the exception that the tracks were full of deep ruts made by the timber wagons, and that huge worn-down stumps lurked in the mud, over which the buggy bounded and rolled in a most exhilarating manner, and that on one occasion the horses jumped a log and hauled the front wheels over it, but in spite of frantic endeavours were unable to make the hind wheels follow, necessitating the passengers manning the wheels and lifting the machine bodily over; with these exceptions, the ride was a most delightful one, and ended safely and pleasantly at about dusk, when we returned to the hotel and refreshed—the horses.

On emerging from the scrub, Mr. Thomas drove down the road to a "landing place" where a quantity of cedar logs were stacked ready for removal to the mill. All were of great size, but one log 16 feet long measured 9 feet 8 inches in diameter, and contained 6,000 feet of timber. There were four longer logs from the same tree, carrying a very even diameter right up to the head. That cedar-tree was about 100 feet high to the nearest branch, and was a perfect cylinder of solid timber right to the heart. We made a calculation that the tree must have been 118 years old at least, allowing the average diameter to be 6 feet and allowing an increase of 2 inches in diameter every three years after topping the scrub, when the lateral growth of the trunk would begin.

I shall dilate on this subject further on. One of the show trees in this district is an immense cedar-tree yet lying where it was felled. So large was this tree that the timber-getters would have nothing to do with it. At last some saw-mill proprietors bought the right to all mill timber on the selection on which the monster stood. The timber had to be removed in a certain time, and this tree remained to almost the last week of the contract, when a timber-getter was offered £25 to cut it down and saw it into logs. He performed his task of cutting down the tree in three days, after which he carried out the rest of the work. The butt is 14 or 15 feet in diameter, but the trunk tapers rapidly, and it is practically not so valuable as its brother giant described above. Its age would be about 250 years.

A large amount of clearing is going on, and much of this work is done by black labour of some kind working on contract. The price for felling ranges from £1 5s. to £2 per acre, and burning-off and subsequent stumping bring the total cost of clearing up to from £12 to £13 per acre. This is about the same as the clearing of the Brisbane River scrubs came to. Although it looks a large sum, still it must be remembered that only a few acres are felled and burned off at first. Then a crop of corn comes in to pay for the work, and in all probability a good many valuable cedar and beech trees have been saved and sold to the mill, which will have more than paid the entire cost of clearing per acre before a stump has been touched.

Plate XXV.

Hauling Cedar at Atherton, North Queensland.

When once the plough gets properly to work in this district, there will be a great future before the farmers. With large lucerne fields, silos, and good breeds of dairy cattle and pigs, there is not the slightest reason why they should not become as prosperous as their brethren in many parts of the South, especially as they have a good stand-by in the timber trade.

The cattle tick has certainly committed ravages here, but cattle may be rendered immune, as we are told by authorities on the subject of tick fever. Besides, there is a remedy which could be easily applied to a few head of tick-infested dairy stock. By turning them into a field of lucerne, the ticks will drop off and die. In the Argentine the great cattle-breeders lay down 100 square miles in lucerne or alfalfa, as they call it in that country. The cattle are allowed to gather ticks from the natural forest grasses, then they are put on to the lucerne, the ticks disappear, and the cattle gradually become immune.

A desire was expressed by several of the farmers that they might be supplied with a bull by the Department of Agriculture. With every desire to do all in its power to advance the interests of the farmers, this is a matter which, for two reasons, cannot at present be complied with. One is, that the principle of supplying group bulls has not yet been adopted, and the other is that there are actually no bulls available. At the same time, the claims of the Atherton farmers for assistance would undoubtedly be cordially entertained whenever practicable, special consideration being given to the fact that they are too far distant from centres of production to provide for themselves as easily as the Southern farmers. They may rest assured that their difficulties and disabilities are not overlooked by the Department, which is at all times ready to advise and assist to any reasonable extent.

I should think that cotton-growing could be profitably carried on in the district, more particularly when the line towards Herberton is completed. Tobacco-growing is another industry which would pay well, provided the class of tobacco were grown which Mr. Nevill, the tobacco expert, advised when visiting the district. Very excellent coffee is now grown and manufactured on the spot, and doubtless more land will be placed under this crop in the near future, Mr. Newport, the instructor in coffee, having already visited the farmers and advised them as to its cultivation.

With regard to the perpetuation of the timber supplies, I made minute inquiries into the estimated quantity of available timber, and the general opinion seemed to be that there was timber enough of the kinds already mentioned to keep all the saw-mills in the district, and many more, going for a couple of generations, not reckoning that sent South. This is all very pleasant hearing to the present generation, but what about the supplies fifty years hence? Teeming as the scrubs now are with fine timber, it must come to an end unless measures are taken to protect and perpetuate it.

What is to be done to prevent its extinction? Nature is only too willing to repair the ravages of man. This is clearly apparent even along the roadsides, which are thickly lined with young cedar-trees. But Nature requires to be assisted. Wherever the young cedars are springing up, they are choked with a mass of quicker-growing vegetation. Consequently, man ought to step in and promote the growth of the trees by slightly clearing round them, taking out a certain number where they are too crowded and planting them elsewhere. Air and light being thus admitted, the young trees would make rapid growth. In a few years they would top the scrub, and within twelve years would attain an added diameter of from 8 to 10 inches. Think what an heirloom this would be for our children and children's children. We have in this timber one of the greatest gifts of Nature, and we should not look upon its immediate commercial value only, but upon the possibility of keeping up that commercial value for ever. Consider the value of a crop of pine 9 feet in girth, or a crop of cedar 24 feet in girth from 50 to 80 feet in height. What crop can possibly be grown which will equal such timber crops in value? If only twenty such trees as I have described could be cut annually per acre, the owner need grow nothing else. With pine at 5s. 6d. per 100 and cedar at £1—there is more money in that timber than in anything else, and it requires no tillage, no looking after. Can anything be done to perpetuate the annual crop? Most certainly it can be done. It is done in every country in Europe. It has been done for a time in Queensland, and so simple is the process that the wonder is that owners of soft-timbered lands have rarely thought of it.

I have already stated that the cedar increases in diameter by 2 inches every three years. It will top the scrub at 10 or 12 inches. Hoop-pine increases at the rate of about 1 inch in diameter annually. The Kauri will have finished its height growth when 12 inches in diameter, increasing subsequently by from 2 to 3 inches in diameter annually. Now, any intelligent timber-getter knows that timber is of little value commercially until it has reached maturity. The Kauri does not attain maturity until it reaches a diameter of from 40 to 50 inches, when it is at its best, the timber being more durable and less liable to flaws. It is then most profitable to all parties concerned, except the saw-miller. A cedar-tree may be legally cut when it has attained a circumference of not less than 7 feet 6 inches—that is, 2 feet 6 inches in diameter at 6 feet from the ground. Now, suppose that every tree under these dimensions is allowed to grow, say, to 4 feet in diameter, a tree 3 feet in diameter 60 feet high will give 3,644 superficial feet, but at 4 feet diameter it will yield 6,480 feet, and at 5 feet the measurement would reach 10,124 feet. Now, here we have a very simple method of keeping up a regular annual supply. Let all saplings and everything under 3 feet in diameter stand. At the end of five or nine years, according to the timber, go over the same ground again and take out all above the dimensions named. By working on this plan there would be timber for all time. At the same time planting might be resorted to both by the Forestry Department and by private individuals. If ten trees only are cut on an acre producing 100,000 feet, at only 5s. per 100 feet, there is an income of £250, and with cedar at £1, I leave it to others to say: Is not such a valuable asset worth looking after?

I have, I fear, dwelt too long on the subject of the timber resources of the district, but the matter is of such paramount importance that I think it but right to discuss it. I much regretted that I was unable to remain longer in the district and pay a visit to Lake Eacham and the Crater. The former is a fine sheet of water of great depth, but destitute, I was told, of fish. I observed that there were no fish in any of the mountain streams I crossed. As these streams are permanent, always cold and abounding in miniature waterfalls and rapids, they would be admirably adapted for trout, dace, roach, grayling, and other European fish. The Fish Acclimatisation Society at Killarney might with advantage turn their attention to the stocking of these waters with trout. I would suggest to Mr. Ward, artist to the *Queenslander*, who is a successful breeder of trout, carp, and perch, that he forward some quantities of them to the Cairns district. As he has already successfully established some hundreds of carp in the waters of Stradbroke Island, he would probably be equally successful with that fish in the Atherton Lakes. I understand that he is also importing roach, dace, and tench. These should all do well, the roach and tench in the lakes, and the dace in the running streams.

On my return to Cairns I stopped at Kamerunga State Nursery, which is under the charge of Mr. Howard Newport, Instructor in Coffee Culture. Here there is many an object lesson for the tropical agriculturist. Amongst other acclimatised plants I was shown a small plantation of Para and Ceara rubber-trees. These seem to have taken very kindly to the soil and climate. The smallest are about 15 feet in height, and the largest were being tapped at the time of my visit. Incisions were made in the bark, and clay cups fastened beneath the incisions, into which the milky rubber flowed. Then there was an avenue of Divi-divi trees laden with pods. They were beginning to ripen, and the soil beneath the trees had been swept clean to receive them as they fell. The Bread-fruit, Jack-fruit, and Durien were all bearing well. A grove of Manila hemp plants (*Musa textilis*), easily to be mistaken for the ordinary fruiting banana, is ready for manufacture. Some time ago I received a sample of fibre from Cairns, and sent it to England, where it was valued at £30 per ton.

Here is another industry which could be carried on in the North, especially by farmers who have an abundant supply of water. The necessary machinery is not expensive, and could, in numberless localities, be driven by water-power.

This plant thrives best on the slopes of volcanic hills under partial shade. It does not do well on open plains, and will not grow at all on ill-drained lands. There is immense scope on the hillsides towards Kuranda for the cultivation of the plant. The suckers might be planted 10 feet apart, and they would require no attention beyond keeping the undergrowth in check, and even that work is scarcely necessary in a humid, warm climate. The fibre is at its best when the plant is just about to flower. After flowering the fibre is weaker and more difficult to clean.

Cacao is also growing at Kamerunga, and has reached the bearing stage. It appears, however, that some sort of mildew attacks the trees and destroys them. The trees under notice had not received any attention, but grew anyhow, until Mr. Newport pruned some. One was left unpruned, and the difference between the two is remarkable, the pruned trees showing vigorous growth, the other being almost at a standstill and sickly.

There is a varied assortment of trees and plants of economic value in the nursery, which are yearly being reproduced in quantity for distribution in the form of either plants, seeds, or roots, and applications come in from all parts of the surrounding districts for supplies. *Paspalum dilatatum* is in great demand just now. This excellent grass does very well in the North, and its cultivation is fast spreading. A walk through the nursery in the early morning or evening is most enjoyable. The delicious scent of the Divi-divi flower pervades the whole atmosphere. The weather in March is delightfully cool in the morning and evening, and up to September is said to be far pleasanter than during the corresponding month in the South.

Visitors to the nursery have the opportunity of seeing at close quarters a cassowary, with which the scrubs abound. This bird, although young, is a dangerous animal. It dislikes strangers, and will attack them viciously, flying at them and striking at them with its powerful leg, armed with strong horny toes. Cassowaries are doubtless very interesting birds, but the stranger rapidly loses all interest in them when he finds an animal as big as an ostrich rushing at him, hissing and shrieking out defiance. I always kept a sharp lookout for the bird, which has a nasty habit of lying in wait behind a big croton and suddenly rushing out at the passer-by.

Crotons grow magnificently in this district. There are many varieties planted, and the blaze of red, blue, yellow, and green is most dazzling.

I had a long and interesting conversation on coffee with Mr. Newport. Several farmers had told me that until his arrival they had allowed their coffee-trees to grow without any care, and many of them became disgusted and were about to throw up the industry, when Mr. Newport set to work to put them in the right way. The change was, they said, remarkable, and the yield much increased. Consequently, they held on, and even increased the area under coffee.

Respecting the area planted as given in the statistical returns of the Registrar-General—viz., 537 acres—there is considerable difficulty in getting at the exact area, for the reason that several farmers having only an acre or two do not return these areas under the head of coffee, but under general cultivation. Then, again, there is a large quantity of trees from one to three years old not in bearing at the time the returns are made out; hence the actual output is credited as the return of the whole area under coffee, whereas in reality it is the yield on less than one-half of the planted area, as thousands of trees have not yet come into bearing.

Coffee-growers have not so far had any difficulty in getting in the crop. As I said before, white pickers can be obtained either on contract or on weekly wages. The wages are about 30s. a week, and 3 lb. for 1d. is the contract price. In some cases aboriginals are employed, and they make very quick pickers, bringing in 100 lb. or more for a day's picking.

Cherry coffee loses in bulk 50 per cent., and in weight, between fermenting and drying to parchment, 75 per cent. From parchment to clean coffee the loss is 25 per cent., and in roasting 15 to 17 per cent. The cost of hulling amounts to about ½d. per lb.

The yield of coffee from full-grown trees six or seven years old varies between 10 cwt. and 20 cwt. per acre. In the Cairns and Lower Russell, Kuranda, Mareeba, and Atherton districts, the yield has been from 6 cwt. to 7 cwt., according to the age of the trees, and the degree of care bestowed upon them. This is sold at from 7½d. to 1s. per lb. Mr. Newport took samples to Sydney and Melbourne, and these were valued by experts at 7d., 9d., 10d., and 11d. per lb. Twenty-eight cwt. were sold at £94 per ton, being the crop from less than 700 trees. The average crop may be taken at 12 cwt., and the average price £80 per ton. This gives £48 per acre. The picking of a crop of 12 cwt. will amount to about 37s., and the hulling can be done for ½d. per lb.

It was supposed for some time that coffee left upon the tree until the hull had dried was valueless, and many tons of dried-up cherry have been allowed to go to waste. This has proved to be a mistake. Machines, such as are illustrated in this issue of the *Journal*, deal specially with this class of cherry. They hull the dried berry and leave it in perfect marketable condition. When I was at Kuranda I saw a field of coffee being picked regardless of its over-ripe condition, and the owners reckoned to make from 6 cwt. to 8 cwt. of good marketable coffee.

To sum up what I learned about the coffee industry, I was—not impressed; I have no impressions—convinced that the coffee industry in North Queensland has come to stay. The kanaka may come or the kanaka may go; his stay or departure will not affect the coffee-growers. They can get their crop picked without him. Any crops which, like coffee, will produce from £40 to £50 per acre, will not go to the wall. No difficulty has been experienced in selling the manufactured article. The Cairns coffee has, like that of the Buderim Mountain, made a name for itself for excellence which will, in the near future, go far to oust Ceylon Plantation, Java, and Mocha. Mocha can be produced in Queensland as well as in Arabia, Africa, or anywhere else.

The Northern coffee men are unanimous in their expression of the opinion that the Department of Agriculture put the industry on a firm basis by the appointment of a coffee expert, and from all I could learn from them Mr. Newport has amply justified the action of the Department.

I now come to the matter of rice cultivation. I knew before I went to Cairns that the rice-growing industry in that district was languishing, if not absolutely dead. Two rice-mills have, however, been working up to the present. From what I could learn it would appear that banana-growing is more in favour with the Chinese, who were the principal rice-growers, owing to the more certain return to the continuous yield, and to the less amount of labour required in cultivation of the banana plant. I also heard that the rice lately grown was not of too good a quality. However that may be, the fact remains that the industry has declined to such an extent that the owners of one large rice-mill, fitted with all the latest appliances, and driven by steam-power, belonging to the Messrs. Clacherty Brothers, has been closed down, and the owners are prepared, if sufficient inducement is offered, to remove the plant to the Logan or Pimpama district, and purchase all the rice grown there at a price which will be an inducement to the Southern farmers to extend the area of their rice-fields.

The price is from £8 to £9 per ton of paddy delivered at the mill.

A fair crop of rice in the Logan district, given a good season, is 40 bushels of 60 lb. to the acre. This is equal to 160 lb. more than a ton, for which the farmers will be able to get £8; in addition to this the straw, according to Mr. F. W. Peek, is worth £6 per acre. Thus the average return of grain and straw amounts to £14 per acre for a six months' crop.

As Mr. Peek is proceeding shortly to Cairns on business, he will make a point of seeing the Messrs. Clacherty, and will discuss the question of their removing the mill to the South. The mill can deal with 5 tons of paddy a day, and with new machinery, which would be introduced, the same quantity can be got through in an hour.

As proof that rice-growing will pay, Mr. Clacherty told me that one Chinaman at Fresh Water Creek realised £17 for his crop. The Cairns mountain rice has been sold at £30 per ton. Such returns should be good encouragement to the rice-growers of the State.

The banana trade is very lively, and large consignments come from Geraldton and from plantations along the railway line. The Geraldton bananas do not seem to suffer so much from the attacks of the fruit fly, or from the disease known as "black-heart," as those grown in the immediate neighbourhood of Cairns. I was present for a short time at the inspection of some dozen truck loads of magnificent bunches of bananas on the Adelaide Steamship Company's wharf at Cairns. A remarkable circumstance was pointed out to me by Mr. Macpherson, the fruit inspector. The greatest damage done by the fruit fly is invariably on one side of the bunch, the other side being scarcely injured. There was no explanation of this, but possibly it may be that the pest prefers the lee side of the bunch as being more protected from the wind, and perhaps he thinks he can carry on his nefarious work in greater security and with greater secrecy than if he worked on the weather side. The examination of bananas is no child's play when some 10,000 bunches have to be separately and carefully inspected. I noticed several hundred bunches rejected which to the eye of the uninitiated appeared quite healthy, yet over half of every bunch so thrown out was maggotty or black-hearted. Fifteen thousand bunches were passed and shipped in a few hours in a southern steamer, and this quantity is often exceeded. Two or three times a week the steamers going south are laden with bananas for the southern capitals.

As time goes on, however, the steamers' holds will undoubtedly be largely occupied with coffee and cotton in addition to the usual cargoes of sugar, timber, and bananas.

In conclusion, I have merely to reiterate what I have already written, that the climate, soil, rainfall, and means of communication at Cairns, the Mulgrave, Lower Russell, Atherton, and Herberton are such as should enable energetic young farmers to make comfortable homes for themselves. Below the range the climate in summer is undoubtedly hot and steamy, consequently the work in the cane-fields is extremely harassing, and not such as would commend itself to the white working man, except where ploughing or mere carting is concerned. The kanaka or coloured labour of some kind is an absolute necessity if the sugar industry is to survive. What the loss to Queensland generally will be if it goes down is incalculable, as the ramifications of the business extend to all the States and to all classes of business. Thousands of white men have comfortable homes now which will be lost to them when the kanaka goes.

QUEENSLAND WHEAT HARVEST.

In the early part of the year we set down the probable yield of wheat for the harvest of 1901 at 1,500,000 bushels, and the average yield per acre at 20 bushels. The report of the Registrar-General just to hand gives 1,692,222 bushels as the actual quantity of grain threshed, the average yield per acre amounting to 19·40 bushels. The latter is the greatest average yield per acre for the last ten years, except in 1894, when the yield was 19·48 bushels per acre with a crop of 545,185 bushels from 27,991 acres. Last year 96,951 acres were under wheat, of which 9,719 acres were mown for hay, and 87,232 acres reaped for grain. Notwithstanding the drought the failures have been comparatively few. In the Central district, at Springsure, the heaviest failures occurred, only 4 acres being reaped out of 263 acres sown. In the Allora district 78 acres failed for hay, mainly owing to drought, and 246 acres totally failed for grain, the frost being accountable for 75 acres and hail for 119 acres. In Warwick 215 acres were badly rusted, and were therefore burnt. Seventy-seven acres totally failed in Dalby. At Nanango 699 acres yielded 15,540 bushels, an average of 22·23 bushels per acre. No rust appeared in any field in this district.

The greatest quantity of wheat was harvested at Allora, Toowoomba, Warwick, Roma, Dalby, Killarney, and Highfields, in the order named.

Only 2 acres were reaped for grain in the Townsville district, and both were affected by rust.

The acreage mown for hay, 9,719 acres, yielded 15,096 tons, or an average of 1·55 tons per acre.

There are eighteen flour-mills in operation in the State which treated, during 1901, 1,244,505 bushels, making 26,093 tons of flour. The value of wheat rose considerably as the season advanced, reaching 3s. 2¼d. per bushel. The total value of the Queensland wheat crop, at 3s. per bushel, represents £253,833.

The wheat yield of South Australia for the past season is stated to have been 8,012,762 bushels from 1,415,658 acres, an average yield of 5·66 bushels per acre. These returns show that whilst the South Australian farmer gets a gross return of 16s. 6d. per acre, the Queensland wheat-grower, putting the price at 3s. per bushel, has pocketed £2 18s. per acre, and those who obtained a yield such as that at Nanango and several other districts, £3 7s. 6d. per acre; the cost of ploughing, sowing, and harvesting being slightly greater in Queensland than in South Australia.

THE EMPEROR WILLIAM'S CHILDREN.

It is a very interesting sketch of the children of the German Emperor which Miss Hulda Friederichs contributes to the *Young Woman.* They are apparently brought up in a simple, not to say plain, way. At the tea-table, the Empress, who is adored by her children, "herself cuts the bread and butter for her bairns," and anything beyond the frugal cup of milk is regarded as a luxury. The youngest child, the only girl, the little Princess Louise, is now emerging from the infantile despotism which she at first exercised over everybody. Her august father once confessed, with a smile, that "he found it more difficult to make that young person do his bidding than to rule the German Empire."

TWO FARMER-PRINCES.

The Kaiser seems bent on turning his sons to good account by assigning them from early days to different departments in the State. He is preparing two of them for grappling with the Agrarian problem. The writer says:— "By this time the young princes are all quickly growing up into young men. The two eldest are training for the army; the third for the navy, if, after a year's trial, it is found that he has got sufficiently accustomed to life at sea to have overcome the malaise which seemed at first to prevent his ever becoming a sailor-prince. The next two boys are at Plon, the large boys' training-college near Berlin, where the elder boys, also, have spent some years with their tutors. But Prince August and Prince Oscar are to study agriculture, in order to be able, later on, to enter practically into the Agrarian question, which in Germany is one of the most complicated and difficult problems ever before the Government. The way in which the Imperial princes are made to take up this subject should certainly lead them to a thoroughly practical knowledge. A farm has been taken for them, and they and six of their school-fellows have not only to work this farm—under the supervision and advice of experts, of course—but also to make it pay. There is pasture land for their two cows. There are a few acres of grain, and a good many acres of vegetables and potatoes. There are chickens and ducks. And the farm produce is sent to the Imperial Palace, and the father of the two youthful farmers pays for it at the market prices; and if the milk is poor, or the grain inferior, or the eggs and fowls more ancient than is desirable, or the vegetables second-rate, then the farmers' Imperial customer is not at all slow in complaining and in lowering the prices according to the value of the goods. If the princes, after a spell of work in the sweat of their brows, wish for a cup of coffee and some bread and butter, then there is the little white kitchen under the thatched roof of the cottage attached to their farm. And they may then go and make coffee, and drink it out of the nice thick earthenware cups that are kept in the old-fashioned cupboard of their whitewashed little sitting-room at the farm. More hard-working sons of an emperor and an empire, I have been told, do not exist."—*Review of Reviews.*

BUYING MANURES.

We are often asked by farmers whether they can depend upon the artificial manures offered in the market being all that they are stated to be. Our reply has always been: Never buy manures without a guaranteed analysis. An excellent address on this very subject was lately delivered by Principal Wright, of the West of Scotland Agricultural College, under the auspices of the Kirkcudbright County Council. The subject was: "Some Hints about Buying Manures." We take the report of this able and instructive address from the *Scottish Farmer.*

After stating that he had been for ten years engaged with his colleagues of the college in carrying out an extensive series of experiments in the manuring of the chief farm crops grown in Scotland, the Principal said it had occurred to him it might be of some advantage if he were to direct attention to some of the results of these experiments, which specially relate to the purchase of manures, and to considerations which ought to guide the farmer when he was buying manures for his next season's crops.

It seemed hardly necessary, speaking in the county of Kirkcudbright, where the farmers generally had been accustomed to an extensive use of artificial manures for many years, and where, he believed, the subject of manuring was well understood, that he should suggest that all manures should be purchased by guaranteed analysis. It did seem as if it were superfluous to repeat that statement; yet, though it was well known that that should be done, and plenty of men, who would not dream of buying a horse without a warranty of soundness, did not hesitate to procure manures without inquiring with any care into their exact composition and without asking for a particular specification of their character and properties. In the case of one manure, which had come into extensive use in recent years, and which was cheap and very useful for many purposes, there was a further guarantee required besides that of chemical composition—he referred to basic slag. It was of special importance that this manure should be supplied ground into a state of extreme fineness of division, and the slag itself was so hard a mineral that if this fineness be not attained its value was in a great measure lost, as the larger particles in the soil were very insoluble. The standard recommended by agricultural chemists, and which had been more or less adopted, was that 80 per cent. of the manures should pass through a sieve which contained 10,000 meshes to the square inch—an extremely minute degree—and if they considered how very fine that was they would realise that it was impossible to judge of such fineness by the eye or the touch.

No ordinary person could tell whether 60 per cent. or 80 per cent. had passed through such a sieve, and it was essential to have a guarantee to that effect, and, if they had any doubt as to the reliability of the guarantor, the farmer should see the manure tested. That the value of such phosphate depended very much on the fineness of the grinding had been well illustrated in an experiment carried out many years ago by Dr. Aitken, of the Highland

Society, who applied two samples of a ground phosphate to a turnip crop. One of the samples, ground to the standard degree of fineness, produced a crop of 18 tons per acre, while another sample, of which about 50 per cent. only had been ground to the same fineness of division, gave a crop of only 15 tons. The value of the three extra tons in the one case would amount to more than the whole cost of the manure. In the case of bone meal there was no fixed standard of grinding, but, as it could not be reduced to such a fine state of division, its condition should be judged sufficiently well by sight and sample. It was important that the finest ground sample should be preferred to that which was coarsely ground and in large pieces. It was not enough, however, that the manure should be purchased with a guaranteed analysis. It was necessary to see that the analysis was correctly expressed, but unfortunately this was by no means always the case, and he fancied it was also the case that they were not always quite clearly understood. He imagined that some merchants expressed the analysis in a misleading fashion, because they were people capable of being misled, and they would not express analysis in these forms unless they found it useful to do so. It was therefore very necessary that farmers should themselves be able to understand what the analysis ought to express, and this was by no means difficult to do. If they would look at the analysis which he had written on the blackboard it might seem at first sight as if it were somewhat unintelligible, but after all there were only three or four words on it which were easily remembered, and which would enable any farmer to determine for himself what was the value of any manure The first of these was ammonia, and in all analysis the percentage of ammonia was clearly stated. The next was soluble or dissolved phosphate, or tricalcic phosphate rendered soluble, and this is also always expressed clearly enough. Insoluble or undissolved phosphates were also usually expressed accurately, but these had no value in superphosphates or in most compound manures, but were only to be valued in bone manure or that which represents bone material in basic slag. But sometimes the phosphates were described in misleading fashion. For example, he saw in one catalogue of manures a turnip manure which was said to contain 26 per cent. total phosphates. This was misleading. An analysis ought to distinguish between a soluble and an insoluble phosphate, and an insoluble phosphate in such a case had probably no value. A guarantee in every case ought to distinguish and to guarantee the percentage soluble. In basic slag the guarantee was one of phosphoric acid, or phosphoric acid calculated into its equivalent of insoluble or tricalcic phosphate. In regard to the remaining important ingredient in manures—namely, potash—this was very often expressed in misleading terms in manure catalogues. For example some manure catalogues guaranteed "potash equal to 5 to 6 per cent sulphate of potash." Now, potash formed only about 54 per cent. of sulphate of potash, and the above statement, therefore, guaranteed only a little over 2½ per cent. of potash. Why, therefore, was that not stated? It was misleading, and trading on ignorance, to express potash in the catalogued figures of sulphate of potash. Other manure catalogues used the term "potash salts." Now, this might mean any percentage of potash, but no doubt, as a rule, it meant very little, and a guarantee of potash salts should never be accepted. Other analysts in catalogues used the term "alkaline salts." This was a still worse expression, for alkaline of salt might contain no potash at all. Every buyer should insist in the case of manure containing potash in having a guarantee of the exact percentage of pure potash, and should accept no other guarantee. Manure firms of a high reputation, as most of them deservedly are, should cease from using these other expressions which were only fitted to mislead farmers. His next suggestion was that manures should be bought at market prices. It might seem superfluous and unnecessary to give such advice. He supposed there was no farmer in the audience who would not be ashamed to go into the auction mart and pay 5s. a head for sheep, or £2 per head for cattle, more than the ordinary market price, and it might be assumed that the same judgment and discretion would be exercised in the buying of manures. But, as a matter of fact, it was not so. It was within his knowledge that manures were at present being bought in this county, and, he presumed, also in other counties in Scotland, at 50 per cent. over their current market value. That was to say, that manures that were worth £4 per ton were being sold and bought at £6 per ton, or thereabouts, which was a very unnecessary, unjustifiable extravagance, and was also an injustice to those firms of manure merchants who were offering their manures at reasonable market values. It was not to be expected that all farmers should be accurately informed of the exact market price for every ingredient used in manures, but valuable assistance was given to them by the Highland Society, which, among the many services it had rendered to agriculture, had rendered not the least in the publication in its annual volume of Transactions of a guide to the commercial value of manures. Each of the volumes contained a statement of the price that should be paid for each of the valuable ingredients in manures to which he had already referred, and he thought it was as much the business of the farmer to make himself familiar with this table of prices as it was his business to study the ordinary weekly reports of the market fluctuations in cheese and grain and mutton and beef.

(To be continued.)

MAIZE EXPERIMENTS AT WESTBROOK STATE FARM.

BY C. ROSS.

The following are a few particulars of an experiment with maize during the past season. The land, which was divided into plots, may be classed as fairly good brown alluvial, overlying rotten rock; reefs of this rock cropping out in various parts of the field. The soil was nowhere deep. The land had previously borne a crop of cow-peas, and before the seed maize was put in had been brought into a first-class state of cultivation by plough and cultivator.

The areas were marked off from $\frac{1}{8}$ of an acre to $1\frac{1}{16}$ acres. The seed was planted by the "Molisse" one-horse corn-planter, about 18 inches apart and 4 feet between the rows, by the end of October, the soil at the time being quite dry near the surface, but with nice moisture below. This moisture, in addition to the little rain that fell, was kept conserved by continued cultivation between the rows, and in consequence the plants remained healthy until nearly the end of the year, although only a little over half-an-inch of rain fell up to this time. The whole crop began to wilt previous to the January rains, which then were too patchy and light to expect anything like a fair yield. Considering, however, that the rainfall from the time of sowing to the maturing of even the longest growing varieties was only 4 inches, it may be regarded as satisfactory to know which varieties do best under such conditions, thorough cultivation always being taken into consideration, and the fact that early sorts are usually the surest croppers in a dry season.

I may say here that maize crops generally have been a failure in the district this season.

The seed from which these crops were obtained was imported from America, and I may say that the seed now available for distribution may not be the largest of their several types, but is a much better sample all round than the original. The cobs have all been very carefully hand-picked, and every possible care has been taken to obtain the varieties pure.

The appended notes and observations may be of interest.

The seed is now ready for distribution, and intending purchasers can obtain full particulars as to variety and price from the manager of Westbrook State Farm.

NOTES ON THE EXPERIMENTS

Name of Variety.	Area in Acres.	Average Height of Stalk.	Season of Maturity.	Size of Grain.	Size of Cob.	Shape of Grain.	Shape of Core.	Colour of Grain.	Colour of Core.	Yield—Weight in lb.
		Feet.								
Longfellow Dent... ...	$\frac{1}{4}$	$3\frac{1}{2}$ to 4	First early	Small	Medium	Long	Slender	Light yellow	Pink	140
Japanese 90-Day... ...	$\frac{1}{4}$	4 to $4\frac{1}{2}$	,,	Medium	,,	Round	,,	Dark brown	Dark crimson	173
Early Hogan	$\frac{1}{8}$	$4\frac{1}{2}$ to 5	Mid-season	,,	,,	Round to square	Very slender	Dark yellow	Pink	80
Sydney Red-ribbed ...	$\frac{1}{8}$	4	First early	,,	,,	Flat, oval	Slender	Br'wnish yellow	Dark red	89
Balderman	$\frac{1}{8}$	4 to $4\frac{1}{2}$	Late	Medium to large	Large	Long	Thick	Variegated	White	124
60-Day	$\frac{1}{8}$	3 to $3\frac{1}{2}$	First early	Very small	Very small	Long and pointed	Very small and slender	Orange yellow	Pink	124
Riley's Favourite ...	$1\frac{1}{16}$	4	Second early	Medium	Medium	Square to long	Very slender	Yellow	Dark red	875
Golden Beauty	$1\frac{1}{16}$	5	Mid-season	Large	Large	Flat, round	Slender	Deep golden yellow	Brownish red	707
Legal Tender	$1\frac{1}{16}$	$4\frac{1}{2}$ to 5	Mid-season to late	Medium to large	,,	Long, thin	,,	Light yellow	Pink	905
Piasseo Queen	$1\frac{1}{16}$	$5\frac{1}{2}$ to 6	Late	Large	Large, extremely long	Flat, square	Very long and slender	,,	Red	570
Teeming	$1\frac{1}{16}$	$4\frac{1}{2}$	First early	Small to medium	Medium	Long	Slender	Yellow	Reddish pink	638
Early White Horse Tooth	$1\frac{1}{16}$	6	Second early	Large	,,	Very long	Short, slender	White	White	713
Hawkesbury Champion...	$1\frac{1}{16}$	$6\frac{1}{2}$ to 7	Late	Extra large	Large	Long	Medium to large	Yellow	,,	890
Mastodon	$1\frac{1}{16}$	$6\frac{1}{2}$ to $7\frac{1}{2}$	,,	Large	,,	,,	Long, slender	Dark yellow at base, light on outer edge	Red	708
Macleay River	$1\frac{1}{16}$	$6\frac{1}{2}$ to 7	,,	Medium to large	Medium	,,	Slender	Yellow	,,	424
Golden Superb	$1\frac{1}{16}$	5 to $5\frac{1}{2}$	First early	Medium	,,	Flat, square	Rather thick	Straw colour	,,	506
The following Grown on rather Rocky Land.										
Teeming	$1\frac{1}{16}$	$4\frac{1}{2}$	First early	Medium	Medium	Long	Slender	Yellow	Pinkish red	573
Golden Beauty	$1\frac{1}{16}$	$4\frac{1}{2}$	Mid-season	Large	Large	Flat, round	,,	Golden yellow	Brownish red	422
Piassee Queen	$1\frac{1}{16}$	5	Late	,,	Large, very long	Flat, square	Long and slender	Light yellow	Red	325
Riley's Favourite ...	$1\frac{1}{16}$	$3\frac{1}{2}$ to 4	Second early	Medium	Medium	Square to long	Very slender	Yellow	Dark red	370
Silvermine	...	4	,,	Small to medium	Small	Flat, conical	Slender, small	Silvery lemon colour	White	Poor
Ely French	...	$4\frac{1}{2}$	Mid-season	Large	Medium	Round	Medium	Orange red	,,	,,

REPORT ON WORK—QUEENSLAND AGRICULTURAL COLLEGE, APRIL, 1902.

Farm.—The prevailing dry weather is still hampering progress here. Root and other crops that should now be well grown have not yet been planted, with the exception of those in the garden, where irrigation is largely resorted to. The land was prepared for the planting of crops during the month of February, but nothing further can be done until we get rain. Cape barley for green fodder has been planted and replanted, in the hope of storms, and so that the crop should get the full benefit of the rain when the drought breaks up.

Panicum, barley, and giant sorghum, planted during February, failed to grow, with the exception of the last-named, which still holds green and is making a little growth. The *Paspalum dilatatum* grass keeps green and has made very fair growth, notwithstanding the severe season. A fire ran over a portion of this, but had no effect on the growth. The grass at the college generally, although dry, is holding out well, and if rain falls within the next week sufficient herbage will grow to keep the stock going throughout the winter. The cattle, up to the present, are in splendid condition. The dairy cattle are being fed with green maize cut with the chaffcutter and fed in the stalls. The working horses are fed on wheaten straw chaff mixed with a little bran and about two quarts of molasses per head daily. The animals keep their condition well on this feed.

A large amount of clearing land for cultivation and other purposes has been completed during the month. An area of 30 acres on Lockyer Creek adjoining the college boundary has now been cleared, ploughed, and enclosed with a substantial fence, the clearing costing 10s. per acre. Thirty acres of the "Gatton Paddock" have also been cleared and stumped. The sheep paddock (15 acres) has been ploughed. A large amount of clearing and burning off of dead timber has been done in the neighbourhood of the cowshed and other farm buildings. The teams have been kept busy hauling straw from Gatton also sawdust for bedding. No. 5 plot has been planted with Cape barley (5 acres), and an area of 5 acres in the pig paddock has been replanted with the same crop. Rainfall, ·86 inch, five days; the heaviest fall being on the 27th, when ·60 inch fell.

Garden.—The orchards and vineyards have been kept clean and free from all grass and weeds. The vegetable garden is irrigated daily with the result that there is now a splendid lot of vegetables available for college use. It was thought at one time that the Lockyer Creek water had an injurious effect on plant life, especially when young, but I find that, if the water be judiciously used, such is not the case. During the month the following were planted:—Cabbages, Brussels sprouts, Savoy lettuce, kohl-rabi, peas, radishes, parsley, parsnips, beetroot, and carrots; all are kept well irrigated. The mandarin crop was gathered, and yielded poor results on account of the continued dry weather.

Dairy.—During the month 1,325 gallons of milk were treated for 553 lb. of butter, and 88 gallons gave a return of 96 lb. of cheese; the dining-hall consumed 450 gallons. Sixty-one head of cows were milked daily. The dairy herd, as stated, was fed on green maize chaffed, and fed in the stalls. Owing to the dryness of the season very little natural pasture remains, and what little there is, owing to its dry and withered condition, is of small value as a milk-producing fodder. In addition to the chaffed maize, the cows were run for three hours daily on a lucerne paddock. The increase for the month was—Ayrshire: 1 male, 1 female; Shorthorn: 1 female; Grade Holstein: 1 male, 1 female. One Jersey bull was sold.

Pigs.—Increase for month: 11 head, Berkshires. Sales: Berkshires, 6 boars, 4 sows; Tamworths, 10 sows; Middle Yorkshires, 2 sows; Middle York.-Berkshires, 1 sow; mixed pigs, 37 head; baconers, 15 head. We also disposed of 57 fat lambs.

Mechanical Department.—The following work has been done during the month under review :—The portable engine has been thoroughly overhauled, the tubes expanded and brasses fitted, and all cleaned and painted. The Worthington pump has been removed from the garden and placed near the Manchester pump. It is now connected with the stationary boiler and the general water supply, so that, in the event of an accident to either pump, the supply of water can still be kept up. Owing to the continual dry weather causing the creek to run very low, a deeper channel has been dug to supply water to the pumps. It is now necessary to pump every day so as to have sufficient water for the garden, horses, cattle, &c. Shutters have been made and hung at the piggery. Some of the drays and vehicles have been repaired and painted. In the smithy, hinges, &c., were made for the piggery, horses shod, wheels tyred, and implements, drays, and wagons repaired.

FACTS ABOUT GINSENG CULTURE.

Since writing on the subject of the cultivation of Ginseng we have received a copy of the *New York Tribune Farmer*, from which we make a few extracts which may prove of interest to intending growers.

Messrs. E. D. and M. S. Cresley started a ginseng garden in June, 1897, at Tulu, New York State. They first set 500 wild roots with the tops left on. The tops soon died. About the 1st July they visited all the gardens then in Central New York, and found the people engaged in its culture very reticent, although they permitted them to see their gardens. They paid one man £1 for a few seeds and a book of instructions, but the book was never received. Then they learned that the top of the plant should be removed as soon as the plant was dug, and that it would generally grow the next year after setting, if properly handled, and that it might be set at any time of the year when it could be found.

On taking up in the autumn the first 500 roots which had been planted with the tops on, it was found that over 75 per cent. of the roots had rotted. Owing to this cause, and to planting too deep, the experimenters lost about 3,000 roots. Then in 1898 they again planted a few thousand wild roots and planted a quantity of wild seed. They thus raised 10,000 plants from the seed. In 1899 they set out 2,000 plants, sowed the seed they had raised, and bought 2 lb. of seed, of which not 25 per cent. grew. In the autumn of that year they sold seed and cultivated roots, as they had raised 80,000 roots, 40,000 of which were sold. In 1900 they set out 2,000 wild roots and about 40,000 seedlings. They gathered 200,000 seeds, all of which were sold, except 20,000 required for their own use. They also sold several thousand cultivated plants for setting. In the autumn of 1901 they set 20,000 seed and 12,000 cultivated roots, increasing the garden to half an acre, from which they gathered 335,000 seeds. They now took up what had lived of the roots originally sown. The best roots weighed 8 oz., having taken four years to grow to maturity. When dried they weighed in all 57 lb., grown on 560 square feet of ground. They sold this at 9 dollars per lb. (£1 17s. 6d). Singular to say, the brothers at first kept no accounts of general expenditure and return, but they did keep an account of one plant which gave a greater return of seed than the average. It yielded a first crop of 150 seeds, which were planted. Next year it also yielded 150 seeds, which were sold for 3 dollars (12s. 6d.) In 1900 they gathered 152 seeds, sold for a little over 12s. 6d. In 1901 the seeds brought 11s. 5d. Finally the root which weighed 4 lb. green and 1¼ oz. dry, was sold for 30 dollars (£6).

For a few days they kept accounts of their latest sales last season. In the first eight days of July the sales of seeds and plants for setting were 800 dollars (£160), and during nineteen days of November the sales amounted to 2,816 dollars (£563). During the year the profits from the ½-acre garden reached 5,000 dollars (£1,000). What was the total outlay to produce this result? The Messrs. Cresley set it down roughly at 10 dollars (£2) for hired help, and 44·50 dollars (£9 15s. 5d.) for seed, boards for beds, laths for shade, and fertilisers not included. The article winds up by stating that only a few acres are being cultivated, and these only in localities where wild ginseng is indigenous.

The roots should be set with the tops 2 inches below the surface of the ground, at an angle of about 45 degrees. Seed should be planted 1 inch deep—never more than that. The roots are at their best in five years, providing that proper care has been exercised in planting, fertilising, and cultivating.

CASTOR OIL MANUFACTURE.

Up to the present nothing has been done locally in the way of extracting oil from the castor oil plant. Briefly, the operations of oil extraction are by expression, by boiling with water, or by the agency of alcohol. A comparatively simple process can be tried by anyone interested, and a good oil should result if the seed is of the right variety.

First, cleanse the seeds from fragments of the husks and from dust, and submit them to a gentle heat, but not greater than can be borne by the hand, which process makes the oil more fluid and more easily expressed. A whitish, oily fluid is thus obtained, which is boiled with a large quantity of water, and all impurities are skimmed off as they rise to the surface; the water dissolves the mucilage and starch, and the albumen is coagulated by the heat, thus forming a layer between the oil and the water; the clear oil is then removed and boiled with a small quantity of water until aqueous vapour ceases to rise, and a small quantity taken out in a phial remains perfectly transparent and cool.

The effect of this is to clarify the oil and rid it of volatile acid matter. Care is necessary not to carry the heat too far, as the oil would acquire a brownish colour and an acid taste. In India the seed is first shelled and then crushed between rollers, placed in hempen cloths and pressed. The oil is afterwards heated with water in a tin boiler until the water boils. This serves to separate the mucilage and albumen, the product being then strained through flannel and put into canisters. Any oil-press would suffice for extracting oil for ordinary purposes, and by decantation and some process of filtration it could be purified. Cheap wooden rollers would serve the purpose, and these could be driven by a horse-gear, after the fashion of driving the old horse-mills for crushing sugar-cane.

SEED POTATOES THAT HAVE SPROUTED.

A correspondent of the *Agricultural Gazette*, London, writes:—

No doubt seed potatoes are weakened when they have sprouted badly in the damp or elsewhere, the shoots being rubbed off. But a trial which I have just made has given results of a decidedly reassuring character. I took three potatoes with sprouts almost all over them, so that there seemed to be no eye left unshot, pulled off all the sprouts, and planted them in a box of earth. All three have sent up several vigorous shoots. But a more severe test than even this was made. Taking another potato with five eyes all shot out, I broke off the shoots, cut out each eye with a small piece of the tuber around and under it, and planted the eyes. All five have grown two shoots at least to each eye. This has surprised me, as I did not know before that a potato would sprout a second time from the same eye. This it has done, as I am absolutely certain that no unsprouted eye was on any one of the sets planted.—B.

Dairying.

THE DAIRY HERD.—QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 30TH APRIL, 1902.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie ...	Ayrshire	19 Nov., 1901	170	3·8	7·23	
Amy ...	"	7 Nov. "	423	3·5	16·58	With first calf
Isabelle ...	"	7 Sept. "	306	4·2	14·39	
Jeannie ...	"	7 Oct. "	390	4·4	19·21	With first calf
Linnet ...	"	7 May "	324	4·0	14·41	
Lavina ...	"	11 Sept. "	450	4·0	21·16	
Lass ...	"	24 Aug. "	252	3·8	10·72	With first calf
Lena ..	"	3 Dec. "	534	3·6	21·53	
Lowla ...	"	3 Dec. "	398	3·7	16·49	With first calf
Rosebud ...	"	13 Nov. "	524	3·7	21·71	
Ruth ...	"	12 Dec. "	375	3·6	15·12	
Ream ...	"	9 Nov. "	45	4·1	2·06	Dry, 16-4-02
ReamRouthie	"	13 Dec. "	488	3·6	19·67	
Leesome ...	"	15 Jan., 1902	642	3·8	27·32	
Lonesome ...	"	22 Jan. "	344	4·1	15·79	With first calf
Renown ...	"	22 April "	149	3·8	6·34	
Blink ...	"	28 April "	32	3·9	1·39	
Molly ...	Grade Ayrshire...	5 Oct., 1901	367	3·7	15·20	
Bell ...	Jersey	15 Sept. "	271	5·2	15·78	
Connie ...	"	8 Sept., 1900	89	5·0	4·98	Dry, 14-4-02
Carrie ...	"	31 Aug., 1901	285	5·0	15·96	
Effie ...	"	18 Nov. "	348	4·5	17·53	
Evileen ...	"	2 Sept "	265	5·1	15·13	
Ivy ...	"	24 Oct. "	256	5·1	14·62	
Spec ...	"	27 Aug. "	279	5·0	15·62	
Tiny ...	"	5 Oct. "	260	4·6	13·39	
Jersey Belle	"	17 Jan., 1902	478	4·7	25·16	
Stumpy ...	"	17 Mar. "	722	4·5	36·38	
Bluey ...	Grade Jersey ...	9 Oct., 1901	188	4·0	8·42	With first calf
Pansy ...	" " ...	28 Oct. "	401	4·3	19·31	
Countess ..	Shorthorn ...	18 June "	322	3·6	12·98	
Empress ...	"	27 Dec. "	506	3·7	20·96	
Dott ...	"	31 May "	90	3·6	3·62	With first calf Dry, 12-4-02
Frizzy ...	"	29 Nov. "	515	3·6	20·76	
Lady Vixen	"	13 July "	303	3·6	12·21	
Kit ...	"	14 Jan., 1902	587	4·2	27·61	
Louisa ...	"	23 Dec., 1901	543	3·6	21·89	
Violet ...	"	20 Jan., 1902	542	3·7	22·46	
Curly ...	"	12 Nov., 1901	517	3·5	20·26	
Esma ...	Grade Shorthorn	29 Nov. "	286	3·4	10·98	
Restless ...	"	16 Mar., 1902	629	3·6	24·01	
Eva ...	" " ...	26 Oct., 1901	383	4·2	18·01	
Laurel ...	" " ...	22 Aug. "	266	3·9	11·61	
Leopard ...	" " ...	6 Oct. "	379	3·6	15·28	
Lucy ...	" " ...	9 Sept. "	117	3·8	4·97	Dry, 28-4-02
Peggie ...	" " ...	19 April, 1902	200	3·6	8·06	
Russet ...	" " ...	25 Dec., 1901	389	3·7	16·12	
Stranger ...	" " ...	6 Nov. "	440	3·7	18·23	
Alice ...	" " ...	18 Jan., 1902	533	3·4	20·29	
Poly Red ...	" " ...	3 Jan. "	496	3·6	20·22	
Rosella ...	" " ...	18 Jan. "	589	3·4	22·42	
Rowly ...	" " ...	22 April, "	24	3·6	0·96	
Lilly ...	" " ...	22 Feb. "	496	3·3	18·33	With first calf
Catch ...	" " ...	13 Feb. "	367	3·4	13·97	With first calf
Haze ...	" " ...	11 Feb. "	412	3·6	16·61	With first calf
Reannie ...	Holstein Sh'rth'rn	7 Mar. "	644	3·5	25·24	With first calf
Angel ...	Holstein Devon...	5 Dec., 1901	376	3·7	15·58	With first calf
Damsel ...	Holstein	16 Jan., 1902	694	3·2	24·87	
Ada ...	South Coast ...	16 July, 1901	360	4·2	16·93	With first calf
Trixie ...	" " ...	4 July "	64	4·0	2·86	Dry, 8-4-02
Topsy ...	" " ...	4 Oct. "	448	4·2	21·07	With first calf
Fancy ...	" " ...	19 Jan., 1902	586	3·6	23·62	
Lady Rose ...	Guernsey ...	26 Feb. "	364	4·4	17·93	
Plover ...	Shorthorn ...	7 Feb. "	509	3·5	19·95	

The dairy herd was allowed to graze for two hours daily on a lucerne plot, and were fed haffed grain maize in addition.

EXPERIMENT IN PIG FEEDING.

By JOHN MAHON, Principal, Queensland Agricultural College.

In submitting the following figures in connection with the experiments under review, I may mention that very many thanks are due to Mr. John Reid for his trouble in supplying figures in connection with the manufacture of the pigs into bacon, loss between live and dead weights, and report on the quality of each lot.

I wish to make a few remarks in reference to the experiments and regarding the merits and demerits of the various breeds of pigs kept at the college; these remarks are based on careful observations and practical results, and may therefore be taken as most reliable. The pigs kept are bred from the best blood procurable in Australia, and include the Berkshire, Improved Berkshire, Tamworth, Yorkshire (large, middle, and small) breeds. These breeds have been carefully crossed for the purpose of testing their value as flesh producers, consideration being given to the cost of same, and also to the quality of the bacon. The following are the crosses that have been made during the last three years, the results of which have been carefully watched:—Tamworth sire, Berkshire dam; Large Yorkshire sire, Berkshire dam; Middle Yorkshire sire, Berkshire dam; Small Yorkshire sire, Berkshire dam. During the six months ending December, 1901, the total increase of all breeds was 160. The average litters were:—Large Yorkshires, 8; Middle Yorkshires, 8·5; Tamworths, 10; Berkshires, 7; Crossbreds, 7·2. The Middle Yorkshires were, with one exception, on first litter, and therefore the same percentage could not be expected as from sows on second or third litter. We have but one large Yorkshire sow which produced eight on the second litter. From the above it may be gathered that the Tamworth is the most prolific, though I am inclined to think that the large Yorkshire under the same conditions would surpass her. It is notable in connection with the different crosses that the pigs in colour follow the sires; for instance, in every case where the Yorkshire is crossed with the Berkshire sow the pigs are white; Tamworth boars get red or sandy animals with a few black spots. Results here as elsewhere point to the Yorkshire, or Yorkshire cross, as being the best and most profitable of all breeds. It would of course be absurd to expect good results from faulty parents, and it would be as well for breeders to bear this in mind. I have found the product of the Middle Yorkshire, crossed with a large roomy Berkshire sow, to be excellent pigs; the litters are large and healthy, and they are good doers. The large Yorkshire mates well with a close compact sow (Berkshire). Although the crosses are good, I have found the pure Yorkshires to be the superior pigs in every respect. They are prolific breeders, produce healthy pigs, quick growers, small food consumers, and their bacon is of the highest standard as regards quality, yielding a high percentage of lean flesh well distributed among the fat, which is one of the characteristics of high class bacon, for which the demand is becoming greater every day. It may be thought by those who have had no experience of the Yorkshire pigs that they will not withstand the hot rays of the sun. This, however, is not the case, because it may be said of the present day Yorkshire that the hair is much thicker, stronger, and longer than was formerly the case, so that, when turned out or exposed to the sun, they are not liable to scorch, but the hair becomes bleached and somewhat reddish in colour. The Yorkshire of earlier days possessed fine skin and hair, and was therefore affected considerably by the hot sun's rays. In the English *Live Stock Journal* of 14th February, 1902, Mr. Sanders Spencer, a well-known breeder of pure stock in England, writes as follows:—"Prolific pigs.—It is often asserted that purebred pigs are slow breeders. Will you grant me space to give your readers a list of the farrowings of my large white sows during the month of January last? 1st January, Holywell Charlotte farrowed 13 pigs; 2nd, Holywell Tabbs, 14 pigs; 5th, Holywell Czarina, 13 pigs; 6th, Holywell Accident, 12 pigs; 8th, Holywell Bluebird, 11 pigs; 8th, Holywell Smithfield Slit-ear, 15 pigs; 9th, Holywell

Kathleen V., 19 pigs; 13th, Holywell Mousey, 16 pigs; 16th, Holywell Geneva, 10 pigs; 18th, Holywell Gigasoline, 11 pigs; 20th, Holywell Cardiff, 12 pigs; 27th, Holywell Royal Kate, 15 pigs; and Holywell Czarina II., 16 pigs; or a total of 177 pigs from 13 sows, by different boars, an average of 13·5 pigs per litter."

I may further quote from an article which appeared in the Christmas number of the *Farmer's Advocate*, a periodical entered by the Weld Company with the Canadian Department of Agriculture, wherein it is stated that no class of pure stock has made such rapid progress in Canada in the last decade as have the Yorkshires, and their present popularity is certainly well-deserved, as the farmers have learned from experience that, either as purebred or for crossing on other varieties, they are exceedingly valuable in producing the desired type for the profitable production of the approved quality of bacon, while they bring large litters and mother them well, which is half the battle in life of the average pig, whose term of existence in this country is seldom more than half a year. Alluding to the herd of Messrs. Platt and Son, of Ontario, of which they give a photographic portrait in front of their prize-winning pigs, the writer continues:—"Now that the hog-raisers of the corn belt of the United States are taking to the Yorkshires on the merits of the breed and for the purpose of overcoming the faults of the extreme shortness and thickness of back and the lack of fecundity which inevitably follows a prolonged corn diet, an exceedingly bright future opens for the men who are engaged in breeding this variety, as may be inferred from the fact that at the late International Exposition at Chicago, Mr. Platt sold to a Minnesota breeder one boar for 700 dollars, and four sows for 1,661 dollars. Another very large breeder of Large Yorkshires is Mr. Jed. Johnson, of Ontario, who has built up his herd by importations of a number of high-class English stock."

The above extracts confirm the results that have been obtained at the College, although I do not give preference to the Large Yorkshire as maturing more quickly than the Middle Yorkshire, or the latter crossed with a Berkshire sow.

The Tamworth.—In dealing with this breed as a purebred, I must admit that the poorest results have been obtained. Although the litters are larger, the pigs are of a most delicate nature, large consumers of food, and very slow in maturing: I find they will not fatten until they reach the age of ten or twelve months. Several crosses of a Tamworth sire with a Berkshire dam have been made, and in every instance I have found the pigs to be delicate, slow growers, and large food consumers. The Tamworth and Tamworth crosses may be a profitable pig if reared by grazing until it reaches the age of ten months, but the method of feeding with good food from the time of weaning up to the age when the animals will fatten would be ruinous. I might mention that our Tamworth herd originated from stock imported by the New South Wales Government, and from Mr. Chirmside's herd, Werribee Park, Victoria.

The Berkshire.—This breed is too well known to the people of this State to need any comment from me, but I may point out that, after years of careful observation, I have no hesitation in saying that the Yorkshire is a more profitable and in every respect a superior animal to the Berkshire. Regarding constitution and vitality, it would be difficult to determine between the Berkshire and Yorkshire.

With the view of testing the respective merits as bacon producers, the experiments, the results of which are hereinafter detailed, were carried out. A record of the amount of food consumed by each pen was kept, the pigs were weighed at regular intervals, and the increase in weight, noted with the view to ascertain the amount of food for each pound of increase. The pigs used for the experiments were as follow:—One improved Berkshire, one Middle Yorkshire, five Tamworth-Berkshires, and two Middle Yorkshire-Berkshires.

Pen No. 1 contained one Berkshire, one Middle Yorkshire, and one Tamworth-Berkshire; they were fed on ground maize (uncooked).

Pen No. 2 contained two Tamworth-Berkshires, and were fed on cooked maize.

Pen No. 3 contained two Tamworth-Berkshires, and were fed on ground maize (uncooked).

Pen No. 4 contained two Middle Yorkshire-Berkshires, and were fed on cooked maize.

The Berkshire and Yorkshire were from purebred stock, and the Tamworth-Berkshires were from Berkshire sows by Tamworth boars; the Middle Yorkshire-Berkshires were from Berkshire sows by Middle Yorkshire boars.

The ground maize was fed as a thick slop, and the boiled maize was fed in the liquid in which it was cooked. The pigs were fed three times per day, as much food as they would readily eat up, and in addition an ample supply of water. The cooked and uncooked foods were fed so as to afford an opportunity of ascertaining the effect, if any, on the quality and quantity of the flesh produced. It will be seen from the figures in Table I., pen 1, that the daily average gain of the pigs was as follows:—Berkshires, 2·28 lb.; Middle Yorkshire, 2·08 lb.; Tamworth-Berkshires, 1·97 lb. In comparing pens 2 and 3 it is found that the daily average per pig in pen 2 is 1·93 lb., and in pen 3 the average daily gain is 2·04 lb. The daily consumption per pig in pen 2 was 10·12 lb. of boiled maize, and in pen 3, 10·31 lb. of ground maize. Pen 4: The daily average gain of each pig was 1·84 lb., and the food consumed, 9·89 lb. per head.

By referring to the summary of results we find that the pigs in pen 2, fed on boiled maize, consumed 5·18 lb. for each lb. of increase; and pen 3 consumed 5·04 lb. of ground maize for each lb. of increase; pen 4 consumed 4·97 lb.; pen 1 consumed 4·72 lb. of ground maize for each lb. of increase. The feeding value of maize, as fed to the pigs, computed on the basis of a pound of increase being worth 4d. per lb. was in the case of pen 1, 3s. 11·4d. per bushel; pen 2, 3s. 7·1d. per bushel; pen 3, 3s. 8·3d. per bushel; and pen 4, 3s. 10·4d. per bushel.

TABLE I.

Showing Weight of Pigs at Beginning of Experiment, Weekly and Total Gains during Period under Review.

FED ON GROUND MAIZE.

Pen I.	Tamworth-Berks. Age, 22 Weeks.	Mid. Yorks Age, 23 Weeks.	Berkshire. Age, 27 Weeks.	Totals.
	lb.	lb.	lb	lb.
Weight at beginning of experiment	108	128	160½	396½
Gain, 1st week	19½	17½	20	
,, 2nd ,, ...	11½	16½	19½	
,, 3rd ,, ...	12½	14½	15	
,, 4th ,, ...	13½	14	14	
,, 5th ,, ...	12	10½	11½	
Weight at end of experiment ...	177	201	240½	618½
Gain during experiment	69	73	80	222
Average daily gain	1·97	2·08	2·28	

Average daily consumption per head ... ... 9·98 lb.

Summary.

Average Daily Consumption per head.	Total Food Consumed.	Average Daily Gain per head.	Number of lb. of Food Consumed for 1 lb. Increase.
9·98 lb.	1,048 lb.	2·11 lb.	4·72 lb.

FED ON BOILED MAIZE.

Pen II.	Tamworth-Berkshire. Age, 22 Weeks.	Tamworth-Berkshire. Age, 22 Weeks.	Totals.
	lb.	lb.	lb.
Weight at beginning of experiment ...	118	114½	232½
Gain 1st week	12	15	
,, 2nd ,, ...	16½	17	
,, 3rd ,, ...	15½	12	
,, 4th ,, ...	15	11	
,, 5th ,, ...	12	10½	
Weight at end of experiment	189	180	369
Gain during experiment	71	65½	136½
Average daily gain	2	1·87	

Average daily consumption per head ... ... 10·12 lb.

Summary.

Average Daily Consumption per head.	Total Food Consumed.	Average Daily Gain per head.	Number of lb. of Food Consumed for 1 lb. Increase.
10·12 lb.	708 lb.	1·93 lb	5·18 lb.

FED ON GROUND MAIZE.

Pen III.	Tamworth-Berkshire. Age, 24 Weeks.	Tamworth-Berkshire. Age, 24 Weeks.	Totals.
	lb.	lb.	lb.
Weight at beginning of experiment ...	147½	141	288½
Gain, 1st week	18	17	
,, 2nd ,, ...	15	14½	
,, 3rd ,, ...	16	14	
,, 4th ,, ...	14½	13½	
,, 5th ,, ...	10	11	
Weight at end of experiment	221	211	432
Gain during experiment	73	70	143
Average daily gain	2·08	2	

Average daily consumption per head ... ... 10·31 lb.

Summary.

Average Daily Consumption per head.	Total Food Consumed.	Average Daily Gain per head	Number of lb. of Food Consumed for 1 lb. Increase.
10·31 lb.	722 lb.	2·04 lb.	5·04 lb.

FED ON BOILED MAIZE.

Pen IV.	Large Yorkshire-Berks. Age, 22 weeks.	Large Yorkshire-Berks. Age, 22 weeks.	Totals.
	lbs.	lbs.	lbs.
Weight at beginning of experiment ...	127	128	255
Gain, 1st week	14½	15½	
,, 2nd ,, ...	16½	16½	
,, 3rd ,, ...	15	14½	
,, 4th ,, ...	14	13	
,, 5th ,, ...	10	9	
Weight at end of experiment	197	197	394
Gain during experiment	70	69	139
Average daily gain	2	1·9	

Average daily consumption per head ... ... 9·89 lb.

Summary.

Average Daily Consumption per head.	Total Food Consumed.	Average Daily Gain per head.	Number of lbs. of Food Consumed for 1 lb. Increase.
9·89 lb.	692 lb.	1·95 lb.	4·97 lb.

TABLE II.

FOOD CONSUMED.

Pen I.	1,048 lb. maize	Pen II.	708 lb. maize.
,, III.	722 ,,	,, IV.	692 ,,

VALUE OF THE PIGS.

As stores	£9 0 0
As fats	22 10 0

56·6 bushels of maize as fed gives a gain of 27 per cent. of pork, equivalent to 4s. 9d. per bushel for maize.

BACON TEST.

Mr. Reid writes as follows:—Agreeably to your request, I now beg to report for your information the following regarding the live and dead weights of the lines put through:—

Tamworth-Berkshires.

Live Weight.		Dead Weight.
159 lb.	...	130 lb.
173 ,,	...	141 ,,
190 ,,	...	160 ,,
207 ,,	...	176 ,,
164 ,,	...	137 ,,
893 lb.	...	744 lb.

Total loss, 149 lb.; 16·6 per cent.

Middle Yorkshire-Berkshires.

Live Weight.		Dead Weight.
179 lb.	...	150 lb.
179 ,,	...	149 ,,
358 lb.	...	299 lb.

Total loss, 59 lb.; 16·48 per cent.

Pure Berkshire.

Live Weight.		Dead Weight.
227 lb.	...	192 lb.

Total loss, 35 lb.; 15·41 per cent.

Middle Yorkshire.

Live Weight.		Dead Weight.
186 lb.	...	159 lb.

Total loss, 27 lb.; 15·59 per cent.

Mr. Reid further states that these pigs, on account of their having been well fed, and in an advanced fat condition, showed a less percentage of loss between the live and dead weights than the ordinary run of pigs would whose weights would be more in accordance with the class of bacon now in demand.

The weight of the class of pigs which is now becoming popular is from 110 to 135 lb. dressed, and his experience shows that the loss in pigs of this class ranges from 21 to 26 per cent. Illustrations:—On the 25th of March, as arranged, I visited Mr. J. C. Hutton's stores in Brisbane, and, together with Mr. Reid, cut, carefully examined, and noted the quality of the bacon from the different breeds. Samples were photographed by Mr. Mobsby, of the Agricultural Department, for illustration in the *Journal.** The result of our examination was that we came to the conclusion that the bacon from the Middle Yorkshire was far and away superior to that of all the other lots examined by us. The bones were small, the flesh—both lean and fat—firm and bright in appearance, the lean being proportionately spread all over the carcass. I have had samples of the Yorkshire and Berkshire bacon fried, and comparisons made, with the result that the bacon from the former did not show that oily tendency so noticeable in the latter; and, moreover, the loss in fat was not nearly so great, and the flavour of the bacon was superior.

I have nothing further to state with reference to the other breeds experimented with, with the exception of fully endorsing the remarks contained in Mr. Reid's letter of 26th March, from which the following are extracts:—The exhibit of bacon from the various breeds showed clearly that the Yorkshire is the most valuable pig, either as a purebred or crossed. The Tamworth-Yorkshire crosses were good pigs, but not nearly so fine in the flesh, the streaks of lean being coarse and heavy, and there is an absence of that delicate light-pink colour which was shown in the Yorkshire pigs. The pure Berkshire turned out the worst of any, the lean meat of the flesh being very "beefy," and much too red in colour, although the whole of the bacon had been treated in exactly the same way. I have noticed the tendency to become "beefy" on the part of this breed frequently; the lean meat is coarse and assumes a red colour under the cure. We have been getting a number of the Berkshire-Yorkshire crosses from various districts during the past two years, and we have been highly pleased with them. Not only is the skin finer, but the flesh appears to be much more delicate, and lends itself well to the various processes of curing, the product showing a large amount of delicate lean streaks throughout the tissue of fat. In our country, where maize is so largely fed to pigs, there is an inclination for this cross to put on perhaps an undue amount of fat, but if farmers are careful to bring them to maturity when about six or seven months old they would be in splendid condition for the bacon factory and we have no hesitation in recommending the Berkshire-Yorkshire cross.

COMPARATIVE SKIMMING QUALITIES OF HOLSTEIN, AYRSHIRE, AND JERSEY MILK.

By JOHN MAHON, Principal, Queensland Agricultural College.

The experiments, particulars of which are given herewith, were undertaken with a view to determining whether the milk of the Holstein, Ayrshire, and Jersey cows was similar as regards skimming qualities.

The fat contents of the milk produced by the breeds mentioned vary considerably, as will be seen from the table published herewith, and the milk of the Jersey is characterised by larger fat globules, while that from the Ayrshire and Holstein usually contains fat in the form of small globules. It is, however, understood that a wide individual difference exists in all breeds; some Holsteins and Ayrshires producing large globules are met with, and also Jerseys producing small ones. A change also occurs as the period of lactation advances, the globules increasing in number and diminishing in size. In carrying out this experiment, we endeavoured to minimise as far as possible the tendencies to such variation. For the experiment, the night's and morning's milk from each cow were mixed; the milk was separated at temperatures of 85 degrees and 90 degrees Fahr. respectively, and under similar conditions as regards speed of machine and feed of milk. The experiment was made on two occasions, and besides the difference of temperature of the milk at time of separating, the screw was altered in the machine on the second occasion with the object of increasing the thickness of the cream. A reference to the results

* The illustrations referred to will appear in a future issue of the *Journal*.—Ed. *Q.A.J.*

obtained shows the percentage of fat in the Jersey skim milk to be .020 per cent., in the Ayrshire ·022 per cent., and in the Holstein ·024 per cent. In the second trial the reading of the fat in the skim milk gave: Jersey ·020, Ayrshire ·024, and Holstein ·026 per cent. The percentage of fat in the mixed milks was (first) ·022, and (second) ·023 per cent.

The butter fat test of the cream shows a reading of 37·2 per cent. in the first trial, and in the second 47·4 from Jersey cream. From Ayrshire cream the results were: First trial, 36·2 per cent.; second, 44·4. The Holstein cream readings were 33·0 and 42·6 per cent.

The results indicate that the Jersey milk gives up its fat more readily than the milk of the Ayrshire, and the Ayrshire more readily than the Holstein when the milk is submitted to centrifugal force, but the results do not show so great a difference in the separating characteristics as we anticipated, and we intend to make further experiments in this direction.

	First Trial.	Second Trial.
Jersey Milk.		
Per cent. of fat in whole milk ...	4·	4·1
Separating temperature	85° F.	90° F.
Per cent. of fat in skim milk ...	·020	·020
Per cent. of fat in cream	37·2	47·4
Ayrshire Milk.		
Per cent. of fat in whole milk ...	3·6	3·7
Separating temperature	85° F.	90° F.
Per cent. of fat in skim milk ...	·022	·024
Per cent. of fat in cream	36·2	44·4
Holstein Milk.		
Per cent. of fat in whole milk ...	3·	3·
Separating temperature	85° F.	90° F.
Per cent. of fat in skim milk ...	·024	·026
Per cent. of fat in cream	33·	42·6
Mixed Milks.		
Per cent. of fat in skim milk ...	·022	·023

ON COLD CURING OF CHEESE.

Advantages of curing cheese at low temperatures, flavour, texture, colour, small white specks, regulating flavour, uniformity, molds, consolidated stations.

At the tenth annual convention of the Wisconsin Cheese Makers' Association, held at Madison, Wis., in January, as mentioned in last month's issue of *Ice and Refrigeration*, Dr. H. L. Russell, of the Wisconsin Experiment Station, presented some instructive data in reference to the cold curing of cheese. They were based upon the results of practical experiments made not only in the laboratory, but on a commercial scale—*i.e.*, by utilising one full day's output of an established factory handling 40,000 or 50,000 lb. of milk per day. The experiments were extended over a period of about four years, and hence the results are of more than ordinary value. Dr. Russell's remarks were substantially as follows:—

Cold Curing of Cheese.

We have been working upon the curing of cheese to determine if in some way we cannot improve the quality of cheese by varying in one way or other the method by which it is cured. Cheese differs from butter in that when it comes from the vat it is practically a worthless substance, and it only receives its value from a commercial point of view after a lapse of a certain period of time, during which those profound changes occur that characterise the ripening process.

The experiments which we have been making have been with reference to the use of very much lower temperatures than those heretofore employed. In making these experiments a large mass of milk was taken, and from this was made, under exactly the same conditions, a number of cheese.

These cheese were all made in one vat, so as to secure uniform conditions with reference to manufacture, and then they were placed at various ripening temperatures ranging from 15 degrees Fahr. up to 50 degrees Fahr. Under these conditions, if we secure a very marked difference in the product, it ought to be attributed to the ripening temperature, inasmuch as the manufacture was the same throughout.

Our experience has demonstrated that the quality of the product which was secured under these temperature conditions was generally better the lower the temperature at which the cheese was cured, with the exception of those kept below the freezing point. In these cases, in spite of the fact that the cheese was kept below the freezing point, they were of fairly good quality when properly handled after they were taken from the cold room. The cheese which we have found to be the best were those which were cured at a temperature ranging from 35 to 40 degrees or thereabouts; these were better than those at 50 degrees; those kept at 50 degrees were better than those at 60 degrees. This leads us to believe that much lower temperatures than have heretofore been considered advisable may be used with very considerable success in ripening Cheddar cheese.

There are just a few points with reference to these cold-cured cheeses that I wish to call your attention to. In the first place there is the question of flavour. The flavour of these cheese cured at these abnormally low temperatures is very mild. It is a good, clean flavour in every way, in spite of the fact that there is a popular opinion, I believe, that cheese cured at what we might call cold storage temperature very frequently have a bitter flavour.

With reference to the texture of these cheese, in many respects they were practically perfect. They were thoroughly broken down, so that the texture was as satisfactory as could be asked for.

It is noteworthy that a comparison of the cheese from a physical point of view in connection with the chemical analysis show that they have not broken down chemically as far as their physical appearance would indicate. With reference to the body of cheese, they were close and meaty, except in those cases where excessive quantities of rennet were employed.

With reference to the colour of the cheese, they were perfectly even in colour, except in those instances where the body of the cheese was a little loose; in which case the colour was cut around these openings. This, I should say, only happens in the case of cheese made with increased quantities of rennet.

There is one other characteristic of these cheese which is quite remarkable, not only from the practical point of view, but at the same time from a scientific point of view. In cheese cured at 40 degrees or below there appear throughout the entire mass of cheese very small, almost microscopic, white specks. The nature of these I need not go into here in connection with this subject, for that is a matter that is still under investigation. These white specks are not apparent when the cheese is in the cold storage room, but when a cheese is taken out and warmed up they become apparent. At first we thought this was a serious defect, a handicap upon the appearance, and that they would injure the sale a good deal; but Mr. Baer, in his work throughout the State, has had occasion to examine cheese kept in cold storage in different portions of the State, and he has found that the presence of these white specks is not at all uncommon; that, in fact, in most of the storage goods which he examined they were quite evident. They are not readily noticed in the early stage of curing—in fact, we recognised them upon the photographic plate before we did with the unaided eye; but afterwards we found, upon very close examination, that they were present in all of our product kept at low temperature. They have absolutely no effect upon the flavour of the cheese, and do not injure it in any way except, of course, where they might be present to such an extent that it would cause a question in the mind of consumer as to what they were. From the fact, however, that they appear in all cold storage goods and have not, so far as we know, occasioned any concern in the market—that is, buyers buy these goods and do not pay any attention to it—we are led to believe that the matter is entirely inconsequential. Indeed, these appearances might constitute, as it were, a trade mark for cheese cured according to this method, because they do not appear in cheese which is cured above 40 degrees, but are almost invariably present in cheese cured at 40 degrees or below.

Now, the quality of the cheese, as found in the flavour, the texture, the body, and the colour, is, on the whole, better than that of cheese cured at higher temperatures. These cheese have been examined by our own experts, and by cheese experts who knew nothing whatever of the way in which they had been handled. Not only have the Wisconsin judges, but Canadian and eastern experts, pronounced them an exceedingly fine product, a good deal better than the market ordinarily produces.

Not only has it been found that the quality of the individual cheese itself was improved over those ripened at higher temperatures, but there are other advantages which come from the use of this system. Take, for instance, the matter of flavour. It is possible to intensify the flavour of these cheese in a very simple manner. When these cheese, after they have been thoroughly ripened, physically entirely broken down, still have a perfectly mild flavour, if they are then taken out and brought into a higher curing temperature, say, 60 degrees or thereabouts, you can intensify the flavour to almost any degree you desire. In that way it becomes possible with well-matured cheese to get rid of those sharp, twangy flavours so liable to occur in the ordinary product.

Then, again, the question of uniformity comes in. It is possible to make a more uniform product. The daily fluctuations in character of the product are often so great as to practically, in some instances, defeat the skill of the cheese-maker. With these lower temperatures it is possible to produce a very much more uniform product.

Then, again, there is the factor of the keeping quality of these cheese. They are slower in ripening, but they are a great deal longer in passing through what we may call a commercial period, so that instead of the cheese reaching its best, and then soon declining, these cheese are marketable for a longer period of time. This, of course, is an advantage which is very evident.

Again, we have the matter of the diminution of losses in the ripening of cheese under usual factory conditions. Not only is the question of quality important—flavour, texture, &c.—but there is always some loss due to the drying out of the cheese. This is much less with cheese cured at lower temperatures than with those cured at 60 degrees or above.

Again, we have the matter of abnormal taints. We have found that where milks are slightly tainted to begin with, the taint was not nearly so pronounced in the cheese if cured at 40 degrees as if it were cured at 60 degrees or thereabouts. This is particularly true where there is a tendency for the cheese to huff, due to the development of gas-producing bacteria.

Then, one more factor is the matter of molding. The molding of cheese is, of course, a biological phenomenon due to the development of mold spores on the surface of the cheese, a condition brought about by the proper temperature and moisture. Mold will invariably occur when the degree of saturation in the atmosphere reaches the maximum point, and under these conditions at ordinary temperatures at which cheese is ripened you have more or less trouble from the molding of the cheese. We find that when cheese is cured at 40 degrees or thereabouts, these molds will not develop. They cannot grow to any considerable extent, because the temperature is too low for them to develop, so that those losses are to a large extent obviated by the use of these lower-curing temperatures.

Now, there is a matter of expense to be considered in this process, because, in order to be able to cure cheese at 40 degrees, it becomes necessary to use other than ordinary methods. There is increased equipment, and there is also a factor of time to be taken into consideration. The ripening process is slower under such conditions, therefore the factor of interest comes in. It has been found that it is possible to diminish this extra time by the use of higher amounts of rennet, and that under these conditions you do not experience the bad effects which come from the use of large quantities of rennet under ordinary conditions. The use of 6 or 9 oz. of rennet, ripened under ordinary conditions, gives a very sharp flavour. These cheese, made with extra rennet, and cured at 35, 40, and 50 degrees, do not have that sharp and undesirable flavour that usually characterises high rennet cheese; at the same time the increased rennet hastens the ripening process, so that the time element is not of so much importance. While it is possible that it will take somewhat longer time to cure cheese at low temperatures than under ordinary conditions, yet that time is not very greatly increased. I have here a cheese ripened for seven months at 40 degrees, and I think you will find it of excellent quality.

CONSOLIDATED COLD CURING STATIONS.

It is manifestly out of the question for each cheese factory to go to work and construct a curing-room in which the insulation is perfect enough to enable the cheese to be kept economically at a temperature of 40 degrees or thereabouts.

Some years ago a proposition was made by us at the State dairymen's convention to instal centralised curing stations for the ripening of cheese. It would seem that if this low temperature curing process is a success, in place of each factory building its own curing-room, and putting 500 or more into a sub-earth duct, or some other sort of an improvement to reduce temperatures, it is a great deal more economical to combine the curing-room for several factories, to establish co-operation in such a way as to secure maximum results with minimum expense. It is possible to ship cheese from different factories to some central point at which a properly constructed curing-room can be made, where the entire output can be handled so that the quality of the cheese will be much improved thereby, and the ordinary losses considerably lessened. There are other advantages which would accrue from this production of cheese in large lines, so that buyers could easily contract for considerable quantities at one time. In this way it is possible, through the use of this consolidated cold curing station, where cheese is shipped from various points to be cured, to produce cheese of the best quality at the minimum of expense.

The experiment has been tried of shipping cheese from Iowa to Canada, and from Canada back to Iowa, in order to see whether they would stand the journey without impairment in quality, and those cheese, sent 800 or 1,000 miles, have been placed under these curing conditions, and came out a No. 1 cheese, so that the question of distance is no factor whatever in this matter.

Poultry.

TO FREE HENS FROM LICE.

A correspondent in *Farm Poultry* gives an ingenious device for freeing laying hens of lice, after having used many other methods and failed. His plan was:—Take an ordinary common-sized cotton clothesline; unbraid it so that it will make one-third or half when flattened out; cut in pieces about 12 in. long, and wind each once around the roost, letting the two ends pass down into the neck of a bottle about two-thirds full of kerosene, the bottle being suspended from the roof by a string fastened around the neck. The clothesline acts like a wick, drawing the oil up out of the bottle, and it being saturated with the oil, no louse can help coming in contact with it when he attempts to go to the hen at night, or when he leaves her in the morning. Hens with scaly feet and legs are also soon cured of their trouble when this method is used. Bottles can be suspended 3 or 4 feet apart on the roosts.

The Orchard.

QUEENSLAND AGRICULTURAL COLLEGE.

The question is often asked, both in Europe, in the United States, and in the States of this Commonwealth, "Do Agricultural Colleges do any good?" Usually the reply is in the affirmative.

What is the *raison d'être* of Agricultural Colleges? They are certainly not intended to be merely farms and orchards worked for the direct pecuniary benefit of the State, kept up by the funds of the taxpayer, and entering into competition with the farmer and fruit-grower who has only his own capital and labour to depend upon. Yet this is precisely the view that unthinking people, and especially people with no knowledge of rural pursuits, adopt. They fail to understand that whilst agricultural colleges are expensive to keep up, and return no direct profit to the State, yet they are invaluable institutions for the training of young men in the various branches of rural economy. Already numbers of the students of the Queensland College have, after their three years' course of study, obtained employment on farms, in creameries, butter factories, and dairies. Numbers of others have taken up land for themselves and have become successful wheat and fruit growers, dairy farmers, &c. The instruction given at our college is bearing fruit in manifold ways beneficial to the State.

As showing what kind of education, theoretical and practical, is given to our students, we have been asked to print a paper written by one of them, Mr. M. R. Fox, and read before the College Debating Club. We do so with pleasure, as the paper is intelligent, practical, and devoid of unintelligible language so common to writers on scientific subjects. It is entitled

Spraying and the Destruction of Pests.

Before commencing to speak on this subject I must express my regret at being unable to read this paper at our last meeting, and also that it will not be as long and instructive as I would wish, owing to my being unable to secure any books that afforded information that I might check my remarks by. However, I have done my best to prepare as instructive and reliable a paper as I can, and hope you will deal leniently with it in your criticisms.

Sprays are used mainly to contend with fungoid diseases and insect pests, and are therefore divided into two classes—"Fungicides" for fungus, and "Insecticides" for insect pests. Up to the present time no one spray has been invented that will act equally well on both these pests, and as they require different substances for their destruction it is not likely that there will be one.

Insects differ greatly in their mode of attack, and therefore they will require different treatment. For example, take the "aphis" of the peach and the "Codlin moth" of the apple. The former causes mischief by sucking the juice from the plant; the other lays it eggs at the calyx of the fruit, and the larva does the work of boring about inside. Scale insects and borers again must be treated differently to those that gnaw the leaves and outside of the plant.

To destroy insects that eat the outside of the leaf or bark, a fine spray or powder of some poisonous substance is used. Generally these insects are more easily and cheaply got rid of than any other kind. The commonest of the poisons used against these pests are Paris green and London purple—in fact, these two are the only ones in general use. These compounds contain arsenic, in the Paris green as aceto-arsenite of copper, and in London purple as arsenite of lime. The Paris green is more to be relied upon as having sufficient strength; the amount of arsenic in the purple often varying considerably. The latter is more soluble in water than the Paris green. One ounce of the powder to 10 gallons of water is the standard strength, although on some varieties of apples and other delicate foliaged trees it is advisable to weaken the mixture to 1 oz. to 12 gallons. If used stronger, the Paris green especially, is liable to burn the foliage. Quicklime added in the making up of these mixtures will make the poison stick to the leaves better and will also limit the burning action on them. Too much lime must not be added, as it will clog the nozzle of the spray pump. Four of lime to one of Paris green is about the best proportion. According to "Lodeman," sugar added to these sprays will make them adhere to the leaves better. This is especially applicable to copper spray solutions, on which I shall speak later.

The insects that do not gnaw the outside of the leaves and plant would not be affected by poison that is sprayed on the outside; therefore, a different application is needed—one that will kill by coming into contact with the insect. For soft-bodied insects and caterpillars, tobacco water, tar water, quassia, and many other cheap remedies are used, but are only good for aphis, caterpillars, &c. Some insects, such as the woolly aphis and cottony cushion scale, have a coating of a waxy substance over them which makes them proof against the abovementioned sprays, the wax preventing the insecticide from reaching their bodies. To kill them, the waxy coat must be destroyed, and some substance that dissolves it is mixed with the spray. Kerosene is the best stuff to accomplish this, but if it were sprayed on to a plant in a pure state it would not only destroy the insect, but would also kill the plant. To prevent this, an emulsion is made with soap, and this is generally a hard job, as a perfect emulsion is necessary, and no kerosene must be left unemulsified or it will burn the plant, and also destroy the india-rubber parts of the spraying outfit. One formula for making an emulsion is as follows:—Churn 2 gallons of kerosene and ½ lb. of common soap in 1 gallon of water till a perfectly stable emulsion is formed. This is then diluted to 30 gallons with water and is ready for use. Resin with caustic soda makes another good spray for scale insects in general. These sprays cost a great deal more than tobacco water, &c., and are more trouble to prepare, but can always be relied upon if used judiciously. Judgment must be used in spraying not to use a strong spray on a tender-foliaged plant. Washes for scale insects are made from sulphur and lime, and prove very efficient.

Sprays for fungus pests naturally differ entirely from those used on insects, and are those that will burn or otherwise destroy the fungus without damaging the host plant. Fungi are divided into two classes—those growing on dead or decaying tissue and those feeding on living tissue. To the latter class belong the fungi which generally attack cultivated plants. Some fungi start their mischievous work in the centre of the plant, and this makes it very difficult to destroy them—in fact, it is practically impossible to get rid of them without destroying the plant itself. Others confine their attacks to the surface of the stalks and leaves, and it is with the latter we shall principally deal.

The only chance one has of eradicating a fungus is to take it in hand before it becomes firmly established and before its spores have penetrated into the tissue of the plant. When this happens the tissues of the plant must be destroyed to kill the fungus, and it is plain that the cure is worse than the disease. All sprays and applications must be preventives, as a cure is impossible when the fungus once becomes firmly established, unless it is one that confines its attacks to the surface of the plant. The best method of preventing attacks of these diseases is by covering the stems and branches with some dressing (care being taken to fill all the little crevices in the bark), which either prevents germination or destroys the spores as soon as they have germinated.

The materials in general use for the prevention of fungus pests are bluestone, lime, and sulphur, bluestone being the most important. These are made up into various sprays and applications, the chief of which is Bordeaux mixture. Some say that if London purple is added at the rate of 1 lb. per 100 gallons of mixture, a more effective spray is formed, but discretion must be used in so doing. Bordeaux mixture may be called the standard spray for fungi. Lime and sulphur boiled in water in equal proportions is a remedy for mildews. Other washes are made of sulphur, lime, and salt. The fungus "Oïdium" of the grape is entirely prevented and cured by dusting sulphur over the affected parts. The sun volatilises it, and the fumes cause the fungus to curl up and die.

For boring insects different methods are adopted; one is to remove all the loose bark on the trunk and branches after pruning, and to apply a wash of tar, grease, kerosene emulsion, phenyl, or any other solution that would cause the flavour of the bark to be unpalatable to the insect before it enters the plant. A poison added to the wash should make the application still more effective. Care must be taken to have all cracks and crevices covered with the application or it will be of little value, as the insect would soon find out any clean spot. A wash of lime, sulphur, and salt is very efficacious, not only in keeping away borers, but also in preventing the appearance of many fungus pests. It is one of the best remedies for the San José scale of the apple. Borers may often be killed when in the grub stage by shoving a fine pliable wire into their burrows, or by injecting a small quantity of turpentine or kerosene into the hole and then plugging it up with a piece of soft clay.

The cyaniding process for destroying scale and other insects is a most efficacious method, as the gas searches out the most remote corners, and if used sufficiently strong no insect can live in it. In California this method has been taken up almost entirely, and the sprays are being left alone. The tree is covered with a sheet or tent of some close material (Canadian duck is used by the Department of Agriculture, and is considered by the fruit experts to be the best material for this purpose). Hydrocyanic gas is then generated in the tent with sulphuric acid and cyanide of potassium. According to Mr. Benson, in the *Agricultural Journal*, Vol. IV., Part 4, the best strength to be used is made up of 1 oz. of cyanide, 3 oz. of water, and 1 oz. of sulphuric acid to every 300 cubic feet of space taken up by the tree. Care must be taken not to make the gas too strong, or injury to the trees will be the result. Some scale require stronger treatment than others. Mangoes will stand the gas very strong, and the gas then destroys the eggs as well as the insects themselves.

In spraying plants there are three points to remember:—

1. Spray as soon as a disease or pest is noticed; every delay is to the advantage of the pest. The killing of the insect at this period may mean the prevention of hundreds, and prompt applications may mean the destruction of millions of fungi spores.

2. Be thorough. When spraying, spray thoroughly. As I said before, it is no good making an application if it is not done properly and thoroughly.

3. Be intelligent in your spraying. Think what you are going to do. The grower must know the cause of a disease, and then find out the best method of stopping it.

Before spraying a crop it must first be calculated whether the increased crop of sound fruit will cover the expenses of buying the materials and mixing and applying the spray. There are many efficacious sprays that it would not pay to use owing to their cost. The fruit-grower knows the price a crop of inferior quality brings, and also the price given for perfect or fancy crops. The difference between the two shows to what extent the crop benefits by treatment. Proper treatment must produce good results. Remember, the arsenite sprays will destroy gnawing insects with hardly an exception, and the copper solutions will prevent attacks from most fungi.

A CURE FOR EARACHE.

Procure an ordinary clay pipe, and insert a wad of cotton wool in the bowl, then drop six or eight minims of chloroform on to the wool, and cover with a similar wad. Insert the pipe stem just within the ear passage, and gently blow down the bowl of the pipe. The results are often quite wonderful. Sometimes it is sufficient to drop a few drops of chloroform on to a handkerchief and apply the latter to the affected ear, or drop the chloroform on to a wad of cotton wool, which should be loosely packed into the ear passage.

Viticulture.

PRUNING.

By E. H. RAINFORD, Instructor in Viticulture.

It is now four years since an article on this subject appeared in the *Agricultural Journal*, and as many new men have gone in for viticulture since then, some of whom, perhaps, are unaware of the fact or unable to procure the article in question, it will not be out of place to deal with the subject again. Although there must be, unavoidably, more or less repetition of previous matter, there will be this difference—viz., that whereas in the former article the plates illustrating the various systems of pruning and the steps taken to arrive at them were taken from other works, those illustrating this article are reproduced from photos of vines taken at the experimental farms for the pruning records, and therefore can be relied on as actual and not imaginary.

Every vigneron knows that pruning a vine is a necessary part of its cultivation; for if it were not done, it would extend over and entangle with other vines forming an impenetrable thicket, rendering cultivation impossible, and would produce small, defective, valueless grapes. The primitive methods adopted by the "lazy man," who restricts himself to slashing his Isabellas with an old scythe now and again, can hardly be described as up-to-date pruning; some more scientific method than this of controlling the vegetation is required. The growth must not only be restrained within certain limits, but the vine must be given the definite shape that can be most economically cultivated; for as winter pruning and summer pruning form an important part of vine cultivation, these can only be effected with economy of time on those vines which have a definite and similar shape.

The question that the unpractised hand asks himself is: How am I to begin? How am I to keep it up? What rules and principles am I to follow and observe? The vine is pruned in many ways according to the variety, soil, and climate, but the following laws should be observed in all systems:—

1. A shape must be given to the vine that permits the sap to be repartitioned to all parts of the vine equally; to succeed in this the permanent wood must be kept as much as possible in one plane.
2. Balance the vegetation of the vine and its crop to the fertility of the soil.
3. Canes of average size are more fruitful than thick ones.
4. Vertical canes dispose more to wood, and those inclined downwards to fruit; any dispositions tending to check the flow of sap assists production of fruit.
5. The fewer the number of buds on a shoot or spur the greater will be the vigour of each individual shoot growing from them, and *vice versâ*.
6. The more abundant the fruit the less will be the saccharine matter in it.
7. Deformations produced by wounds, angles, and torsions diminish the flow of sap and consequently the activity of the vine or part of the vine.

An explanation of some of the above rules will assist novices to understand their application:—

1. The necessity of giving a vine a correct and *permanent* shape is of prime necessity in pruning, and one that is more honoured in Queensland in the breach than in the observance, in trellised vines. In all parts of the State vineyards are met with where vines are to be seen straggling all over the wires like monstrous octopi, possessed of double the legal number of tentacles, with the inevitable result that in a few years all the lower spurs

die or become barren. The extremities make very heavy wood, with a corresponding waste of vigour, and the vine as a whole has not half the crop it would have had if pruned in one plane, as shown in Figs. 14 and 17. To prune such vines properly is impossible, and the waste of time, considering what to prune and what to leave, is considerable. The spurs should be formed at regular intervals, and, in double-armed systems, in equal numbers on either arm.

2. This is easily to be understood, and is a warning not to overtax the vine, lest it declines. By keeping an eye on last year's wood no difficulty will be found in balancing the pruning to the vigour of the vine. If the wood is too strong, and there are suckers or water-shoots, allow more eyes or spurs; if spindly, and some eyes have not burst last season, prune more closely.

4. This rule should be remembered when pruning long or with fruit-rods.

5. Assists to carry out rule 2.

6. This is easily understood, and should be borne in mind when pruning vines that are required to have a high saccharine density of must or ample colouring matter in the grapes.

7. This rule is seldom observed, and vines are met with that are bent at sharp angles or twisted round wires, which retards a free circulation of the sap and causes a copious growth of suckers and water-shoots—a waste of vigour which is paid for by loss of crop. This rule does not conflict with rule 4, as that applies to fruit-rods, and not to permanent wood.

Before entering into a description of the various systems of pruning adapted to this State, it would be well to give a few words of advice to beginners on the *modus operandi* of pruning a vine, and the points to be attended to when doing so.

If there is any doubt as to what wood to take off and what to leave, as may happen if there has been any damage to the shoots from wind, frost, or hail, prune away first all the wood which the pruner is sure he will *not* require; this will relieve the vine of a quantity of confusing wood, and help to simplify matters. In dealing with what is left, the future shape of the vine must be the prime consideration, and not the coming crop.

When pruning off any stout wood or canes, a slight pressure on the cane or spur to be removed, with the left hand away from the direction of the cut, will greatly assist the action of the secateurs and relieve the strain on the hand of the operator. It must be done contemporaneously with the cutting, and the pressure must not be too heavy, or the wood will split before the section has been made. A little practice will soon tell the exact amount of pressure to put on.

When pruning away suckers, be careful to extirpate them where they unite with the stock, no matter how deep down they may be; if cut off higher up they will give fresh work next season, which is to be avoided.

After using the saw in removing last year's fruit-rods or old spurs, plane the sawn surface off with a sharp chisel; this will effect a better healing of the wound, and prevent water from lodging on the section and starting decay of the wood.

When the pruner has a choice of more than one cane for laying down as a permanent cordon or temporary fruit-rod, do not prune away the others until the one chosen has been finally tied down in its place; as, should it be broken in the operation, which sometimes happens from various causes, he will have another to replace it with. Had he pruned away all the wood but the one cane which subsequently broke, there would be no remedy for the mishap.

Always prune away any dead wood down to the live wood, which will heal; if dead wood is left on the vine, decay will ensue, which must injure it; moreover, dead wood left on a vine marks the slovenly pruner—the "lazy man."

When pruning spurs always leave the bottom cane and prune away the top one, even if the lower cane is weaker and thinner. It is a great mistake to leave the upper cane because it may be stronger, a mistake frequently made in Queensland, and which is answerable for the outrageously long, contorted spurs seen on short-pruned vines. If the lower canes are spindly it is a sign that the vine is being over-cropped, when the number of spurs should be reduced, or they should be pruned to one eye for a year or two. Make the section as nearly as possible in a plane with the top cane, and avoid making more than one cut.

The suckers and watershoots of vines have, with few exceptions, non-fructiferous eyes. This must be remembered when pruning vines that have had the normal wood injured from accidents, in which case, when choosing rods and cordons, take only those canes which have issued from the previous year's wood. Suckers are canes issuing from the stock below the ground. Water-shoots are canes issuing from all wood formed before the previous year.

If, in short-pruned vines, the canes are long and thick, showing waste of vigour, it is better to utilise that vigour by means of one or two short fruit-rods, as in the mixed Royat system, instead of increasing the number of spurs; and in long-pruned vines by increasing the length of their rods. When, however, the reverse is the case, and canes are spindly and weak, prune spurs to one eye each and decrease the length of the fruit-rods until the balance is obtained.

The pruner should always keep his tools sharp, as by doing so he gets over his work quicker and makes cleaner cuts. He should never hurry his work, but take his time over it.

Pruning is divided into two classes, short pruning and long pruning. By short pruning is understood, that the fruit-bearing spurs are restricted to two, at most three, eyes, not counting the dormant eye at the base of the spur. By long pruning is understood that the fruit-bearing spurs or rods number four eyes and upwards. These two classes are subdivided into several systems, the principal of which will be described, and there are also one or two systems in which the two classes come together called mixed pruning. These are, however, but a modification of short pruning.

SHORT PRUNING comprises the following principal systems:—The Bush, the Royat or Unilateral Cordon, the Thomery espalier or Bi-lateral Cordon.

LONG PRUNING comprises the following systems:—The Guyot, the Bordelaise espalier or double Guyot, the Cazenave.

MIXED PRUNING comprises the mixed Royat; the Bush with fruit-rod.

There are many other systems such as the Sylvoz, Chaintre, Vertical Cordons, &c., but as they are unadapted to this climate it is useless to describe them.

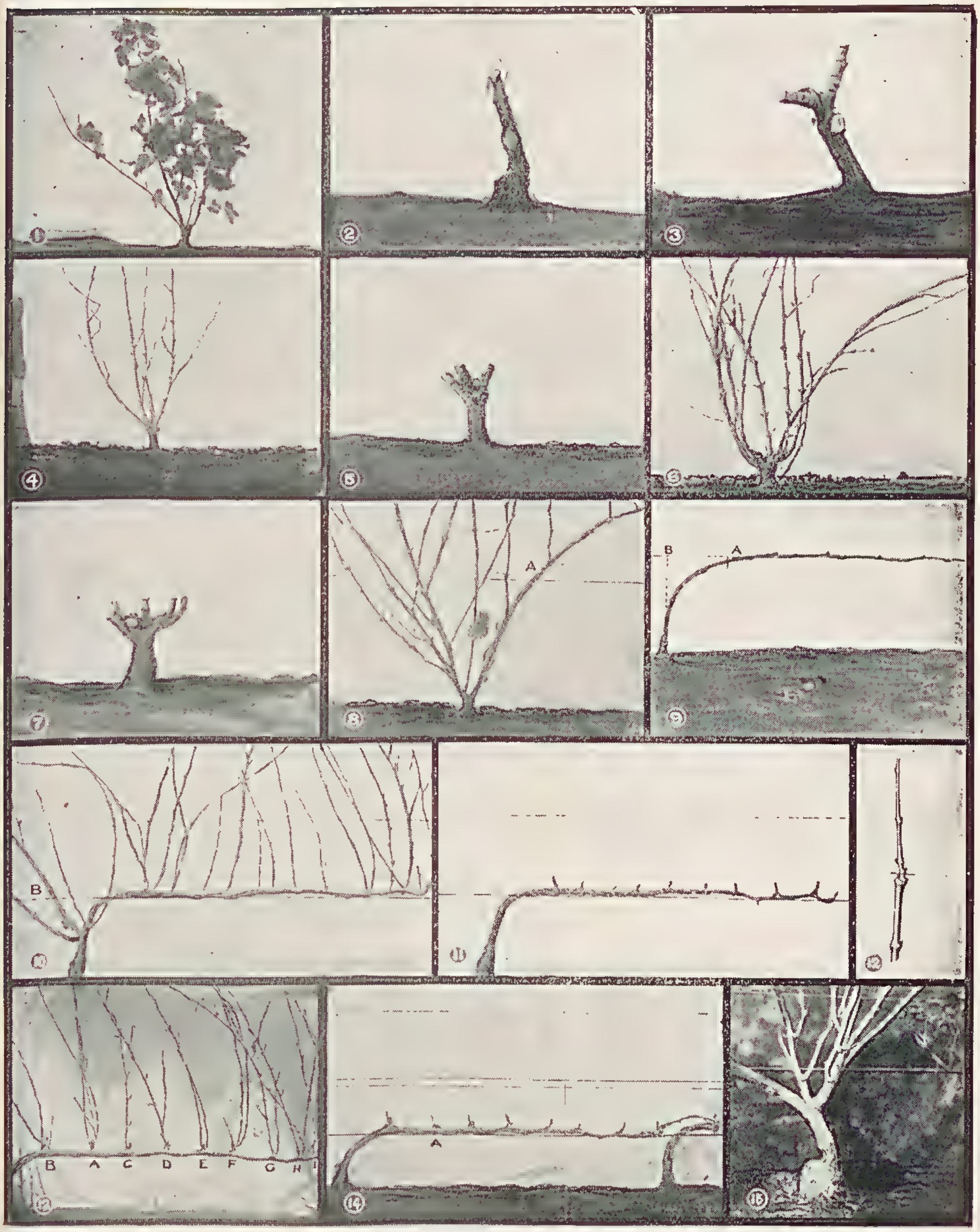
SHORT PRUNING.

THE BUSH SYSTEM.

Bush pruning is the system usually adopted when vines are not trellised, but are supported by stakes. The aim of the pruner should be to keep the vine low and to form and maintain the spurs at equal distances round the crown of the stock, also to avoid lengthening and crowding of the same. Supposing a cutting to have been planted in any fairly fertile soil, with a moderate rainfall it will have made during the year the growth shown in Fig. 1. In ninety-nine cases out of a hundred, the vine should be pruned back to one spur with two eyes as in Fig. 2; the exception is for strong growers in rich soil, when two spurs may be left as in Fig. 3.

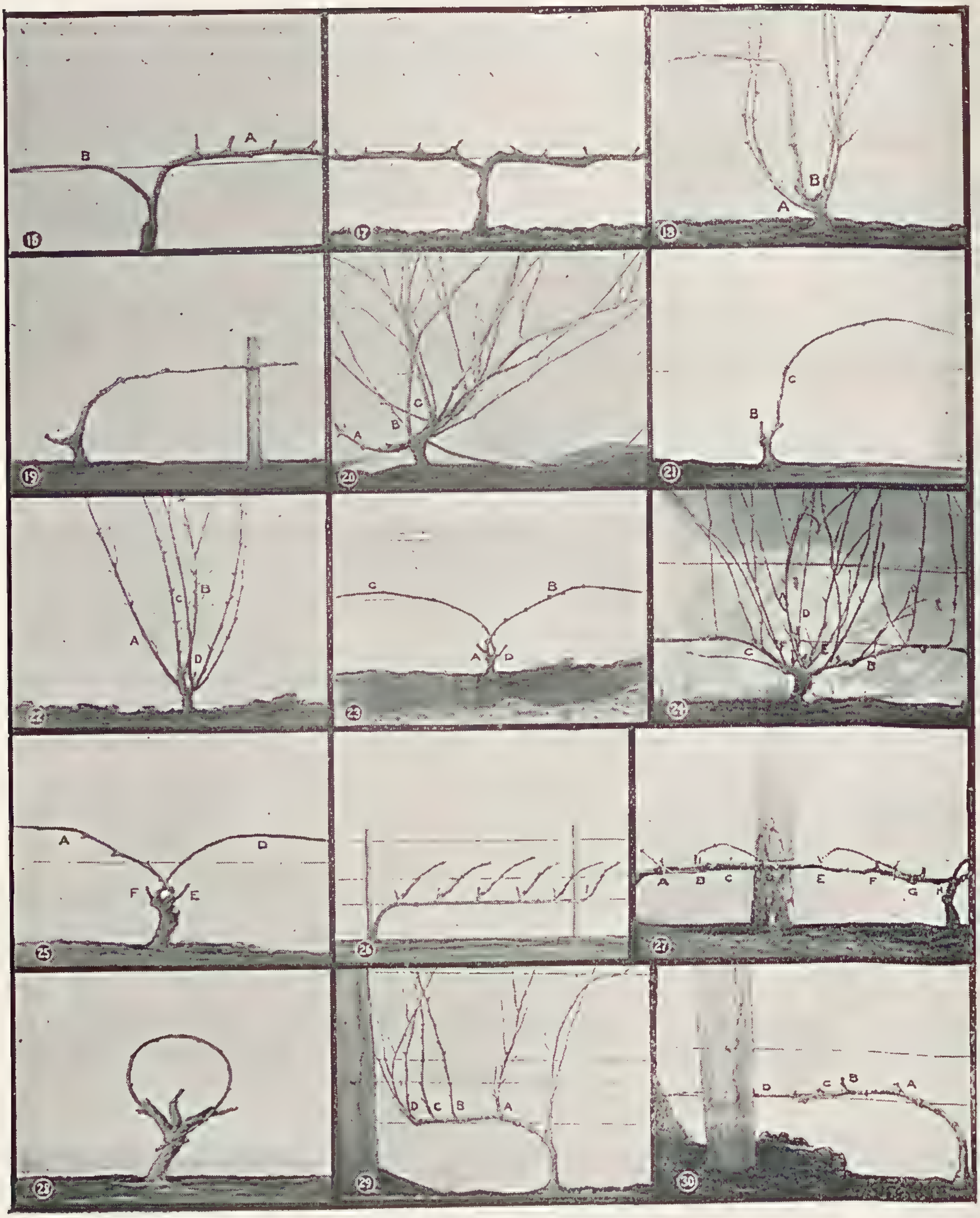
At the second pruning the vine will have made the growth shown in Fig. 4. Choose two or three canes starting from the crown of the stock at the same level, and prune these to two eyes each, not counting the blind eye at the base of the cane, and then cut away all other wood close to the stock, and the vine will appear as at Fig. 5. Many writers on pruning lay great stress on making the section of the cane through the node above the last eye; theoretically it is correct to do so, but it is seldom practised; examine the work of the most expert pruners and the section will be found as frequently elsewhere. So far as Queensland is concerned, the pruner may make his section anywhere between the eyes with perfect safety, so that it be not too close to the eye.

Plate XXVI.



Examples of Pruning Vines.

Plate XXVII.



Examples of Pruning Vines.

The following season the vine will appear as at Fig. 6, and by following the rules already given in the choice of canes for spurs, the vine, after pruning, will be as shown in Fig. 7. There are five spurs in this vine although the photograph apparently shows four; it was planted at the Biggenden State Farm as a cutting in July, 1899, and bore a crop in 1901. The same process is continued, adding one or two spurs yearly until the number the vine is able to support is reached.

ROYAT OR UNILATERAL CORDON.

This system, so called because it was first practised to any extent at the town of Royat in France, is an excellent one on which to prune trellised vines, and in some respects is superior to the Thomery espalier. The formation of the unilateral cordon is arrived at as follows:—The first year's growth of the planted cutting (Fig. 1) is pruned to Fig. 2, as in the Bush system. The following year, if the vineyard has been planted in good soil, the vine will have made a growth as at Fig. 8, having one 7-foot long cane A; this is managed by severe disbudding during the previous spring and summer. The cane A is attached to the bottom wire of the trellis at about 18 inches from the ground, as in Fig. 9; should there not be a sufficiently long cane available through weak growth, the vine should be pruned back to two spurs which will yield a good cane for next season. Supposing a good strong cane to have had its length shortened by injury, it may be laid down, taking great care to leave a *bottom* eye for the last eye of the cordon to make a shoot with which to continue the cordon next season (see Figs. 29 and 30). The cordon must, in either case, reach the next vine, as seen in Fig. 30, and the last eye must be a top eye. In bending the cane down to the wire the curve must be as in Fig. 9; from B plumb with the stock to A where cane and wire meet must not be less than 6 inches, better still 8. This is a very important point that must be strictly attended to for reasons which the limits of this article forbid the writer to enter into. The curve in Figs. 10 and 11 is too sharp. That in Figs. 9 and 14 is correct. The following spring all shoots from bottom eyes on the cordon, together with any issuing from below the curve, must be rigorously disbudded.

In the succeeding winter the vine will have the appearance of Fig. 10. This photograph was taken of a vine that had suffered from a dry season. Under ordinary circumstances, the canes would have made stronger growth. Some vigour was also wasted on the canes below the curve which should have been removed in the spring. The cane chosen for the first spur must be *not less* than 12 inches from the vertical line of the stock. Should two canes offer, one at 9 and one at 15 inches, choose the latter. This is all-important, the reason being that if the first spur is less than 12 inches from the stock it will absorb a superabundance of sap causing a heavy growth of wood with a corresponding weakening of the other spurs (see Fig. 15). Even at 12 inches distance the spur will for the first few years make greater growth than those in the middle of the cordon. Having chosen a cane for the first spur, prune it to two eyes. The next spur should be at from 6 to 8 inches distance, removing any intervening canes clean with the stock, and so on to the end of the cordon; all canes growing from the under side should be pruned off, also all wood on the stock below the first spur. The vine will then be as at Fig. 11, with from eight to ten spurs. This number will not be found to be too many in ordinary fertile soil in Queensland. If the number is reduced, there will be a growth of too much wood, or else the mixed Royat system will have to be resorted to. If the previous season the cordon had not attained its full length, it should do so now by laying down the cane issued from the last eye as shown in Figs. 29 and 30. The following winter the vine will have made a growth as at Fig. 13. It will be noticed that two of the spurs have only one cane each, the others having been broken off by wind in the spring. Proceed to prune all but the last spur, as in the Bush system, by cutting out the top cane and pruning the lower to two eyes; spur A in Figs. 13 and 14 shows how this is done. The last spur, B, is pruned differently. Instead of cutting out the upper cane, it is pruned to four or five eyes, and tied down to the vine ahead of it, as in Fig. 14, so as to fill the blank space up to the first spur of the next vine; the lower cane is pruned to two eyes. This short fruit-rod serves two purposes—one, to fill the blank space as mentioned; another, to utilise for fruit the sap which accumulates at the extremity of the vine. It will have been noticed by readers that the extreme spurs on vines invariably made very strong wood. The vine is now perfect in shape. The following year the little fruit-rod is entirely removed close to the spur, and the upper cane of the spur is again pruned to a fruit-rod, and the lower pruned to two eyes as in the previous year. Should wind have damaged the shoots, and there be only one cane to the spur, this must be pruned to two eyes, and the fruit-rod dispensed with.

Such is the Royat or unilateral cordon system, which is in all respects an excellent one, and in the writer's opinion superior to the Bi-lateral cordon, to be described next. Vignerons who intend to adopt it are advised to plant their vines at a distance not exceeding 6, at most 7, feet apart, otherwise the length of the cordon will be exaggerated. Vines over that distance apart should be pruned on the Thomery espalier fashion. Before quitting this system a few hints will prove of service to vignerons. Should there be found the year following the laying down of the cordon (Fig. 10) blank spaces through injury of the young shoots by wind, &c., make a cut in the cordon with the secateurs in front of the blank eye, and it will frequently cause a shoot to start at that spot; but it is far better to carefully tie up the shoots as they grow to avoid injury by wind than to have recourse to expedients for filling up blank spaces. After a time spurs will begin to lengthen, and possibly project outwards, with danger of injury from cultivators, &c. The vigneron's attention must always be directed to keeping the spurs short by occasional renewals, no matter what system of pruning is adopted. To effect this advantage must be taken of occasional water-shoots which make their appearance at the base of spurs; the best situated must be carefully protected when a spur requires renewal, and not removed at the summer pruning. The following winter this shoot is pruned to one eye and the spur pruned as usual. The year after the cane from the base of the spur is pruned to two eyes and the old spur removed clean with the stock. If a water-shoot fails to make its appearance for forming a new spur, prune the spur to three eyes and blind the two lower ones. This will seldom fail to force out a water-shoot unless the spur is very old.

THOMERY ESPALIER OR BI-LATERAL CORDON.

This is a system of pruning which forms a vine with two arms or cordons, one on either side of the stock, with spurs on both arms. The procedure adapted the first year is the same as in the previous system (Figs. 1 and 2). There are now two ways of forming the cordon—a correct and more troublesome way, and an incorrect and easy way. Needless to say the latter is far more frequently chosen, but as the ill results of doing so are of no great consequence it need not be severely condemned. In the first place a well placed upright shoot issuing from Fig. 2 in the spring, is pinched back a few inches below the bottom wire of the trellis. Of the laterals that will start out only the topmost is permitted to grow, the others being pinched back to the first leaf. The following season this shoot will resemble Fig. 12. At the base of the top lateral there will be several eyes, and it should be pruned as indicated in Fig. 12, leaving two well-placed eyes just below the section. The following spring the shoots issuing from these two eyes are trained right and left along the wire, and they are at the next pruning shortened to meet the arms of the neighbouring vines at equal distances; the arms are then permanently tied down in their place. The subsequent pruning is exactly the same as in the Royat system, except that there is no fruit-rod on the last spur, which is pruned like the others. It is not uncommon to form two spurs at the end of either arm to absorb the sap. The objection to this method of forming the vine is that it entails considerable attention to the shoot that is pinched back lest it be injured, in which case the formation of the vine will be retarded a year; with this drawback, it is far superior to the procedure next described.

The second method is to allow the shoots from Fig. 2 to grow without any pinching back and to lay down a cane the following winter, as in Fig. 9, but with less curvature and extending but half the distance to the next vine. At the summer pruning instead of removing all the shoots starting from below the curve, one is allowed to remain as at B, in Fig. 10, about 4 inches below the bottom wire. When the vine is pruned the following winter, this cane B is tied down to the wire in the opposite direction to the other arm and pruned to an equal length, the canes on last year's arm A chosen for spurs being pruned to two eyes each, the vine then appearing as at Fig. 16. Next year spurs will be formed on B as on A, and a year later the vine will be fully formed as represented by Fig. 17. It is obvious that it would not do to form the first spur on either arm at 12 inches from the curve as in the Royat, for in that case there would be from 2 to 3 feet of blank space in the middle of the vine; the first spurs must therefore be formed at not more than 6 inches from the curve or even less, and this fact constitutes, in the writer's opinion, the most serious defect of the system for reasons before mentioned. It will be seen that Fig. 17 is a better shaped vine than Fig. 16, but the latter was the only vine in course of formation that the writer could use for an illustration. It must be well understood that the shape is not given as a model; Fig. 17 is far better. The principal objection against laying down the second arm a year after the first is that subsequently the sap has a tendency to favour the first arm to the detriment of the second; it remains stronger and thicker. But in Queensland, such is the vigour of vegetation of vines in moderately good soil, this slight disparity does not seem to affect the crop on the later arm, so far as the writer has been able to judge. But whichever way the vine is formed, the system itself is inferior to the Royat for the following reason:—Opponents of the Royat system urge that the unconquerable tendency of the sap to favour the first and last spurs on the cordon to the detriment of the others constitutes a serious defect. If so, it is a double defect in the Thomery espalier, which has practically two first and two last spurs on the cordon, to which must be added the blank space in the middle of the vine only to be remedied by bringing the first spurs right on to the two bends with the result as seen in Fig. 14. The writer has frequently met with spurs close to the stock that practically absorb all the vine's vigour, starving to death the more remote spurs.

LONG PRUNING.

By long pruning is understood those systems in which every year one or more temporary rods of more than three eyes each are left on the vine to produce fruit, together with short spurs for the reproduction of wood. The object of pruning long is principally to obtain fruit from those vines which would give a poor crop if pruned short, as the fertile eyes of the canes of these varieties are not situated near the base of the cane. It is also resorted to for obtaining an abundant crop from very vigorous vines. It is divided into several systems, of which three are recommendable for Queensland—the Guyot, the Bordelaise espalier or double Guyot, the Cazenave.

THE GUYOT.

This system of pruning is called after Dr. Guyot, an eminent French viticulturist, who invented or introduced it. The first year's growth of the vine is pruned as in Fig. 2, and the following winter the vine will appear as in Fig. 18 (the vines in Figs. 4 and 8 would be equally serviceable). Of the several canes issued from the stock one, A, is pruned to two eyes, and another, B, is pruned to six or eight eyes and fixed to the bottom wire of the trellis. The vine will then resemble Fig. 19. The wire is not shown in the illustration, as the vineyard was trellised subsequently. The object of the short spur is to provide two canes for the next pruning, one to be utilised for a fruit-rod, the other for forming a return spur.

The following winter the vine would appear as in Fig. 20. The spur had made two canes, A and B. In the ordinary course of things A should have pruned to eight eyes and attached to the wire as a fruit-rod, and B pruned to two eyes to form the return spur; but by an accident A was rendered useless for the purpose, and C, the lowest cane on the old fruit-rod, had to be utilised. All other wood being pruned away, the pruned vine is shown in Fig. 21, the same shape as the previous year (Fig. 20). Each winter the same system is followed with identical results. The vignerons must bear in mind that the upper cane of the return spur is used for the fruit-rod and the lower cane for forming the return spur, and not *vice versâ*. The system is simplicity itself.

THE BORDELAISE ESPALIER, OR DOUBLE GUYOT.

The Bordelaise espalier is a double Guyot on one vine; that is to say, it consists of two fruit-rods and two return spurs. It is a system better adapted for this State than the single Guyot for the reason that in this climate the latter system is unable to utilise the great vigour of vines in fertile Queensland soils; there would be waste of energy in production of useless wood. For poorer and shallow soils it is, however, recommendable, and there is no difficulty, if the need arises, of converting the single Guyot into a Bordelaise espalier.

To initiate the Bordelaise requires a young vine with two spurs, as in Fig. 3. This is generally obtainable in vines of a year old in good soil in Queensland; if not the vine should be pruned back as in Fig. 2, and the subsequent winter two spurs formed as in Fig. 3. The following year the vine will have made a growth as in Fig. 22. The six canes, it will be observed, are growing from two spurs formed the previous season. A and D are chosen for the two return spurs because they are the lower canes on the spur, and B and C for the fruit-rods being the upper canes. These are pruned to eight eyes each, and tied to or twisted round the bottom wire (law 7). The vine will appear as in Fig. 23; it is immaterial that the fruit-rods cross each other. The following winter the vine will appear as in Fig. 24; B and C (the old fruit-rods) are pruned away close to the stock; the spur A, in Fig. 23, produced the canes F, D in Fig. 24, and the spur D (Fig. 23) the canes A, E. (For unavoidable reasons the illustrations are on a small scale, and somewhat difficult to follow; a small lens will assist the eye in finding the canes and spurs.) F and E are pruned to two eyes each for return spurs, and A D pruned to eight or ten eyes each and tied to the bottom wire or twisted round it. The number of eyes to be left on the fruit-rods will depend entirely on the variety and vigour of the vine, and the required number of eyes should be counted on the upper side of the cane, the lower eyes being disbudded in the spring. All other wood being pruned off, the vine will resemble Fig. 25. The same method is followed the next and succeeding years. The vine if correctly pruned will always present the appearance of Fig. 25. In Queensland, and on the Downs especially, where gales of wind are frequent in the spring and early summer months, it is well to have a third return spur as a reserve in case of injury to the shoots of the other two, which may easily occur if tieing up in the spring has been neglected. It is obvious that the loss of a shoot on a return spur involves the loss of a fruit-rod next season, as the remaining cane must be pruned short to form a spur unless a favourably situated water-shoot from the stock can be utilised for one. For renewing spurs when they become long and distorted, which they soon do, the same means are employed as described under the Royat system.

This system of pruning is an excellent one, and should be more popular in Queensland than is the case. With but few exceptions, all varieties of vines yield an abundant crop with this class of pruning; moreover, it is simplicity itself once the principle is fairly grasped. The objections to it are that it can only be practised on trellised vines, which is an objection to all varieties of pruning, and that much attention is required to the shoots from the return spurs to avoid injury from wind. In the case of the Black Hermitage, especially, this is quite true; nevertheless, a little extra time spent on tieing up the shoots in the spring is amply compensated in the yield and saving of time in the pruning. One great advantage this system confers is in the case of spring frosts destroying the shoots, any buds that have remained dormant, which frequently happens on fruit-rods, will give a crop which could not be looked for in the case of short-pruned vines. For this reason, at the State vineyards subject to late frosts, the writer leaves as many as fifteen eyes on each fruit-rod. A considerable number of these remain dormant in the spring and are a reserve in case of damage by frosts. If, on the other hand, more buds burst than the vine can support, some of the shoots are disbudded to avoid distressing it.

THE CAZENAVE SYSTEM,

So called after the viticulturist who first invented it, is long pruning adapted to the cordon shape of vine, as the Bordelaise espalier may be said to be long pruning adapted to bush-shaped vines. The formation of the Cazenave follows the lines of the Royat system, until the vine is as represented in Fig. 12. The vine is then pruned, as follows:—

The spurs A, D, F, and H are removed close to the stock, and B, C, E, G, and I are left. Instead of pruning off the upper canes of these spurs they are cut to six or eight eyes each (the number of eyes depends entirely on the vigour of the plant) and attached to the wire above, whilst the lower canes of the spurs are pruned to two eyes each to form return spurs. As already explained, the eyes to bear fruit should be on the upper surface of the cane, the lower eyes should be disbudded in the spring, except for vines with very long internodes, when top and bottom eyes may be counted.

To the writer's great regret, an accident occurred to the photograph plates of the vine pruned on this system, so a reproduction from a work on pruning is necessary to give an idea of the shape of the vine after pruning, which is given at Fig. 26. The writer, however, prefers a modification of this system; he trains the cordon on the second wire and ties down the fruit-rods to the bottom wire. In his opinion the system, as illustrated in Fig. 26, is not in accordance with the principles of pruning as given in law 4. These vertical rods lead to a production of much wood and to consequent loss of fruit, whereas in the writer's modification, the downward direction of the fruit-rods give rise to production of fruit (law 4). The following year, the fruit-rods are pruned away close to the stock and the two canes issued from the spur are treated as before—the upper made into a fruit-rod and the lower into a spur. The Cazenave system is to be recommended for strong-growing vines like the Morillion, Lenoir, &c.

MIXED PRUNING.

Mixed pruning is, as its name implies, a mixture of long and short pruning, and is adopted when the spurs on a short-pruned vine are unable to utilise all the sap secreted by it, and it is not possible or convenient to form fresh spurs to do so. In this case one or two fruit-rods are managed to transform the superfluous vigour into fruit. Fig. 27 shows a vine pruned in this fashion. Two spurs, B, E, are pruned on the Cazenave system—*i.e.*, with fruit-rod and return spur; the remainder, A, C, D, F, G are pruned short, and H is pruned with the short fruit-rod as is usual in the Royat system. The following year the spurs B, E must be short pruned, and two other spurs, C, F, or D, G, pruned long. No spur must be pruned long two years running, but each must take its turn, otherwise there would be a preponderance of sap to the spur always pruned long.

Another instance of mixed pruning is shown in Fig. 28, where a fruit-rod is left on one of the spurs of a bush-pruned vine, the end being tied down to the vine itself, or to the stake supporting it. As in the preceding case, the fruit-rod must be changed from spur to spur every year.

This is, in as concise a form as possible, a description of the systems of pruning which will suit the requirements of Queensland vignerons, the procedure being also adapted to the Queensland climate, where, in one year, a vine makes a growth requiring two, and even three, in Europe. There are other systems of pruning which the writer refrains from describing, partly because they are unfitted for this State's climatic conditions, and also because this description must be condensed within the limits of an article, and not expanded to the dimensions of a pamphlet.

Tropical Industries.

COTTON SEED—A VALUABLE DISCOVERY.

A discovery is announced in the *American Fertiliser* of a new method of treating cotton seed for the extraction of the oil, which, it is said, promises to revolutionise the industry, reduce the cost of manufacture by 50 per cent., and enable the purchasers of cotton seed to pay the farmers 30s. per ton more for the seed than they have hitherto been receiving. Many things appear to be tending towards making cotton-growing a most profitable industry, and we shall be glad to see some of our Southern farmers following the example of Dr. Thomatis, at Cairns, who has the courage of his conviction, and puts 15 acres of his land under cotton. If the new process is what it claims to be, the price of cotton seed will rapidly rise, and we earnestly advise Queensland farmers to obtain seed while it may be had reasonably, and to try an acre or two. We do not say—give up all else and grow cotton; on the contrary, give up nothing, but add cotton. It will not lie on the grower's hand. It is always saleable at a price low or high according to the demand, and that demand for lint and seed it ever increasing, both in Europe and Japan.

The discovery is as follows:—

Mr. H. I. Heard, a bond and investment expert and actuary, of Washington, D. C., arrived in the city of Charleston recently for the purpose of acquainting the southern people with a discovery or invention just perfected at the national capital, which, he thinks, promises to completely revolutionise the cotton-seed oil industry. It is understood, according to the *Charleston News*, that the present process for the turning out of cotton-seed oil requires the use of six different machines. The McFarland-Reinohl invention, relating to treating cotton seed, and for which a patent was applied for, will do away with these six pieces of machinery altogether. The seeds are placed in a large vat containing a certain chemical solution, and after a lapse of twenty minutes the hulls pop open and float on the surface, while the denuded kernels fall to the bottom of the vat.

United States Chemist Wylie, of the Department of Agriculture, has pronounced this discovery as among the most wonderful of modern times. He has studied the matter carefully, and he sees in it a speedy change from the old-time methods of producing cotton-seed oil. Congressman Livingston, of Georgia, is interested in the scheme. He has always had the welfare of the southern farmer at heart, and he believes that this invention will result in great benefit to them in more ways than one. By the use of the machine for separating the cotton-seed kernels from the hulls and lint the small percentage of kernels which adhere to the hulls after they have been opened and the kernels which become entangled in the lint or fibre are recovered, and the lint partially dried and rendered fluffy. The following machines now required are discarded: Machine for cleaning seed of sand; machine for removing bolls, wood, &c.; magnetic machine for removing iron, nails, &c.; delinting machine; hulling machine, and a reel for separating meats from the hulls. In addition to the vat already mentioned, a machine is utilised for drying the kernels when they are to be transported a distance to an oil-mill, or when the oil is to be extracted immediately. The seed are taken directly from the vat to the crushing rolls; the mash is heated and the oil extracted in the usual way. It may then be refined or shipped as crude oil. The crushing rolls now in use are adapted for crushing the seed.

"The product of these processes" said Mr. Heard, "namely, dried cotton-seed kernels, reduces the weight one-half and the bulk two-thirds for transportation to oil-mills, while the cost of denuding the kernels is reduced nearly, if not fully, 50 per cent. as compared to the present prevailing practices of treating seed by delinting and hulling the seed by mechanical means. It also leaves the hulls and the lint in condition for paper stock of a very high quality. This stock is worth from 1 to 2 cents per lb., while the kernels are in condition for reduction to meal for extracting oil. In both these processes the chemical solution may be used repeatedly by maintaining in strength.

"Now, in regard to extracting oil from cotton seed, the first process of treating cotton seed by the chemical solution is carried on two steps further, and the oil extracted therefrom in three steps or operations, as against ten steps under the present most approved methods known to the art, as defined by D. A. Tompkins in 'Cotton and Cotton Oil,' page 206. The oil extracted from the kernel is impregnated with the chemical use for denuding the seed, and serves as a factor in the first step of refining the oil, thus serving a twofold function. In extracting the oil from the cake it is freed from the chemical, and is adapted for use as a food product for cattle or as a fertiliser.

"The cost of producing crude oil by these methods is reduced 50 per cent. And the oil refined is equal to any olive oil on the market, which sells at 80 cents per quart in sealed cans. The cost of refining is no greater than the present cost of refining cotton-seed oil.

"Another important point is that in the transportation of cotton seed treated by the foregoing processes only the kernel or meat of the seed is shipped from the ginnery, thus reducing the weight one-half and the bulk to be carried more than two-thirds. The hulls and the lint (1,000 lb. from a ton of seed) are worth as paper material from $20 to $40, at the rate of 1 and 2 cents per lb. This makes a net gain of $9 to $18 over the present practice of treating cotton seed to the step of cooking the meal for extracting the oil. Besides this there is an additional gain in the saving of the chemicals for refining oil."

The saving under the process will, it is claimed, permit the payment of about $8 (£1 13s. 6d.) a ton more for cotton seed. It is also claimed that it means a revolution in the business, and millions of dollars to the cotton farmers of the south. It is proposed to organise an independent company and give the farmers a chance.—*American Fertiliser.*

AN OLD INDUSTRY REVIVING.

COTTON-GROWING.

Lecture by the Editor.

The following is the substance of a lecture on cotton-growing, delivered by the editor of this *Journal* to the Mulgrave farmers at Nelson, North Queensland, in March last, and subsequently at Hambledon. As the lecture was entirely extempore, we take the report from the *Cairns Daily Argus*, which is practically verbatim :—

Recognising that from his varied experience Major Boyd was well qualified to speak on the cotton industry and kindred matters, our representative was glad to seize an opportunity, extended with the utmost graciousness, to get some information on a subject of great importance to this district. It is well to note that our genial visitor considers cotton could be grown very advantageously in our tropical climate and soil, and would prove a valuable adjunct to other crops. Indeed, he found that Mr. D. Thomatis, of Smithfield, had 15 acres of South Sea Island cotton growing on his land. The following ample information, very kindly furnished to us, is substantially the same as that given in a lecture delivered by Major Boyd to the Mulgrave farmers at Nelson last night:—

THE GREAT COTTON CONSUMER.

The Major commenced by remarking that 135,000 bales of cotton were imported into America last year from Japan and Peru. America worked up in her cotton mills more cotton than Great Britain. Seven million bales were used up in the southern mills of the United States last year. South Sea Island cotton which was grown in Florida last year was sold locally at 2s. 1d. per lb. The price of uplands cotton in America fluctuates in the most extraordinary manner. Last year it ran from 4½d. per lb., clean lint, to 9½d., following which came a drop to 6d. The present price of uplands cotton clean is 9½d. per lb. The cost of producing 1 acre of cotton, putting the crop at the very low average of 1,000 lb. seed cotton, is £3 1s. 8d. Supposing a man to gin his own cotton, the cost of production from the first ploughing of the land to the marketing of the cotton, say in Japan, would amount to over £8 for one bale of 400 lb. Freight to Japan from Brisbane is £2 16s. 6d. per ton; the cost of landing the same cotton in England is £7 11s. approximately. These remarks apply to uplands cotton.

PROFITS OF COTTON-GROWING.

The value of uplands cotton in the British market and in the Japanese market is about 4d. per lb., consequently the value of a 400-lb. bale of cotton is £6 13s. 4d. It would, therefore, appear that there was no profit to be gained by the export of cotton to either country, but, whereas formerly the seed was absolutely valueless, now undecorticated seed is worth from £4 10s. to £6 per ton, whilst decorticated seed is worth from £7 to £8 per ton. The hulls and remaining lint, of which a ton of seed will give 1,000 lb., are worth as paper material from £4 to £8, and a new process has been discovered of extracting the oil, by which farmers will receive about 30s. a ton more for the seed. The refined oil sells at 3s. 4d. per quart in sealed cans. Furthermore, the cotton seed being crushed produces 37 gallons of oil per ton, and cotton-seed oil is worth from £23 to £24 per ton. Again, after the extraction of the oil we have the oil-cake for cattle food. Oil-cake is worth £7 per ton. It will thus be apparent that the by-products of cotton are worth far more than the actual cotton lint itself. Uplands cotton is an annual which may be pruned, but it is not worth while to do so. Sea-Island cotton, on the contrary, pays for pruning; when not pruned, it runs to wood. When pruned, it is somewhat similar to coffee, and produces large crops which often amount to 9 lb. weight of cotton in seed. This means 3 lb. of lint. Sea-Island cotton at the present moment is sold in the Southern States of America, where it thrives to perfection, at 2s. 1d. per lb.

It is possible a market for Australian-grown cotton could be found in Japan, which is much closer to us than England; the price paid there is 5½d. per lb. for clean uplands cotton. The cotton-mills in the Southern States of America and the Gulf work up far more bales of cotton than the United Kingdom. Seven million bales, which formerly went to Manchester, are now used up in the States cotton-mills.

We have no experience in the Cairns district of the yield of uplands or white seed cotton, all the cotton hitherto grown up here being clean black-seed Sea Island, but in the South a yield of from 1 to 1½ lb. of clean cotton per bush is considered a very fair crop. There the cotton is planted in rows 6 feet by 5 feet (the former being the distance between the rows), giving 1,200 bushes per acre. This means, at 1 lb. per tree, 1,200 lb. of clean lint. Calculating the value of this lint at 5d. per lb., you have £25, from which must be deducted the cost of cultivation and picking, which amounts to £3 18s. Those who wish to make the calculation for themselves can do so by noting that the cost of picking cotton is ½d. per lb. and the cost of ginning is ¼d. per lb. Each bale costs 2s. 6d. for cartage, freight, insurance, and commission. One of the most important factors in shipping cotton is dumping. Two 400-lb. bales are dumped into one, and the Brisbane shipping agents as a rule charge nothing for dumping. To sum up the whole matter, the net profit on 1 acre of cotton, at the very low average of 1,000 lb. of seed cotton or 400 lb. of lint, is over £5 per acre.

BETTER THAN OTHER CROPS.

Now compare this with the profits on rice, sugar, wheat, and maize. Without going into figures it can be shown that the net profit derived from wheat is under £2, from rice under £6, and from maize under £2 per acre. Supposing that a crop of sugar-cane reaches 20 tons an acre (we live in hopes that Dr. Maxwell will show us how to produce 100 tons an acre), that would, at 10s. a ton for the cane, amount to £10 an acre, from which must be deducted the cost of cultivation, trashing, cutting, and loading, leaving the small sugar-grower but a living wage.

It has been asked: Will it pay the cotton-planter to pick it? Like coffee, cotton is essentially a working man's crop (the term "working man's crop" is used as distinguished from a "poor man's crop," as coffee has been called, because the "poor man" cannot grow it). An able-bodied working man can cultivate, pick, and market 10 acres either of coffee or of cotton if he has a family of children old enough to go into the field. These children earn for him ½d. per lb. of his crop, consequently, if he has their assistance, the cost of picking can be eliminated. (Parents might object to their children being taken from school to pick cotton, but between the years 1864 and 1880 the Education Department arranged the children's Christmas holidays in such a manner that the bairns were available to pick the cotton at the proper season.)

A Perennial or an Annual?

Is cotton a perennial or an annual? It is both. Sea-Island cotton may be grown for several years in succession by pruning. Uplands cotton (woolly seed) may be pruned, but it is not worth while, except to produce a very early crop.

To Cotton-planters.

The following warning might profitably be given to cotton-planters. Never pick cotton until the dew is dried off it. When picked, lay your cotton in the sun for three or four hours, but take it in before sundown. At the very first appearance of one white boll pick it, and continue to pick as long as the white bolls appear. Never leave the cotton which has burst out from the bolls for one single day in the field, otherwise it will turn yellow.

Cotton-picking Machines.

Several cotton-picking machines have been invented in various parts of the world, one of which was expected to solve the question of hand labour. It was a machine which was provided with brushes and rolled over the cotton—that is to say, two discs were fastened to an arched attachment, enabling the discs to run on both sides of the cotton plants. The theory was that the brushes would tear the cotton from the bushes, the cotton being subsequently carried away to a receptacle by combs. This machine, however, proved a dead failure. The latest and most approved patent is a pneumatic machine worked by powerful suction, somewhat on the principle of the sheep-shearing machine. The machine passes along the cotton-field, one man on each side of the trolly from which the suction power is conveyed. Briefly speaking, this machine consists of one or two or more pneumatic tubes, which, when presented to a perfectly ripe cotton boll, immediately suck it into a receptacle in rear of the power. (It has been stated in American papers that this machine will perform the work of cotton-picking in one-hundredth part of the time formerly required by hand-pickers.)

In Conclusion.

Major Boyd informed us that, whilst South Sea Island cotton could not be profitably grown in the Southern part of the State, although the plant throve remarkably well, it would, he considered, flourish in this district. As will be seen from the above, it is far the more valuable kind of cotton. Cotton-growing, moreover, would not present the same difficulties from a labour point of view as sugar-growing. Cotton is, we are assured, even more easily picked than coffee. We hope some of our farmers will profit by Major Boyd's good advice and information on the matter of cotton-growing, and endeavour to establish an industry as a result.

CEARA WAX.

The *South American Journal* (says *Planting Opinion*) recently published an article from a contributor regarding "carnauba wax" called Ceará wax in the United States, which is characterised as "one of the most curious products of Nature, and is produced in the form of a powder or a dust on the leaves of the carnauba palm-tree (*Coryplia cerifera*)." This variety of the palm is to be found in vast numbers on the margins of the River Jaguaribe and its affluents in all the districts of Aracity, as well as along other rivers in the State of Ceará, Brazil. It is also to be found in smaller areas in the adjoining States of Piauchy, Parahyba, and the Rio Grande do Norte.

Although the tree has many other qualities which render it of service to man, its most valuable product is its wax. Last year the amount of this wax exported was about 1,000 tons. One firm in Aracity sent over 500 tons to the United States and Europe. The United States consumes the largest quantity in the manufacture of phonograph and gramophone record cylinders. The wax is also used in stearine candle preparations for the purpose of giving the candle firmness and adding lustre and brilliancy to the flame. Another use is to give lustre to yellow and russet boots and shoes and to harness, while it is also used as a polish for hardwood floors.

The crop is gathered and prepared from September to March, being the summer season in Ceará. In favourable seasons the tree is richest in wax about the middle of January. From each tree about six young leaves not yet fully opened are gathered by means of pruning shears fixed upon a long pole, and this is repeated twice more during the season. The first quality of wax is produced from the tenderest leaves. Generally it takes from 2,000 to 3,000 leaves to produce enough powder or dust to make 15 kilograms of wax. The leaves, when gathered and selected—first and second qualities—are laid out in the sun to dry for two or three days. When dry they may be put into a storehouse for an indefinite time or until required for use by the producer. The leaves are then covered by a whitish dust or powder, which is brushed off in a tightly closed room. The leaves are then beaten with switches, the dust falling to the floor. The dust is afterwards swept up, placed in a tin vessel half full of boiling water, and kept boiling for fifteen or twenty minutes, when the wax gathers in a mass on the top of the water. It is then removed and placed in a coarse-meshed, cotton cloth strainer to allow any water to drain off. When dry the result is a mass of white yellow, hard, vitreous wax. After the powder has been extracted, the palm leaves are used in the manufacture of hats, matting, and brooms. A fibre called "tucum" is also obtained from the leaves, while in some parts of the country the leaves are used in thatching houses. The fruit of the tree has a black pulp of a sweetish taste, and is eaten both by human beings and animals. The seed resembles a small cocoanut, and makes good food for pigs. It is also used as an adulterant for roasted coffee after it is ground.

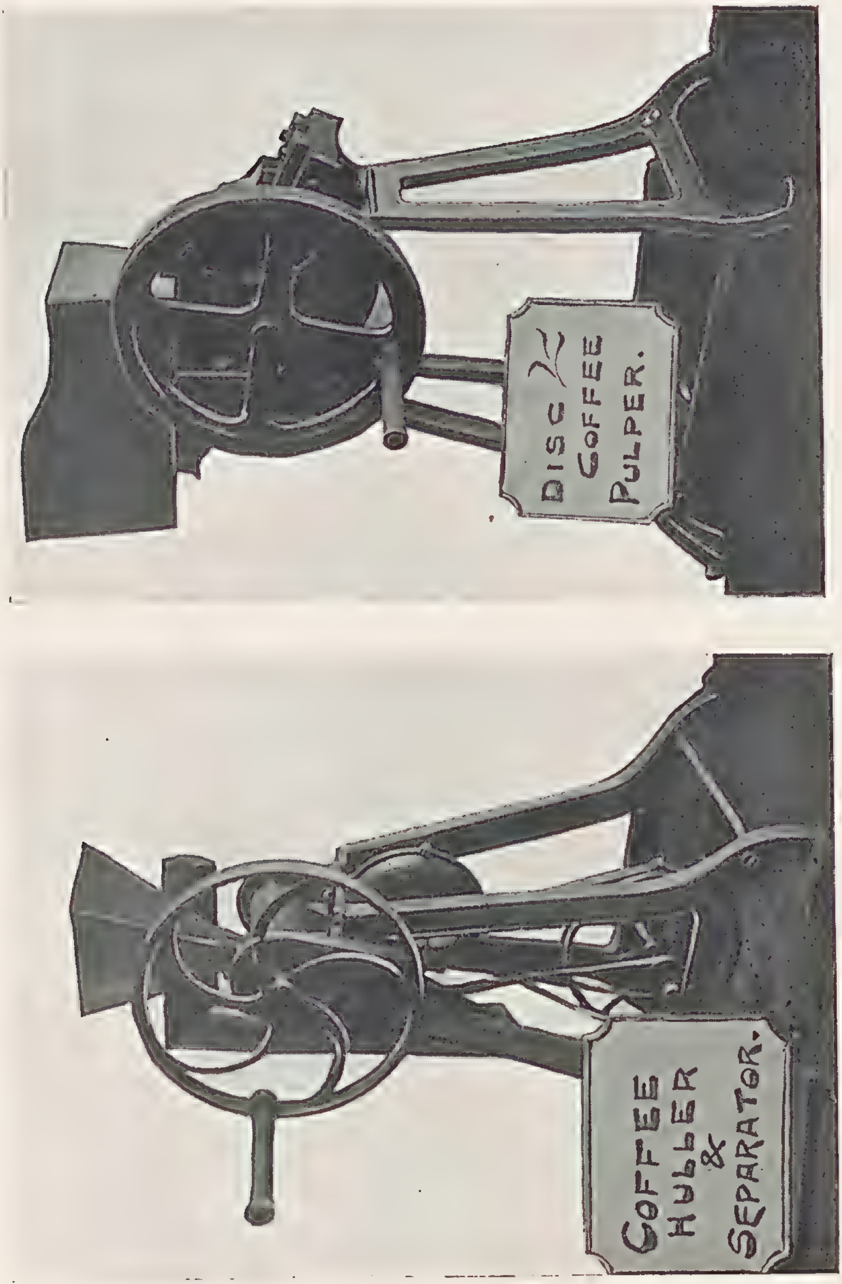
On this wax the State of Ceará collects an export duty of 10 per cent., with 5 per cent. additional on the official value, which is declared every month. —*Bureau American Republics.*

COFFEE MACHINERY.

We lately inspected two machines (which are here illustrated) for manipulating coffee at the Phœnix Foundry at Cairns. Of them Mr. Newport, Instructor in Coffee Culture, writes as follows:—

The coffee-pulping machine portrayed in Fig. 1 is a small pulper on the disc principle. It has all the modern improvements in the way of brass screws for setting the chops, and being entirely of iron, steel, and copper or brass is a machine that will not readily wear or get out of order. The hopper or box above the disc, into which the water and cherry coffee goes, is of tin, and is to prevent, by gravitation in the water, stones or foreign substances passing into the machine and damaging it, as well as to ensure regularity of feed. The work of these machines is good, and has been tested and approved by the Instructor in Coffee Culture, and several of them are in use and are giving

Plate XXIX.



Coffee Machinery.

satisfaction in different parts of the State. The power required to work one of these pulpers is less than one man and the capacity consequently not great, but it is, nevertheless, capable of easily dealing with the crop from an estate of 15 to 25 acres.

This machine costs at the Phœnix Foundry, Cairns, £12, as pictured, and without the cast-iron stand, the machine being made to be bolted down to a wooden frame or block, £10.

In Ceylon or England these machines cost some £14 to £15, to which freight must be added. Moreover, the risk of breakage, as well as loss of time in obtaining machines from distant countries, make them expensive by the time they are erected on the estate. The advantage, therefore, to the growers individually and the industry in general in being able to obtain reliable machines manufactured practically at their own doors, and at prices even lower than those for the same quality of machines were they imported, may be appreciated.

Huller, Polisher, and Fan.—The machine in the second illustration is one, if possible, even more useful than the former, being a combined huller or peeler, polisher, and fan. The machine is on the "Smout" principle, which works well and satisfactorily without breaking or damaging the coffee, provided only it is properly dried before being put in. The flow of the coffee from the machine, and thereby the degree of polishing, can be regulated by a sliding weight, and in passing out the husk is fanned off by the blower.

The chaff passes upward through the funnel shown, which may be continued as desired, while the clean coffee falls into any receptacle placed at the bottom of the machine.

This machine has also been tested and approved, and several are in use among the growers. Its capacity also is as great as would be required by the average coffee estate in this State, and it is possible for a boy to work it. The combined machine as depicted costs £12 10s. The huller alone may be obtained for £7, and the blower alone for £3 3s. When the two have to be used together, however, it is much more convenient to have them upon a stand, and arranged so that the one flywheel works both.

This machine will deal equally satisfactorily with dry cherry as with parchment coffee, and, as it puts the product at once into a marketable form, is invaluable to coffee-growers.

The question is sometimes asked—What is to be done with coffee that has dried on the trees? In other instances farmers who have a few trees, or possibly even an acre or more of coffee, conclude that once dry on the trees coffee is of no further use, and leave it without any question. Again, where the picking of coffee when ripe is difficult or inconvenient for various reasons, or where water is not available, or not to be had in sufficient quantity for pulping, the crop is often allowed to waste. This machine presents a solution to all these difficulties.

The process of pulping produces a better quality, certainly; but, if this cannot be done, the coffee is still valuable, and well worth the stripping from the trees or raking in and drying to enable it to be put through the huller. Dry cherry coffee is worth from 4d. to 8d. per lb. clean, and, while often not saleable as dry cherry, as a clean, medium-grade, raw coffee has a ready market in the metropolis as well as the cities of the Southern States.

Seeing that only drying is required before the raw product can be dealt with by this machine, and that on coming out it is at once marketable, the value of the machine is obvious, and the information as to its availability and cost will be of immediate interest and benefit to coffee-growers and those thinking of growing this staple.

Finally, the price of the two machines together, less than £25, gives a very satisfactory reply to the question as to the cost of machinery necessary in coffee culture, and as these two machines do practically all the work necessary in curing the coffee (except of course the drying, which can in most cases be done in the sun) the amount of capital necessary to sink in machinery cannot be said to be heavy.

EXTERMINATION OF THE CANE GRUB.

By A. J. BOYD.

The widespread devastation effected by the sugar-cane grub in the North demands such a monetary sacrifice on the part of the planters and farmers that every proposed means for eradicating or even greatly minimising the pest deserves serious attention.

In conversation with Mr. Clark, in charge of the experiment plots at Hambledon, he introduced the subject of the possible annihilation of the cane grub. He thought that this might be accomplished by attacking the insects in their own underground domain. Was there any insectivorous animal in the country with grubbing or subterranean habits which could be employed for the purpose? Well, what about the European mole (*Talpa europæa*)? Lately in Yorkshire there has been a disastrous drought, and thousands of moles have died from its effects. The same destruction of moles also occurred in Northumberland. This destruction has had a very bad effect upon the soil, and has permitted the increase of noxious insects which were kept in check by the gargantuan appetite of the mole. There is no animal in the world, domesticated or wild, which has such voracity. In particular, its favourite food is the larvæ of the cockchafer, and this is the very grub, or one nearly allied to it at all events, which is now devastating the Northern canefields. The mole devours frogs, worms, and animal pests of all kinds in enormous quantities. Every twelve hours it will eat more than its own weight of these delicacies, and if it cannot get that quantity in that time it will die of starvation. This has been absolutely proved by experiment. The mole is a species of "glutton" consequently. It will devour almost any kind of flesh. When maddened by hunger it does not hesitate to attack animals as large as itself. It is about 6 inches in length, with a cylindrical body. Birds, lizards, frogs, and snakes all are equally welcome to this voracious eater. Toads it will not touch, probably on account of the milky exudation from the body of the useful toad. If two moles are confined together without food, one will attack the other, and the weaker one is invariably devoured by the conqueror. Vegetable food is rejected by it.

It has many natural enemies in the old country, such as weasels, stoats, owls, kestrels, buzzards, &c. In this country it would, doubtless, also find its enemies in the hawks, snakes (particularly the carpet snakes), native cats, &c. They are capital swimmers, and take readily to the water. Bruce, writing in 1793, remarks that he saw a mole paddling towards a small island in the Loch of Clunie, 180 yards from land, where he saw molehills.

All gluttons are great water-drinkers, and moles have a very ingenious method of procuring and preserving water, without which no mole would live twenty-four hours. Mons. La Court, a distinguished French naturalist, who made moles and their habits a special study, declared that they dig deep wells for water in their underground "mansions" and preserve it against droughts.

Let me describe the mole's mansion, as given in the "Encyclopædia Britannica." This is constructed with the greatest ingenuity. By the way, each mole appropriates to itself a certain space of ground, which is his own particular hunting district. The fortress, or lair, consists of a central nest formed under a hillock, which is placed in some protected situation, as under a bank, or between the roots of trees. The nest, which is lined with dried grass or leaves, communicates with the main run by four passages, one of which only joins it directly, leading downwards for a short distance and then ascending again; the other three are directed upwards and communicate at regular intervals with a circular gallery constructed in the upper part of the hillock, which in turn communicates by five passages leading downwards and outwards with another much larger gallery placed lower down on a level with the central nest, from which passages proceed outwards in different directions, one only communicating with the main run, while the others, curving round, soon join or end in *culs-de-sac* (blind alleys). The main run is somewhat wider than the animal's body; its walls are smooth and formed of closely-compressed earth, its depth varying according to the nature of the soil, but ordinarily from 4 to 6 inches. Along this tunnel the animal passes backwards and forwards several times daily, and here traps are laid by the mole-catcher for its capture. From the main run numerous passages are found on each side, along which the animal hunts its prey, throwing out the soil in the form of mole-hills.

Mons. La Court says that in very rich, ploughed soil, the mole burrows close to the surface and sometimes runs along it, forming merely a groove or trench.

In Europe, moles are systematically destroyed, but the only reason for this, so far as I can learn, is that their numerous hills are unsightly on lawns or on pasture land. Some farmers, however, will not destroy the moles in their fields, as they loosen the subsoil, aerate the soil, and furnish a fine top-dressing from the fine mould of the hills.

The sexes come together in March—here in Queensland the season would be about September—and the young, usually from four to six in number, which are brought forth in about six weeks, quickly attain their full size.

The mole is a perfectly harmless animal. The muzzle is long and obtusely pointed, terminated by the nostrils, which are close together in front. As to its teeth, the upper incisors are simply chisel-edged teeth, the canine is long and two-rooted; then follow three sub-equal conical premolars, and a fourth much larger and like a canine. These are succeeded by three molars with W-shaped cusps.

In the lower jaw, the three incisors on each side are slightly smaller and slant more forward; close behind them is a tooth which, though quite like them, must, from its position in front of the upper canines when the jaws are closed, be considered as the canine; behind it, but separated by an interval, is a large double-rooted conical tooth, the first premolar; the three following premolars are like the corresponding teeth above, but smaller, and are succeeded, as above, by three molars; forty-four teeth in all. From this description of the little animal's dentition it will be seen that it is a pure flesh-eater, and, for its size, one possessing formidable powers of attack and mastication.

The minute eye is almost hidden by the fur; the ear is without a conch; the forelimbs are rather short and very muscular, terminating in broad, naked, shovel-shaped feet, the palms normally directed outward, each with five digits armed with strong, flattened claws. The hind feet, on the contrary, are long and narrow, and the toes are provided with slender claws. The body is densely covered with soft, erect, velvety fur, the hairs uniform in length and thickness, except on the muzzle and short tail which is clothed with longer and coarser hairs. The fur is generally black, but paler shades, even up to pure white, have been observed.

Now, here is an animal harmless to vegetation, harmless to man, which will not devour the gardener's friend—the toad—which aerates the soil by its burrowing, and which delights, above all things, in a full meal of cockchafer grubs. It has a very wide range geographically, being found in all countries from England to Japan, from the Scandinavian Range in Norway and the Middle Dwina in Russia to Southern Europe and the southern slopes of the Himalayas, where it occurs at an elevation of 10,000 feet In Great Britain it is found as far north as Caithness, but in Ireland and the Western Islands of Scotland (except Mull) it is altogether unknown. Now I would make this suggestion: The mole can be procured from Japan or India. Let a hundred or so be imported, and place them on a piece of cane country infested with grubs. The cost of the experiment would be trifling. There need be no question of the moles devouring the grubs. The only thing to find out would be whether they could cope with such a multitudinous pest, however much they might eat. Still, as the moles increased, so would the grubs decrease, and it is quite within the bounds of probability that, with the introduction of an animal which would hunt them underground, the cane grub would become a thing of the past.

IRRIGATION AT BUNDABERG.

Amongst the most ancient aids to agriculture employed by man must be reckoned irrigation. This important work is alluded to in ancient Egyptian and Jewish records, and evidences are plentiful in many parts of the East and in Italy, Greece, Spain, and Northern Africa. It is unlikely that we shall ever know who it was that first made a study of the theory and practice of artificial irrigation. It is, however, established that reservoirs and distributing canals existed in Egypt in the reign of Sesostris, or, as he was called, Usurtesen I. of the XIIth Dynasty of Theban kings. It was an immediate successor of this king, Amememhat III., famous for his great engineering works, who conceived and carried out the most successful enterprise of its kind ever attempted in Egypt, until the great irrigation works of to-day were begun by the British. He constructed the vast artificial reservoir, Lake Mœris, which received and retained the waters of the Nile after the annual inundation had spread them over the land.

In a rainless country like Egypt, such a magnificent reservoir would prove of incalculable benefit to agriculturists, for it may easily be imagined that the sweet waters were not left to stagnate, but were conveyed by aqueducts over many miles of country, which otherwise would have received no moisture beyond that derived from the annual overflow of the Nile, but which, by the foresight of the king, joined to the skill of the engineer, were made to bring forth abundant crops of grain and other products.

When we consider that the importance of and necessity for irrigation were recognised more than 2,000 years before the birth of Christ, we can but marvel that in the twentieth century men are content to depend upon the uncertain rainfall to sow and harvest their crops. In this country there are thousands of acres lying idle and worthless, so far as the needs of civilisation are concerned, which have yet to be won to remunerative agriculture by judicious irrigation and drainage. The rainfall, in many districts, is so capricious, the amount of water needed to produce heavy crops so great, the difficulties in the way of making our soils retain enough of the cloud water which falls to meet the demands are so many, that it must be plain to every practical man and student of agriculture who has devoted much thought to the subject that the time must come when the waters now running to the sea, with their tons of unused fertility, will be turned to use in irrigating large tracts of the country through which they flow.

If 12,000,000 acres of the barren sand of the Sahara Desert in Africa have been rendered fertile by French enterprise, notwithstanding the absence of fresh-water rivers and lakes, what could not be achieved in our richly endowed State —richly endowed with vast tracts of fertile lands, numerous rivers flowing full in wet seasons to the Gulf of Carpentaria in the North, to the Murray in the South, and to the Pacific along our extended coastline?

The one thing needful is the priceless boon—water. Although we have numberless rivers, yet many are but rivers in name, for in dry seasons they are either quite dried up and become mere sand beds, or show at best a chain of stagnant waterholes.

It is here, then, that the capitalist and the engineer have such an ample field before them in the way of conserving the vast bodies of water which periodically flood the country, and are, as before said, borne away to the sea, leaving the rivers to gradually dry up and once more resume their normal state.

Have we the men and the money to lead the way in this vital matter?

Fortunately, there are some enlightened agriculturists who have early recognised the enormous value of irrigation. On the Burdekin River the planters have for some time past been irrigating their crops with great advantage. So sure are they of the profit to be derived by irrigation works, that no land is placed under crop which cannot be irrigated.

At Mackay, Bowen, Rockhampton, and other places some areas are irrigated. Taken altogether, however, the irrigated lands of the State amount to less than 20,000 acres, and barely 7,000 acres of this area are under sugar.

Let us instance the country of Belgium, the most thickly populated State of Europe. Arable land in this small country is greatly prized, and vast areas comparatively have been added to the agricultural lands by utilising the barren sand-dunes, such as we described and illustrated in the April issue of this *Journal.*

In the Campine district of Belgium 2,281 hectares (5,474$\frac{2}{5}$ acres) of absolutely worthless drifting sand were sown and irrigated. These lands now produce 3,000 kilos (nearly 3 tons) of hay per hectare, worth 10 francs (8s. 4d.) per 100 kilos (220 lb.) The value of the aftermath gives another £4 3s. 4d. per hectare, so that the total yield is 400 francs, or £16 per hectare of 2$\frac{2}{5}$ acres. But we might multiply such examples to any extent. Suffice it to show what can and what ought to be done.

The late Minister for Agriculture, the Hon. J. V. Chataway, clearly saw that, if our rural industries were to go ahead, something must be done in the way of assisting the farmers, and, as the sugar industry was practically the only one without an adviser, he looked round him and found a scientist in that branch of agriculture who had achieved some remarkable successes in doubling and trebling the best yields of cane and sugar per acre previously obtained in Hawaii. This was Dr. Maxwell, who, at the invitation of the Minister, and with the cordial co-operation of the cane-growers and mill-owners, after a provisional visit of inspection to our sugar districts, took up his residence amongst us, and at once began to investigate the state of the sugar industry, and to devise and advise means for materially increasing the output.

Amongst other suggestions, he naturally included manuring and irrigation. He found, on examination of the sugar-growing districts, that much of the land under cane was situated favourably for irrigation, and he pointed out to the planters the natural advantages which lay within their reach. Many had already thought of this; many again planted their cane, and in dry weather prayed for rain—rain which for years had been lying at their feet unappreciated, but which most men had not the means to utilise; whilst others had neither the energy nor the intelligence to put their own shoulders to the wheel, and afterwards invoke the blessing of Jupiter on their labours.

At Bundaberg there is a fine river called the Burnett, navigable from the sea to the town, a distance of 9 miles. For several miles above and below the town there are large and small sugar plantations, and several very fine sugar-mills of the latest pattern. For many years the planters grew splendid cane on the fertile soils watered by the winding Burnett. But they always depended on the rainfall. How often, in a dry season, must they have looked upon the deep, clear waters of the Burnett, and longed to be able to apply it in life-giving streams to their parched fields and stunted crops! Yet still they waited on the rain, and the Burnett flowed placidly by.

Two years and a-half ago Dr. Maxwell arrived on the scene, and pointed out, *inter alia*, the splendid facilities offered by the Burnett River and by the favourable lie of the land for irrigating large areas.

Amongst the many wealthy and enlightened planters of the district were the Messrs. Gibson Bros. and Howes, of Bingera plantation. These gentlemen had long thought of a scheme for irrigating on a large scale.

Dr. Maxwell, on the occasion of his first visit to Queensland, addressed a large audience of planters, farmers, and others interested in the sugar industry at Bundaberg. The chair at that meeting was taken by the Hon. Angus Gibson, M.L.A. In introducing the Doctor, Mr. Gibson said that he had been in Dr. Maxwell's company several times since his arrival amongst them, and he need hardly tell them how pleased he was to have those opportunities of conversing with him and listening to the words of wisdom and intelligence he had brought to bear on his study of the sugar industry. The Northern people were delighted with the results of his visit, and the Childers planters would have liked to retain him much longer than the Doctor's time would permit. Speaking for himself, after many years' experience in the growth and manufacture of sugar, he found that to-day, in the light of what he had learned from Dr. Maxwell, he (the speaker) was only a novice at the business. The methods of cultivation of which Dr. Maxwell would speak to them that afternoon had been the means of doubling the output of sugar in Hawaii, but they, in Queensland, had a lot to do before they could hope for similar results, and no doubt a gentleman such as Dr. Maxwell was required to help them to attain the high state of perfection to which they had brought sugar culture in the Sandwich Islands.

Dr. Maxwell, in the course of his address, spoke strongly on the value of and the necessity for irrigation and manuring.

In conversation with the Hon. Angus Gibson, he explained what he had succeeded in doing for the planters in Hawaii, where he had been for many years engaged in solving difficult problems in cane cultivation and sugar manufacture, and where such marvellous success had attended his work that lands, which formerly only produced 2 or 3 tons of sugar to the acre, had the yield raised to 10, 12, and even 14 tons per acre. Mr. Gibson had already had information as to the revolution in cane and sugar production in that island as the result of Dr. Maxwell's operations and advice. He was consequently quite prepared to experiment on his own cultivation and to adopt suggestions, especially as they tallied so remarkably with his own observations, experience, and aspirations. Accordingly, he promptly decided to lay down a large plant and carry the Burnett waters over the whole of his extensive canefields. Dr. Maxwell thought it would be better to "go slow" at first, and it was just as easy to gain experience on 100 acres as on 1,000, with the great advantage that fundamental errors made in the first case would not be ruinous to the experimenter.

Accordingly a small plant was laid down, and thus was irrigation initiated on the Burnett River. The results were so gratifying to the proprietors that Mr. James Gibson set off for an extended tour to various countries of Europe, to visit as many places as possible where the latest features of irrigation were to be studied. A shrewd, observant, business-like man, very little escaped his notice or failed to be carefully noted. On his way back he went to Hawaii, and there saw for himself all that had been achieved by agricultural and engineering science in the way of irrigation, drainage, and manuring under Dr. Maxwell's advice.

On his return, the partners deliberated over all the systems of irrigation which he described, and it was finally decided to undertake the enterprise on a large scale. They were the more satisfied that the large expenditure would be amply justified, as they had tangible evidence of the value of irrigation on their first field, which had yielded about 50 tons of cane per acre. Orders were accordingly placed with Walkers Limited, at Maryborough, for the whole plant. Whilst the machinery was being manufactured, accurate levels were taken of the whole area to be operated on, and the care and precision with which this difficult, but necessary, work was carried out are shown in the even and gentle flow of the water along the main drains. Where it was found that there was too steep a declivity, the land was built up to prevent the water passing away too rapidly and so not soaking into the soil. Where there occurred an up-gradient, it was cut down, and thus throughout the whole area, both by these means and by flood-gates, an even course with a general gentle incline was secured.

Readers of our papers on "First Steps in Agriculture" will have noted that we advised small farmers not to irrigate land situated high above the water supply. The expense of lifting water increases with every foot of

Plate XXVIII.

Irrigation at Bingera, Bundaberg.

height. At Bingera the water is lifted to a height of 230 feet above the river level, which is the highest point at the Hill End portion of the estate. To effect this, an enormous standpipe has been erected near the pumping station. We regret that we cannot give an illustration of this in this issue, but we propose to give that and other illustrations of the works in succeeding numbers. Above the pumping station are four huge dams, capable of storing 5,000,000 gallons of water, and work on these is still going on, which will increase the capacity by another 1,000,000 gallons. From these dams the water passes through the fields by means of drains, where it is controlled by flood-gates and sluices. The main drains are all supplied with these, and hence the water can be diverted at any point to the lateral drains on either side. The bulk of the cane was planted before the irrigation scheme became an accomplished fact. Consequently, the cane is growing on a slight bank with a water channel between the rows, and the canes do not get the full benefit of the water. This is, however, to be at once remedied, and the cane lately planted lies in the hollow, and the water passes directly over the stools, which thus get all the nourishment in the way of moisture that they require. We heard it remarked that manure was as necessary to the cane plant as water. True, so it is, and so Dr. Maxwell says, but it must be remembered that the water itself contains elements of plant food in solution, and, furthermore, the constant moisture dissolves much plant food in the soil which, in such a dry time as is now being experienced, must remain locked up and unavailable to feed the plants. This is clearly shown by a glance at the first and third illustrations. The cane shown in No. 1 has not been irrigated, and from its growth, or rather, want of growth it is plain that the roots have not been able to assimilate any plant food. The length of crushing cane only reaches from 6 inches to a couple of feet, and the whole crop looks withered and stunted. Now, glance at the third picture. The cane here depicted was in precisely the same condition as that of No. 1 when it was first irrigated, and both have six and a-half months' growth. We noted canes on the irrigated fields having already 9 feet of crushing cane, and with such long healthy tops that, should frosts keep off till August, another 2 feet will be added, and sugar-planters need not to be told what an additional 2 feet means in a crop of cane. The whole 1,000 acres irrigated present an ideal picture of health, verdure, and evenness of crop, and this is all due to the water passing through the main irrigation ditch shown in our second illustration. That ditch has a length of 2½ miles, and carries the water to cane growing at that distance from the pumping station.

To come back to the question of manuring. To be perfectly successful, irrigation must go hand in hand with drainage and manuring; not that manuring has ever been neglected on Bingera. All kinds of manure have been employed at the rate of from 1 cwt. to 8 cwt. per acre. Commercial fertilisers are fairly cheap, but it will be understood that, employed on such a large scale as is done here, the question of manure is a serious one. Mr. Gibson informed us that for the present crop £5,000 had been spent in manures, and it is these manures that are being converted into soluble food available for the plants by the irrigation waters.

Large numbers of men are employed in regulating the water supply so as to direct it into the right channels. Here it has to be turned on, there turned off, and so numerous are the sluice-gates and furrows that a staff of nearly 100 men is constantly employed in this work, each of whom has about 9 acres under his charge. Every application of water is equal to a rainfall of 2 inches, but this can be increased or lessened at will. The pumping plant, at the time of our visit, was raising 4,000,000 gallons of water every twenty-four hours, but is equal to rising 11,000,000 if necessary, and, although only 1,000 acres are under irrigation this season, it is capable of completely watering 2,000 acres and, even in times of regular rainfall, an additional 1,000 acres.

The following description of the irrigation plant we take from the *Bundaberg Mail*, as it accurately depicts the machinery and its performances:—

"The irrigation plant proper, which is located about 100 yards from the river whence the supply is drawn, consists of two sets of cross compound, horizontal, condensing, pumping engines, coupled by gearing to two sets of what are known technically as three-throw pumps. These pumps are 22 inches in diameter, with a 36-inch stroke, and are constructed on the bucket principle, working at a hydraulic pressure of 84 lb. This is equal to a lift of 200 feet, while to the head of the 'stand' pipe the lift is 230 feet—a point that has been successfully reached, and which is the highest on the estate. The high-pressure engines are 16 inches in diameter and the low-pressure engines 32 inches, each, however, having a 4-foot stroke. The boiler power consists of three Lancashire (double-flued) boilers, 7 feet 6 inches in diameter by 26 feet long, and work at a pressure of 150 lb. to the square inch. It is needless to say that the shed accommodation for the foregoing is ample and complete, while there is also an air of cleanliness and order about same that adds materially to the pleasure of inspecting such giant products of the mechanic's craftsmanship, reflecting the utmost credit upon the engineer-in-charge, Mr. Tutin. The water pumps discharge into two 18-inch cast-iron pipes which pass up the shaft and under the engines, where they join at a large air vessel in the engine-room. The water thus raised from the Burnett then passes out through a 30-inch wrought-iron pipe, thence up the hill and on to the several dams which have been formed to store it. The necessary air for the large air vessel in the engine-room and for the two smaller ones located down the shaft is supplied by two Westinghouse air pumps attached to an air receiver. The huge water pumps are carried on two massive steel boxed girders, each 22 feet long by 29 feet wide. The shaft whence the supply of water is drawn is 87 feet deep, with a diameter of 17 feet, while the situation of the engine-room is fully 10 feet above the highest known flood level. The whole of the plant was manufactured by Walkers Limited, of Maryborough, and their contract has been most faithfully performed. However, while the plant proper has been most capably turned out by this firm, Bingera mechanical skill has contributed no mean share to the perfection of the system, as the whole of the water mains have been made by boiler-makers employed on the estate, while the Bundaberg Foundry has contributed no small amount of work in bringing about the general perfection of the system which confronts the visitor. In connection with the pumping station it is worthy of note, as showing how an enterprise of this kind brings grist to the mill of divers tradesmen, that 144,000 bricks (53,000 being used in the shaft alone) were needed, and 110,000 of these were made on the plantation; the balance, being fire bricks, had to be imported from Brisbane. Further, about 700 tons of sand was required for the concreting, which was extensive, exhausting 600 casks of cement, while the provision of 600 yards of stone also furnished welcome employment for carriers and breakers.

"Again, in feeding the furnaces made hungry by the large amount of work expected of them, 90 tons of coal, at a low estimate, is consumed per week; while in various other ways the installation of irrigation at Bingera means a filip for employment in different callings whose products are needed to enable the estate to reap full benefit from the new enterprise entered upon, and whose fruits will but go to bind Messrs. Gibson and Howes the closer to Bundaberg by inducing them to launch out into other labour-giving avenues of investment."

We much regret being unable to illustrate in this issue that portion of the Burnett River whence the water supply is drawn. There is a fine stretch of water extending from about half-a-mile below the pumping station to 5 miles above it, with an average depth of water, despite the abnormally dry season, of 12 feet, and to this water the enterprising firm has obtained the right for irrigation purposes. Before passing into the pumps, the water is filtered through broken rock and pebbles, and passes into the dams clear, cool, and tasting as good as fresh tank water. From what we saw of the results of this large expenditure, running into something like £40,000, it must be clear to even the average mind that it is going to turn out a highly profitable investment, and should prove an incentive to others, who can afford it, to follow suit. Indeed, one or two planters said they were quite prepared to invest their money in irrigation, but for the fiat which has gone forth concerning the kanaka labour. It would take one season to get the plant ready, a second to irrigate the crop, and after the third year the labour question will arise. This is what gives capitalists pause. Were the conditions otherwise, most of the Bundaberg plantations would go in for irrigation, and, as a consequence, the Burnett City would rise to the premier position amongst the sugar capitals of the North.

It is through the courteous invitation of Messrs. Gibson and Howes and that of the president of the Bundaberg Chamber of Commerce, who kindly invited the writer to proceed to Bingera in a special train chartered to convey some 150 visitors to the plantation, that we are enabled to give this short account of this great enterprise. All who, on the 1st of May, were conducted by Mr. Gibson through the irrigated fields, were filled with astonishment at the magnificence of the crops—crops of the same age as the hopelessly withered, stunted cane shown in our illustration.

The crucial test, however, will, after all, be in the determination of the sugar content of the canes when they are ready for the mill. If the crop reaches 50 or 60 tons of cane per acre, and a ton of sugar can be made from 8 tons of cane, a slight calculation will serve to illustrate the great value of scientific cultivation, irrigation, and manufacture.

SUGAR IN JAMAICA.

In his annual report of 1901 Dr. W. Fawcett, B.Sc., director of the public gardens and plantations of the Island of Jamaica, discourses thus about the prospects of sugar in that island, in happier times the principal producer of sugar and rum in the West Indies:—

Last year 3¼ acres, containing some sixty-two varieties of cane, obtained from various parts of the world, were obtained for the purpose of supplying tops to planters; but it was considered advisable, when the newly-appointed Government chemist arrived, to stop the distribution of tops, and replant with a view to making a thorough comparative test of all the varieties; twelve holes of each have therefore been planted out at a distance of 4 by 6 feet apart, and are doing well. In addition to these old varieties tops of thirty-six new varieties from Demerara and eight from Barbados have been planted out, and are in a thriving condition, with the exception of four of the varieties from Demerara, which died shortly after arrival. During the arrowing season attempts were made to cross-fertilise some of the best varieties, with a view to producing a cane possessing the several good qualities of the parents, but we were not successful.

The seedlings that were raised at Hope last year have received careful attention, and are now ratooning; one of them, a seedling from D. 95, looks promising.

This year, seeds of D. 61, D. 99, D. 49, and D. 95, were sown, resulting in a batch of seventy plants. These have been potted into bamboo pots, and will be planted out as soon as they are large enough.

There is a general awakening throughout the island to the belief that sugar should again be made our most important crop. The cost of cultivation is less than in any other part of the West Indies : *e.g.*, in a dry district, where there are three dry years in ten, a sugar planter states that the cost is £3 14s. per acre, yielding an average of 18 tons.

Much of the machinery is antiquated, involving great loss. On one estate it is estimated that a new mill costing £600 would make a difference of £1,000 per annum.

The Agricultural Instructor has been able in some cases to show that great improvement might be made in cultivation, and his suggestions have readily been acted on with excellent results.

There is a large demand for new seedling canes, and tops to the number of 15,617 have been distributed. The reports as to the value of D. 95 and some others are very encouraging. An article in the "Bulletin on Sugar-cane Seedlings," by Mr. T. J. Harris, gives such directions that planters may raise their own seedlings.

Altogether it may be said that with better cultivation, improved machinery, and new canes, the prospects of sugar cultivation in this island are very much brighter than they have been for many years.

We understand that it is proposed to follow the example of Queensland in the erection of central State-aided sugar-mills, and in a late issue of the journal of the Agricultural Society of that island the statistics as given in the Central Mill reports in Queensland are published. Doubtless close inquiry will be made by the authorities in Jamaica into the working of the Central Mills in Queensland before the Government finally decides on the question of adopting the system there.

Illustrations.

A STEP IN ADVANCE.

In this issue we present our readers with a view in an English village. The reproduction has been made under novel conditions, and speaks for itself as a most excellent piece of work, being made with the finest screen at present in the Commonwealth. It is intended to produce the future illustrations in the *Journal* in the same manner.

Plate XXX.

STREET IN AN ENGLISH VILLAGE.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1901.									1902.			
	April.	May.	June.	July.	Aug.	Sept.	Oc .	Nov.	Dec.	Jan.	Feb.	Mar.	April.
North.													
Bowen	4·75	0·94	0·19	0·10	6·36	0·18	0·93	0·92	0·71	0·19	2·19	2·01	0·68
Cairns	8·87	13·18	0·57	0·89	2·53	1·82	2·34	5·23	2·78	3·79	12·90	11·43	3·48
Geraldton	26·10	26·72	1·21	2·58	11·77	3·37	3·85	6·45	1·60	3·78	16·87	7·55	12·83
Herberton	2·87	3·80	0·18	0·64	2·53	1·04	4·92	1·13	1·30	0·57	5·77	3·86	1·54
Hughenden	1·74	3·48	0·03	Nil.	0·33	Nil.	0·31	0·29	1·43	1·57	2·02	0·53	*
Kamerunga	9·57	13·18	2·09	2·60	1·94	1·72	1·19	5·74	2·16	2·58	10·59	14·24	3·40
Longreach	2·56	5·95	0·09	Nil.	0·37	0·58	Nil.	Nil.	1·71	0·87	0·27	0·18	0·03
Lucinda	9·16	8·63	2·89	2·17	5·89	0·30	2·59	Nil.	0·32	3·55	11·38	2·67	1·78
Mackay	6·80	1·32	0·25	1·07	5·14	2·29	1·35	1·85	0·71	3·78	8·43	4·41	6·73
Rockhampton	2·84	0·79	0·24	2·29	3·04	1·78	0·51	0·41	0·19	4·79	1·36	1·68	0·21
Townsville	3·13	0·74	0·32	0·19	1·87	0·14	0·90	0·16	0·61	2·24	3·14	1·61	0·35
South.													
Barcaldine	1·90	2·21	0·82	0·63	0·25	0·51	0·54	0·55	0·09	2·39	0·07	0·37	0·02
Beenleigh	4·17	4·55	4·15	1·34	4·49	0·70	3·35	1·35	0·14	2·41	1·82	0·68	0·42
Biggenden	6·35	1·47	1·56	0·74	2·81	2·11	1·35	0·47	0·92	2·12	0·83	1·80	0·65
Blackall	3·96	3·80	0·90	0·55	0·44	0·88	0·60	0·97	0·32	1·68	0·34	0·34	0·05
Brisbane	3·10	2·29	3·29	1·31	3·71	1·30	3·25	1·41	0·75	1·38	2·67	0·76	0·17
Bundaberg	10·27	1·14	0·74	2·01	5·59	1·80	2·18	1·28	Nil.	6·33	0·75	1·99	0·43
Caboolture	4·64	3·34	2·27	3·70	3·18	1·55	5·01	3·17	3·45	2·29	2·66	1·29	1·99
Charleville	2·61	3·28	0·93	1·27	0·92	0·32	0·04	0·65	0·96	0·47	0·22	0·42	0·23
Dalby	3·12	1·12	3·59	2·83	1·66	1·11	4·09	0·15	0·42	1·65	0·20	0·30	2·00
Emerald	0·88	1·31	0·63	0·90	1·74	1·11	Nil.	0·09	0·63	3·28	1·11	0·97	0·30
Esk	4·11	1·78	2·45	3·01	3·03	1·72	4·87	1·08	2·20	1·81	1·06	0·75	1·25
Gatton College ...	3·86	1·55	2·93	1·53	3·23	1·06	3·02	0·86	0·26	2·27	1·58	0·26	*
Gayndah	3·97	0·97	2·32	2·29	Nil.	1·91	2·39	0·04	0·38	2·54	0·51	0·99	0·81
Gindie	0·44	1·21	0·84	1·34	1·77	1·81	0·53	0·02	0·57	1·35	1·46	0·78	0·47
Goondiwindi	1·82	1·90	1·73	2·30	1·55	0·67	2·83	0·21	0·20	2·06	0·75	1·20	0·06
Gympie	3·89	3·38	2·82	3·40	3·39	1·34	1·91	1·34	1·25	1·49	1·65	2·33	1·09
Ipswich	3·38	1·43	3·16	0·97	2·47	3·54	3·98	1·17	0·35	1·45	2·80	0·32	0·03
Laidley	3·81	1·47	2·54	2·00	5·32	1·22	3·37	1·10	1·65	1·79	1·94	0·39	0·10
Maryborough	5·58	4·09	2·22	3·07	5·02	1·05	1·54	1·84	1·54	1·29	0·75	0·96	1·57
Nambour	3·33	7·25	3·33	6·80	4·42	0·98	3·89	2·85	3·89	1·30	2·06	1·61	†
Nerang	5·12	5·42	5·34	0·79	5·41	0·88	4·57	2·70	0·46	3·98	4·54	0·65	0·65
Roma	1·11	1·11	2·66	2·26	0·98	0·43	0·71	0·54	0·83	2·72	1·11	0·54	0·15
Stanthorpe	2·13	0·77	2·74	1·52	4·22	1·42	2·93	2·22	1·67	3·17	0·51	0·56	0·10
Taroom	1·88	1·70	2·19	2·74	2·34	2·11	0·92	0·42	0·31	0·53	1·82	1·30	0·33
Tambo	2·75	2·85	1·47	0·73	0·74	1·47	0·51	Nil.	0·16	1·73	0·35	0·68	0·04
Tewantin	11·70	12·20	5·45	8·34	4·61	2·71	3·26	1·66	2·70	3·09	1·13	3·44	2·84
Texas	1·46	1·10	1·87	1·00	3·06	1·47	1·47	0·26	0·43	1·95	1·62	0·42	Nil.
Toowoomba	6·59	1·04	3·57	2·22	5·57	1·85	4·45	1·10	0·87	3·46	1·20	Nil.	0·79
Warwick	2·91	0·82	3·47	1·57	5·74	2·05	3·12	1·19	0·71	3·48	0·65	0·55	Nil.
Westbrook	3·38	0·74	3·48	1·64	6·50	1·75	2·27	0·59	0·31	3·21	1·04	0·06	0·41

* Returns not received. † Data unreliable.

CLEMENT L. WRAGGE,
Government Meteorologist.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER (duty free).—Market for colonial, steadily improving. Brisk demand for inferior qualities. Australian, choicest, 110s. to 112s.; Danish, 110s. to 114s. New Zealand, 100s. to 110s., in brisk demand.

CHEESE (duty free).—American, 42s. to 53s.; Canadian, 56s.; New Zealand, 54s.

CONDENSED MILK.—18s. 6d. to 20s. 5d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. ; refined, 4s. 2d. and ¼ per cent.).—Refined, £16 to £17 10s. per ton ; German beet, 88 per cent., 6s. 6d. per cwt.

SYRUPS (duty, 2s. per cwt. and ¼ per cent.).—Finest, 14s. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—5s. 9d. to 8s. per cwt.

RICE (duty free).—Rangoon, £5 15s. to £7 10s. ; Japan, £13 10s. ; Java, £15 to £17 ; Patna, £17 to £21 per ton ; Queensland paddy, local price £7 10s. to £9 (Pimpama Island clean), valued at £18 10s. in the London market.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, small to good middling, 40s. to 105s. ; peaberry, 75s. to 120s. ; Santos, 30s. ; Mocha, 65s. to 100s. ; Jamaica, finest, 100s. to 125s. per cwt.

ARROWROOT.—St. Vincent, 1½d. to 3½d. ; Natal, 5d. to 8d. ; Bermuda, 1s. 3d. to 1s. 6d. per lb.

WHEAT.—Australian, white, 30s. 6d. ; New Zealand, white, 29s. 6d. to 30s. 6d. ; Duluth, red, 29s. 9d. ; Manitoba, red, 30s. per 480 lb.

FLOUR.—Australian, 20s. 6d. per 280 lb.

MALTING BARLEY.—English, 25s. 6d. to 27s. 6d. per 448 lb.

OATS.—New Zealand, 25s. to 27s. per 384 lb. ; Canadian, 16s. to 28s. per 320 lb.

SPLIT PEAS.—46s. per 504 lb.

GINGER (duty free).—Calicut, good medium, 80s. to 100s. ; medium, cut rough, 39s. ; small, cut rough, 30s. to 34s. ; Japan, rough, 39s. to 40s. ; Jamaica, good bright, 60s. to 70s. ; middling to fair, 40s. to 56s. per cwt.

TAPIOCA.—1¼d. to 3d. per lb.

PEPPER.—Capsicums, 16s. to 80s. ; chillies, 34s. to 50s. per cwt.

TOBACCO.—American. Messrs. Thomas H. Edwards and Co., Liverpool, report as follows on the Tobacco Market :—

STRIPS.	1902.	LEAF.	1902.
WESTERN—		WESTERN—	
Fillers	4½ @ —	Common export	— @ —
Rather short	5¼ „ 6	African export	— @ 5 @ 6½
Very middling to middling	6¼ „ 6¾	Short trade	— @ 4
Good to fine	7 @ 8 @ —	Medium to good trade ...	4½ „ 6
BURLEY	6 „ 9 „ —	BURLEY	7 @ 7½ @ 8
VIRGINIA DARK—		VIRGINIA DARK—	
Fillers	5 @ —	Common export	— @ —
Rather short	— „ 6	Short trade	— „ —
Very middling to middling	6½ „ 7½	Medium trade	4 „ 5
Good to fine	8 „ —	Good to fine trade	5½ „ —
VIRGINIA AND CAROLINA BRIGHT—		VIRGINIA AND CAROLINA BRIGHT—	
Semi-dark	— @ 7½	Common or semi-bright ...	6 @ 7
Semi-bright	8 @ 9 @ —	Medium or mixed	8½ @ 10 @ —
Medium or mixed	10 @ 11	Good to fine	11 „ 12 „ 15
Good to fine	11¼ @ 12½ @ 14		

NOTE BY R. S. NEVILL, Tobacco Expert.

There is reported to be a shortness in the crop of the United States, and prices are ruling high, and the imports into the United Kingdom for 1902 will probably show a falling-off, and at a higher figure than the imports of 1901 ; and if the fight continues between the American Tobacco Co. and the Imperial Tobacco Co. prices are likely to go higher in Great Britain.

WINE.—Australian Burgundy: Wotonga 13s., Waratah 18s., per dozen.

GREEN FRUIT.—Apples, Tasmanian, 8s. to 11s.; New York pippins, 13s. Australian realised 11s. to 16s., and some Cleopatras 18s. per case. Victorian pears, 2s. 6d. to 8s. 6d. per dozen. Peaches, 2s. 9d. per case. Grapes, 5s. per case. Oranges, Valencia, from 7s. to 8s. for common sorts to 26s. to 46s. for finest selected per 420; lemons, finest selected, 20s. to 29s. per case of 420; bananas, 6s. 6d. to 12s. per bunch.

COTTON.—Clean upland, 5½d. per lb. In America, seed cotton, 2½d.; lint, 11d. per lb. S.S. Island cotton, 2s. 1d. per lb.

COTTON SEED.—£6 2s. 6d. per ton.

COTTON-SEED OIL CAKE (decorticated).—£4 6s. 3d. to £4 7s. 8d. per ton.

COTTON-SEED OIL.—Crude, £22 10s. to £22 5s. per ton.

LINSEED.—47s. 6d. to 50s. 9d. per 416 lb.

LINSEED OIL.—£29 15s. to £30 per ton.

LINSEED OIL CAKE.—£8 6s. 3d. to £8 12s. 6d. per ton.

RIGA HEMP.—£33 per ton.

NEW ZEALAND HEMP.—£33 10s. per ton.

WOOL.—Bidding at the last sales was active and competition brisk, and the advance on the opening sales was well maintained on 13th May, when there was a further upward tendency for best merinos:—Merinos, 7½d.; fine crossbreds, 10d.; other wools ranging from 5d. to 10d.

FROZEN MEAT.—The following are the latest quotations for the various descriptions of frozen meat mentioned (last week's prices being also given for comparison):—

New Zealand Mutton.

(Crossbred Wethers and Merino Ewes.)

	May 10.	May 17.
Canterbury	$4\frac{3}{16}$d.	4½d.
Dunedin and Southland	$4\frac{1}{16}$d.	$4\frac{1}{16}$d.
North Island	$3\frac{15}{16}$d.	4d.

Australian Mutton.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3¾d.	3¾d.
Light (under 50 lb.)	3¾d.	3¾d.

River Plate Mutton.

(Crossbred and Merino Wethers.)

Heavy	3¾d.	3¾d.
Light	3¾d.	3¾d.

New Zealand Lambs.

Prime Canterbury (32 lb. to 42 lb.)	5d.	5d.
Fair average	4¾d.	4¾d.

Australian Lambs.

Prime (32 lb. to 40 lb.)	4¾d.	4¾d.
Fair average	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.

New Zealand Frozen Beef.

Ox, fores (100 lb. to 200 lb.) ...	4¾d.	4½d.
Ox, hinds (180 lb. to 200 lb.) ...	5¼d.	5¼d.

Australian Frozen Beef.
(Fair Average Quality.)

Ox, fores (100 lb. to 200 lb.) ...	None offer-	—
Ox, hinds (180 lb. to 200 lb.) ...	ing.	—

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations for New Zealand and Australian lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 7s. 6d. to 7s. 9d.; Danish, 6s. to 7s. 9d. per 120.

BACON.—Irish, 60s. to 63s.; American, 45s., 48s. to 54s.; Canadian, 54s. to 58s. per cwt.

HAMS.—Irish, 86s. to 92s.; American, 44s. to 52s. per cwt.

HIDES.—Queensland heavy ox, 5½d. per lb.; light ox, 4¾d.; cow, 4⅝d. New South Wales heavy ox, 4¾d.; light ox, 4⅜d.; cow, 4¼d. Latest quotations show an advance of 0⅛d. per lb.

TALLOW.—Beef, fine, £34 10s.; medium, £31 10s.; mutton, fine, £37 9s.; medium, £32 10s. per ton.

MARSUPIAL SKINS IN THE LONDON MARKET.—It may be of interest to kangaroo-shooters and other dealers in marsupial skins generally to compare the values of such skins in the British market with those ruling here. There is usually a strong demand for Australian marsupial skins. For good parcels of Sydney the demand is especially keen, and they sell relatively better than the commoner descriptions. Victorians and Tasmanians also realise high prices. The best lots of silver bearskins now sell at the highest prices that have been touched for many years, while the commoner selections are also considerably dearer. Furriers' kangaroo also sell to advantage. At one sale the number of skins offered was:—Opossum, 934,675; bear, 31,687; wallaby, &c., 166,746; kangaroo, &c., 3,066; fox, 6,394; emu, 319; total, 1,142,887 skins. Sold.—Opossum, 934,675; bear, 31,687; wallaby, &c., 166,746; kangaroo, &c., 3,066; fox, 6,394; emu, 319; total, 1,142,887 skins. The prices realised are as follow:—First extra large blue, 1s. 4d. to 1s. 10d. per skin; second ditto, 10¾d. to 1s. 2d.; first blue, 10½d. to 1s. 4¼d.; second blue, 8¼d. to 1s.; small ditto, 7½d. to 10½d.; first extra large red, 1s. 1d. to 1s. 8½d.; second ditto, 8¼d. to 1s. 3½d.; first red, 9¼d. to 1s. 0¾d.; second red, 6½d. to 9½d.; small red, 5¾d to 8¼d.; thirds, 3d. to 7d.; first Victorian, 2s. 9d. to 3s. 7d.; second and small Victorian, 1s. 1d. to 2s. 5d.; third Victorian, 9d. to 1s.; grey Tasmanian, 1s. 4d. to 3s.; black Tasmanian, 2s. 11d. to 6s. 9d.; bear, silver, large, 11d. to 1s. 11d.; ditto, red, large, 8d. to 1s. 3d.; ditto, small, 3¾d. to 4¼d.; swamp wallaby, large, 1s. 1d. to 2s. 7d.; ditto, middling, 8d. to 2s. 1d.; ditto, small, 8d. to 1s. 9d.; rock wallaby, 1½d. to 6½d.; Tasmanian wallaby, 2d. to 2s. 3d.; kangaroo, 6½d. to 1s. 7d.; ringtails, 1d. to 4d.; native cat, 4d. to 1s. 2d.; house cat, 2d. to 8d.; wallaby, 1d. to 8½d.; emu, 1s. 7d. to 3s. 6d.; fox, 6d. to 3s. 6d.

Vegetable Pathology.

REPORTED DISEASE IN MARYBOROUGH ORANGES.

REPORT BY H. TRYON, ENTOMOLOGIST AND VEGETABLE PATHOLOGIST, DEPARTMENT OF AGRICULTURE.

Brisbane, 12th May, 1902.

SIR,—I have the honour, by way of supplement to my communication of 8th instant, to report on the condition of two cases of Maryborough oranges received since (on the 9th May) at the offices of the Department, and forming part of a return consignment.

* * * * *

understood to have been already "condemned" in New South Wales on the ground that the fruit that it comprised was affected by "Melanose," as certified to by Mr. Inspector J. Martin, Inspector, Department of Mines and Agriculture, New South Wales (*vide* certificates 3rd May and 5th May).

This fruit to which reference is made as above, I find to exhibit conspicuously (in addition to dead scale-insects of more than one kind) skin injuries and blemishes, as follows:—

1. *Injured from Hydrocyanic Acid Gas.*—The oranges affected by the cause specified manifest reddish-brown blotches and patches that merge at their boundaries with the general surface colour, this being due to the fact that—as the result of chemical action—the chloroplasts of the cells of the superficial tissue have become disorganised, resolving themselves into brown particles and discharged brown colour, and the cells themselves killed. This injury, that is exhibited by a considerable portion of the contents of the cases, has probably arisen from the fact that the fruit—as ascertained—was green or partly green, at the time of treatment at Maryborough, in the "fumigation chamber."

2. *Acarus Injury* (? "Melanose," *Cobb*; "False Melanose," *McAlpine*).—This injury, that in my opinion is caused by an *Acarus* belonging to the genus *Brevipalpus* (Rhapignathidæ), provisionally named *R. citriperda*, takes the form of linear markings, spots, blotches, and patches of very irregular outline or direction; the former always well defined externally. These, except when their dimensions are considerable, as is commonly the case, when they are light-brown with often dark-brown narrow margins, are blackish-brown coloured. In the latter event also, the surface of the fruit embraced by them is irregularly tesselated by the presence of minute cracks. In some cases these larger markings are evidently formed by coalescence of mere specks or other small markings, and generally reproduce the form taken by water that has spread over an oiled surface—the appearance exhibited being such often as to recall to mind the idea of an archipelago. These markings of such varied size and form present the following microscopical features. In their initial condition there merely exists, in connection with them, a darkening of the entire contents of the cells of the epidermis, groups of these cells becoming uniformly dark-brown. These cells, moreover, may be covered externally with a special evenly distributed substance, that appears to have solidified after having spread or flowed over them. This is of the nature of a resin, and dissolves in boiling potash, after the manner of that body. The layer of cellular tissue covered by this resinous matter, and with which it is in close union, has died and has become fissued—as already described—after the manner of mud in drying. When a portion of it is removed and freed from the imprisoned air that it contains, and otherwise suitably prepared, it may display the presence of mycelial-fungus threads that seem to be here and there directly

connected with an aerial growth. This fungus organisation is by no means constantly existent; nor is its distribution when present co-extensive with injured surface of the fruit in connection with which it occurs. More than one distinct species of fungus apparently occurs under the conditions and in the connection named.

On almost every orange exhibiting this second form of injury may be found dead examples of the previously mentioned plant-injuring *Acarus* or its eggs, and the above-mentioned features characteristic of it receive an adequate explanation in the manifestation of the peculiar feeding habit on the part of this animal; the fungus or fungi growing saprophytically on the dead resin-loaded tissue, and developing with greater or less prominence in response to the variations in meteorological features that from time to time obtain.

NOTE.—The same *Acarus* caused, in the opinion of the writer, as already published, the Scab of the lemon. This he formerly attributed to a fungus named *Ramularia scabiosa* n. sp. ("Insect and Fungus Pests," p. 144, 1899), that was afterwards assigned to the genus *Phyllosticta*. This conclusion as to the origin of the obscure disease mentioned is now favoured by the Vegetable Pathologist of Victoria—Dr. McAlpine—as already announced ("Fungus Diseases of Citrus Trees," p. 40-1).

3. "*Maori*" *Disease*, caused by the orange mite (*Phytopus oleivorus*).—This is present only in a very mild form on some of the oranges under examination, but seldom occurs in connection with them beyond an extent in which a mere lack of lustre is produced on the fruit whereon the mite that occasions the "Maori" condition occurs. Accordingly the effects due to the attacks of the orange mite have not constituted those noticeable features on which Mr. Inspector Martin has based his condemnations of the consignments that are comprehended in the term "Melanose" that he has used.

Conclusion.—It will appear that, contrary to the suggested finding that the concluding paragraph of my previous letter mentioned as a matter for anticipation, the present report is evidence that the conclusions, so far as they relate to the state of the oranges in question, arrived at by the New South Wales authorities are sustained on sufficient grounds.

An important distinction, however, obtains between the views of my colleagues of the southern colonies and those of myself, in spite of this agreement. This relates to the causal agent of the malady. For whereas they deem this a parasitic fungus developing its spores externally; and the fruit victimised, to accordingly necessarily convey an infective element, whence it is a source of danger to horticultural interests, I on my part regard the malady as the result of the attacks of an *Acarus:* whence it follows that diseased fruit that still harbours this animal or its eggs, either endowed with life, should alone come under the provisions of the Diseases in Plants Acts of the different States that schedule "Melanose" as a disease to be taken cognisance of.

Recognising the disease to which this Report principally relates as a species of *Acariasis*, it has not previously occurred to me that it might be identical with one that, in New South Wales and Victoria, has been ascribed by most competent authorities to a vegetable parasite. Indeed, until the exceptionally dry season, that would favour the development of such a malady as that under notice, was experienced, its presence was too little pronounced to justify prominent attention—a fact that would augur well with reference to the future degree of manifestation to be expected.

I have, &c.,

HENRY TRYON,
Entomologist and Vegetable Pathologist.

P.S.—It has not been deemed necessary to refer to the so-called Melanose diseases of the citrus tribe met with in the United States and in Europe; with the latter, however, the Australian orange affection can have no connection.—H.T.

The Under Secretary, Department of Agriculture, Brisbane.

Animal Pathology.

WARTS.

By WILMOT C. QUINNELL, M.R.C.V.S., Government Veterinary Inspector.

Warts (sometimes known in surgery by their Latin name *Verrucæ*) are collections of lengthened *papillæ* of the skin, closely adherent and ensheathed by a thick covering of hard, dry cuticle. From friction and exposure of the air their surface presents a horny texture. They occur in all veterinary subjects, most common in young animals.

Before treating of these excrescences, we will say a few words to explain the structure and function of the skin in health.

The skin, or integument, is the outer enveloping membrane of the body, and continuous with the outer limits of the internal mucous membranes. It consists of two distinct layers, of which the outer is termed the epidermis cuticle, scarf-skin, or false skin; and the inner the *derma*, *chorion*, *cutis vera*, or true skin.

The upper skin is destitute of blood vessels and nerves, as may be seen by inserting a needle under it, and it is the part separated in a blister. It grows from below upwards, end is continually being shed in the form of minute scales (scurf).

If a large portion of the epidermis be removed, the process of repair is slow and proceeds from the edges of the wound, but recovery is quicker if any of the deeper cells of the layer remain. Skin-grafting aims at transplanting small portions of healthy epidermis—including its deeper layers—to denuded surfaces, and when the grafts take root the raw surface is much more speedily covered because the healing process spreads from each graft. The epidermis, being impermeable to moisture, serves to protect the living tissues beneath it against the absorption of poisons. When it is perfect, poisonous substances may be freely handled; but these substances are readily absorbed into the blood when the cuticle is cut, or when a small portion of it has been torn off.

The dermis, true skin (*cutis vera*), consists of fibres of connective and elastic tissue, interwoven with minute blood-vessels and nerve fibres. Its surface is drawn up into finger-like projections called *papillæ*, the largest of which are about one-hundredth of an inch in length.

These little eminences are more or less conical, or sometimes club-shaped. They may be compound, and contain a capillary loop, nerve, and touch-corpuscle; they project into the epidermis, and by raising it up, as it were, from a ridge on the surface of the skin, they serve to increase the sensitiveness of the part, lodging a touch-corpuscle or "tactile corpuscle" in a favourable position so that the properties of bodies are revealed to the sense of touch.

Regarded as a protective covering, the skin possesses the combined advantages of toughness, resistance, flexibility, and elasticity; the connective frame being the part which mainly confers these properties, although the epidermis co-operates with it.

The sub-cutaneous layer of fat (fill up all the irregularities of surface in the underlying parts, and give the rounded form and plumpness to the surface of the body), and the modification of the epidermis in various forms, as hairs, wool, feathers, scales, &c., serve for the preservation of warmth, and occasionally (when they occur as claws, talons, &c.), as means of offence or defence.

The appendages of the skin are the hairs, sudoriferous and sebaceous glands and horny parts.

The hairs are modifications of skin, and are divided into the hair proper, forming the coat, coarse hair, long and flowing, found in the forelock, mane, tail, eyelashes, lips, and fetlock. The hairs also furnish protection against wet, from the fact that they are always more or less oily, from the secretions of the sebaceous glands, and thus shed water. The hairs through their elasticity furnish mechanical protection, and through the thickness of the coat, to a certain degree, resist the attacks of insects. Finally, the hairs assist the sense of touch.

Sudoriferous glands are attached to the skin, consisting of a curled tube lying in the chorion and a spiral duct passing up through the derma and epidermis, lined with epithelium. Their function is the regulation of animal heat, and also are connected with excretion of urea, &c.

The sebaceous glands empty into the hair follicles or on the skin independently. They consist of vesicles filled with fatty and epithelial tissue, opening into a common duct. Their function is lubrication and protection as well as preservation of the elasticity of the hair and other epidermal appendages.

The horny parts.—These comprise the chestnuts, ergot, and hoofs.

FUNCTIONS OF THE SKIN.

1. The skin everywhere clothes the external surface of the body, protecting the underlying parts from injury.
2. It affords support and protection to the terminations of the sensory nerves, which render it an important sense organ.
3. It is a bad conductor of heat, and thus serves to preserve the heat of the body.
4. It is supplied with a large extent of capillary blood-vessels, and thus by its means a large surface of blood is exposed to the cooling influence of surrounding bodies. The dilatation or contraction of the blood-vessels supplying the skin will help to regulate the heat of the body.
5. The sweat glands which it contains make it an important excretory organ.
6. It plays a subsidiary part as an organ of respiration.
7. Under exceptional circumstances, absorption takes places from its surface.

CUTANEOUS RESPIRATION AND ABSORPTION.

The skin of the domesticated animals performs several very important functions. Besides being a protective envelope, the importance of the skin as a respiratory organ is far from inconsiderable, very appreciable quantities of carbonic acid being exhaled hourly by the external surface of the skin. So important are these purifying functions, proved not only by measuring the excreted carbonic acid, but by the fact if the skin is covered by an impermeable varnish, or if the body is enclosed, all but the head, in caoutchouc dress, animals soon die, as if asphyxiated, the heart and lungs being gorged with blood, and their temperature before death gradually falling many degrees.

The skin is, moreover, an organ of absorption; mercurial preparations, when rubbed into the skin, have the same action as when given internally. Thus potassio-tartrate of antimony, rubbed into the skin in the form of an ointment or solution, may excite vomiting or an eruption extending over the whole body. The effect of rubbing (endermic method) is probably to force the particles of the matter into the orifices of the glands, where they become more easily absorbed than they would be through the epidermis.

Neither alcoholic nor watery solutions of drugs are absorbed through the unbroken skin, unless they are dissolved in chloroform or other agents which have a notable power of endosmosis, or unless well rubbed in.

This fact has a practical application, illustrated by the impunity with which arsenical dips are used, even when three or four times the ordinary strength, and when animals are kept in them several minutes.

Since the functions of the animal body are resident in the various tissues and organs of the body, an acquaintance with the forms and structures of those organs and tissues must precede the study of their functions.

When these actions or functions occur in a disturbed or irregular manner they constitute disease or abnormal life and become the subject of abnormal physiology or pathology. Normal physiology is the basis of pathology, and a knowledge of the one must precede the intelligent study of the other; just as an acquaintance with the functions of the component parts of a machine must precede the recognition of disordered movement and the provision of means of repair.

(*To be continued.*

TEXAS OR TICK FEVER.

SOME INTERESTING EXPERIENCES.

The sixteenth annual report of the Bureau of Animal Industry, Washington, United States, America, lately to hand, contains some reports of continued experiments by Dr. Shroeder, the Superintendent of the Experiment Station, which possess great interest to the cattle-owners of this State. Dr. Shroeder conducted a series of experiments in the growing of non-infected ticks, and afterwards infected them. An effort was made to grow ticks on animals refractory to Texas fever. Horses, mules, dogs, sheep, goats, rabbits, guinea pigs, and pigeons were used, but the ticks persistently refused to take hold of and grow upon any of the animals named. He has since been assured, however, that they occasionally grow on horses and mules in the Southern States. He determined to see what could be done by using very young calves, which are practically immune from Texas fever. All his experiments are given in detail, but here it will only be necessary to state that ticks from cows obtained from the fevered regions of the Southern States were placed on two very young calves when they matured; they were placed in a bottle, the mouth of which was plugged with cotton wool, where they deposited their ova, and the latter hatched in due course. The young ticks were placed on a cow and calf, and were found not to produce the disease. Ticks collected from the cow and subsequent generations of those ticks, were all found to be non-infectious. It was found, however, that whenever any of these ticks were placed on cows from the Southern States that had passed through the fever and had the organisms in their blood, they became pathogenic, their progeny never failing to produce Texas fever when placed on northern susceptible cattle.

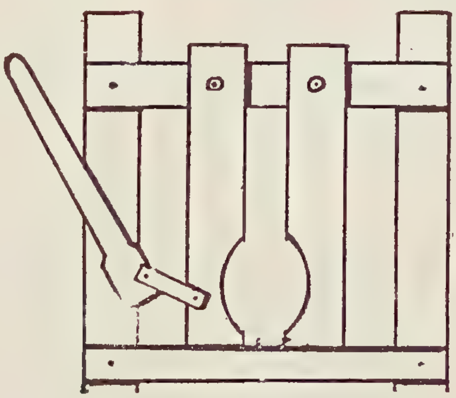
During these experiments an important discovery was made—namely, that it is possible to carry infection by means of insects other than ticks from an infected to a susceptible animal. Two cases of the kind are stated by Dr. Shroeder. In a field where the clean cattle were kept, and separated from the infected paddock by a ditch and two lines of fence, a cow was found to be suffering from Texas fever, although no ticks were found on her, nor on any of the other cattle in the same field. A second case, a cow, had received a hyperdermic injection of blood from a southern cow, and died from its effects. A fly caught on her body was found to have its abdomen distended with blood. This blood was pressed out on a slide, and examined under the miscroscope, and was seen to contain many almost perfect corpuscles, nearly every one of which was infected with a large Texas fever parasite. Eleven days after the death of this cow another cow in the same enclosure was observed to be passing bloody urine, and she died nineteen days after the symptoms were first observed. No ticks were found on her, nor on any of the cattle in the same field. The case was one of true Texas fever, and from these two cases the doctor thinks it is reasonable to assume that flies, and possibly other blood-sucking insects and external parasites, may carry infection from one animal to another; but he thinks the case must be very rare, and that no general outbreak can be produced in this manner.

On the vitality of the cattle tick he records an instance in which he placed a number of female ticks in a cotton-stoppered flask, and kept them in a warm room. The time which elapsed from the day the adult ticks were collected until the day when a host was provided for the young ticks was 168 days, or very nearly the half of the year. Dealing with the persistence of the Texas fever organism in the blood of cattle, he cites an experiment of two calves, from four to five months old, which received a hyperdermic injection of blood drawn from the jugular vein of two southern cows. One was inoculated with blood from the North Carolina cow, whose cases have been so often cited. She arrived at the experiment station in 1889, and her blood is still virulent. The two calves suffered an attack of Texas fever, so mild in character that it would have escaped notice without careful examination of the blood. The blood of those calves was afterwards injected into two northern cows, both of which passed through a severe form of Texas fever, and one died and the other made a slow recovery. From these facts, and the permanently infectious character of the blood of the southern cattle, which has been repeatedly demonstrated, it appeared to the doctor that the organism of Texas fever is in some manner retarded in its growth in the blood of immune cattle, either by the production of an anti-toxin of insufficient strength to destroy it entirely, or some alteration in the system of the cattle about which nothing is known; that is to say, the cause which prevents the multiplication of the organism is a modification of its environment, and not of its own character, otherwise it would fail to display the power of rapid multiplication, which is seen whenever it reaches the blood of a new host not previously infected. If an anti-toxin were produced, the doctor reasoned, the injection of large quantities of blood or blood serum from immune cattle into susceptible cattle would be equivalent to transferring a portion of the immunity of the former to the later. A number of cows were inoculated with ten c.u. of blood from a southern cow, and then quantities of serum up to 100, 300, and 400 c.c. at different times, but nothing was gained from this experiment.

In the course of carrying out this experiment, however, Dr. Shroeder deducted a fact which it would be well for Queensland cattle-owners to carefully note—namely, that the injection of a large quantity of infectious blood causes diseases of no greater severity than the injection of a small quantity. A dose of ten cubic centimetres seems sufficient, but he recommends that that quantity should be the minimum dose. With a ten cubic centimetres dose we may feel quite certain that an attack of the infection has occurred, even if it was too mild to be diagnosed by the ordinary methods within reach of general practice; with a smaller dose an element of uncertainty remains.—*Rockhampton Bulletin.*

A HOG RING GATE.

An easily-made gate or chute for the purpose of ringing pigs is that presented in the accompanying diagram. The two centre boards swing free on pivots attached to the crosspiece, with the exception of that to which the lever is attached. The work of ringing the animals is facilitated by the construction of a drive of hurdles or any other obstructions narrowing down to the gate.



Any port in a storm is the adage of the pig when in a quandary, and into the inviting opening, though limited may be its extent, will go the head of the animal, but that is all. Down comes the lever, and piggy is fast. Then the operation which elicits such piercing protests follows without trouble to the operator. With such a device properly constructed, the largest hog can be held with ease.

Agricultural Patents.

PATENTS ACCEPTED.

SUGAR-CANE HARVESTER ; CUTTING, TOPPING, AND CONVEYING.—Class 30—(9 Figures)—5866 : Thomas Wilson Sloane, of School lane, East Bundaberg, Queensland, cab proprietor, and George Noakes, of Albion Vale, near Bundaberg, Queensland, sugar-planter. "Improvements in machine for Topping and Cutting Sugar-cane." Dated 28th January, 1901. (Drawings, 30s. ; specification, 12s.) The machine is built on a tubular framework of a U-shape in plan, the open gap being in front. Each side of the U is supported by a carrying and driving wheel belt driven at from 1 to 2 miles per hour by an oil or other motor placed over two steering wheels at the rear of the machine. In the centre of the front gap is a plough-like spreader, which parts the cane and bends the stools laterally and forwards, so that the tops are dragged past guide-rollers against vertically reciprocating arrow-headed knife bars fixed on the lateral parts of the frame. At the back of the central gap are two vertical spindles carrying revolving knives that cut the cane close to the ground, the knife-drums being capable of sliding on square shafts to accommodate lumps in the ground. The several canes fall on lateral travelling belts, and are conveyed to the trucks at the rear. At the base of the front ends of the U-frame are shoes attached to the sloping guide-bars, which are intended to raise flat lying cane to a cutting position. (9 claims.)

DISTRIBUTING SEEDS.—Class 28—(7 Figures)—6181 : Charles E. Patric, of Springfield, Ohio, United States of America. " Distributors for Grain Drills." Dated 27th August, 1901. (Drawings, 17s. 6d. ; specification, 9s. 6d.) Several hoppers for seeds are carried on one machine, and in an opening in the partitions is placed a revolving seed-wheel, driven by external teeth gearing with a pinion on a shaft outside the hoppers ; the feed-wheel has a central web against which the seed in the hoppers fall at one side or the other according to the position of a movable guide-plate in the hopper, and carrier ribs are on the inside of the rim ; one side of the wheel is suited to feed larger seeds, and the other small seeds, the external teeth are shrouded by the casing, except at the pinion, and at a position over the delivery tube, where the housing extends towards the central webb, and leaves a small opening through which the seeds can be carried by the ribs out of the hopper, and on passing the housing they fall laterally into the delivery tube. (8 claims.)

ROPE-SWIVEL COUPLING FOR WELL-BORING.—Classes 59, 85—(7 Figures)—6243 : William Albert Crawford, of Moree, New South Wales, Australia, well-boring contractor. " An Improved Boring Tool for Deep Well Sinking." Dated 26th September, 1901. (Drawings, 15s. ; specification, 6s.) This coupling attaches a rope-end to a female socket for the head of the rods. The rod-head is enlarged above the socket, and perforated axially with a cross chamber in the enlargement ; the rope is passed through the perforation and knotted in a swivelling block in the cavity ; removable wearing washers are fitted to the bearing faces under the swivelling faces, and the knot is held up by a screw-adjusted plate ; the rope inside the bore is protected by a tubular prolongation of the swivelling block. (4 claims.)

General Notes.

THE PACKING OF APPLES.

In recent years much attention has been devoted in rural England to the cultivation of fruit, and methods of packing the product for market have received due attention. When the market is glutted it is not always well, except in the case of very perishable and soft fruits, to sell at the low figure then prevailing. For instance, apple-growers can preserve their harvests by careful packing until such season as market prices are such that sales are profitable. An excellent system is to carefully deposit the apples in barrels

in which one of the staves has received a bevelled diagonal cut between the end and one of the middle rims. This obviates the necessity of unheading the barrel when it becomes necessary to examine the condition of the contents. The cask is put on end, the hoop is knocked up, and the tongue of the stave is raised a little. After the inspection, the tongue is pressed back and the hoop replaced. Nothing could be simpler. The advantage does not lay with the grower alone; the merchant also is enabled at once to ascertain the state of the fruit supplied him.

BLACK PUDDINGS.

These are much eaten in the provinces, and are really excellent when properly made. The blood when fresh caught must be seasoned with salt and well stirred until quite cold, or it will congeal. Put a quart of grits or groats to soak in each quart of blood one night. Moisten the crumb of a quartern loaf in rather more than two quarts of new milk made hot. Have ready the skins perfectly clean. Chop finely a sprig of savory, one of thyme, and one of marjoram. Season with pepper, salt, a few cloves, some allspice, a mite of ginger, and a nutmeg grated. Mix with 3 lb. of chopped suet, six eggs beaten and strained, the bread and milk, well beaten, and lastly the groats which were soaked in the blood. When all is well mixed and ready, put into some dice-shaped pieces some hog's leaf. As you fill the skins drop this in about every 2 inches apart. Tie in links only half-full, and boil them in a large kettle, occasionally pricking them with a fine skewer as they boil, or they will burst before they are half-cooked. When boiled lay them upon straw until cold, then hang them in bags in the kitchen. When wanted scald them and put them before the fire in a Dutch oven. Some cooks boil the groats in the milk until swelled, then add more milk when mixing. Leeks are sometimes very finely shred and added to the other ingredients.

THE POTATO IN NEW CALEDONIA.

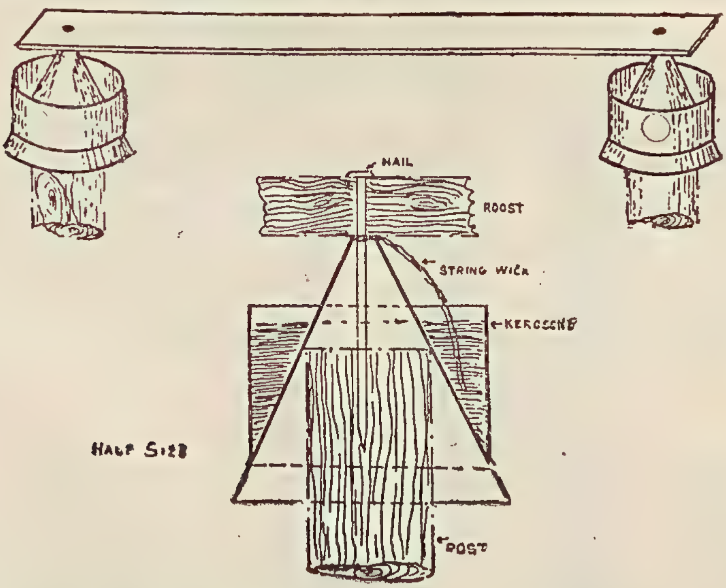
A correspondent of the *Journal des Colonies*, Marseilles, writes from Noumea: "We contribute to Australia for an article of prime necessity—the potato. In 1900 we received 1,441,189 kilos (141,545 tons). Thus, every year, 300,000 francs (about £12,500) are sent to our neighbour, who do not return them to us."

New Caledonia produces excellent potatoes. Why do the farmers not set to work and cultivate them?

To this the editor of the *Journal d'Agriculture Tropicale* replies, that the reason probably is, that in the tropical climate of New Caledonia (locally-grown) potatoes would be dearer than those brought from Australia, and he invites his readers to furnish precise information on the growth and yield of the potato in that colony.

TICK-PROOF PERCHES.

As poultry tick is plentiful in most of our farming districts, the matter of making the perches proof against tick is one of considerable importance. There is no doubt the most effective way is to build the poultry-house of galvanised iron, fastened on the inside of the posts and rails, or, where only a few fowls are kept, to set 8 feet or 9 feet iron about 6 inches or 9 inches in the ground, and draw them together at the top with a piece of ridgecapping, and swing the perches by wires from the roof. Many farmers and others do not feel disposed to go to this expense, and various devices are resorted to to keep the ticks from gaining access to the perches. One of the simplest and most effective of these has been sent to the editor by Mr. F. H. Pybus, of Port Augusta. The drawing



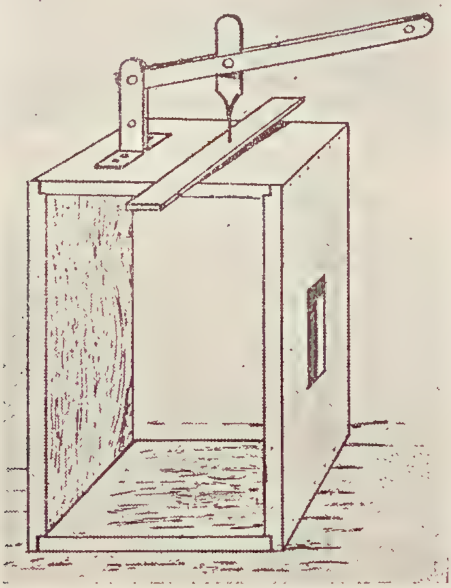
explains itself. The trap is very simply made by anyone who can use a soldering iron. Mr. Pybus fills the tin with kerosene, taking care that the string from the nail head is in the kerosene. He finds dead ticks occasionally in the traps, probably taken up by the fowls. The perches can be fixed to anything convenient, and so long as the receptacle is replenished with kerosene once a week no ticks can climb on to the perches. The trap can, of course, be made any size that is convenient.

The top figure shows the perch and tick-trap secured to two posts. The lower figure is a section through the perch, &c., showing details of construction.
—*South Australian Journal of Agriculture.*

HOW TO MAKE A FRAME PUNCH.

Mr. H. R. Stephens, Toowoomba, once more supplies illustrations and descriptions of the ingenious labour-saving appliances he invents or adapts. This time we have the frame punch shown in the diagram.

Mr. Stephens says: It is such an improvement on the usual bradawl and Archimedean drill that it pays for itself in a very short time.

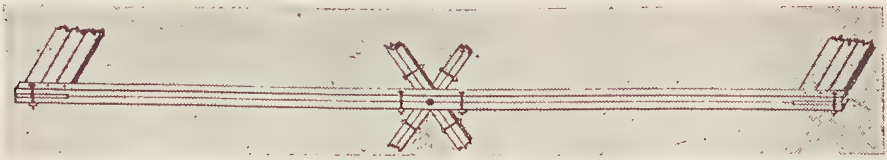


The material required is two pieces of 1 inch by $\frac{1}{4}$-inch iron for the lever, and about 18 inches long. One piece 6 inches by $1\frac{1}{4}$ inches by $\frac{1}{4}$-inch for bracket for fulcrum. An old flat saw-file, and 3 inches by 1 inch by $\frac{1}{4}$-inch bolts.

The tang of the file is drawn out so as to form a punch, and sharpened similar to a bradawl, and then softened for about $1\frac{1}{2}$ inches of the flat part, through which a $\frac{1}{4}$-inch hole is drilled to correspond with one made in the lever pieces, between which it is slipped and bolted loosely. The bracket is then attached, and for convenience screwed to the body of a beehive, which makes a handy bench to operate on.

THE JUMBO WINDMILL.

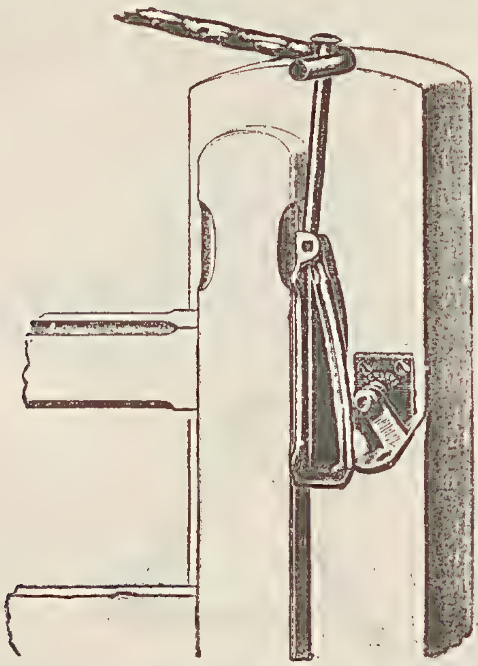
Mr. Stephens also sends a sketch and description of a home-made windmill, remarking that as, during the present unfavourable period of drought, appliances for raising water from below, in order to partly supply the lack of that from above, are receiving attention, he submits to public notice a Jumbo windmill which he and Mr. R. A. Stephens have recently fitted up over an 80-foot well, and which has been made out of bush timber, with the exception of the sail wheel, for which twelve pieces, 18 feet by 3 inches by $1\frac{1}{2}$ inches hardwood, were procured for the arms of the wheel, as it was considered better to have the wheel revolve as evenly as possible, although, doubtless, straight saplings would do fairly well. These twelve pieces, 3 inches by $1\frac{1}{2}$ inches, were paired together and bolted about 6 inches each side of the centre with $\frac{1}{2}$-inch bolts; at the centre itself a $1\frac{1}{2}$-inch auger hole was bored to fit the shaft, which is about 8 feet long, and with a crank having a throw of 5 inches, making a pump stroke of 10 inches. The casing of the mill was filled in with bark and any old boards that were about, which would keep the wind off the sails at the bottom. The six sails themselves have each an area of about 25 square feet, and as they were slipped in between the arms with a ½-inch bolt at the end board, and the others with a 3-inch nail through the arms and boards, they were very securely fixed. If, in a very exposed position, this mill should have a tendency to go too fast, Mr. Stephens suggests a door or slide in the casing in preference to any brake arrangement. These mills should be set so as to face the prevailing winds.



The method of making the arms for the wheel is to get (for up to a 20-foot wheel) pieces of 3 inches by 1½-inch hardwood, and bolt them together, the hole for the axle being bored slightly smaller than the axle, so as to cramp on it when the bolts are screwed up with pieces of batten to keep the arms equally divided.

A USEFUL GATE CATCH.

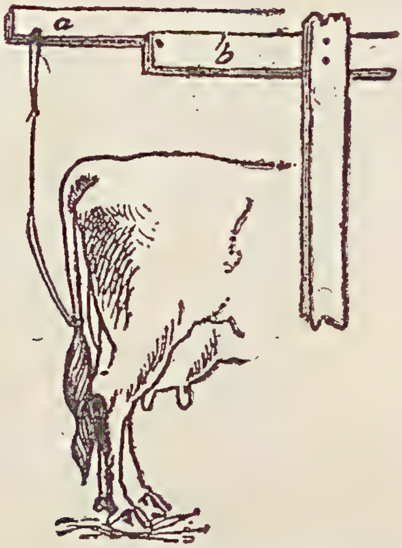
Hunting men know a little of the trouble experienced in opening gates, which somehow seem to be devised with the object of giving the maximum of trouble to the followers of the "sport of kings." One of the latest and most useful gate catches is called the "Eckby gate catch," which has been seen at shows. The accompanying illustration explains the action of this catch, which is perfectly automatic, and does not fail to receive the gate when it swings to the post. Having no springs, it is not likely to get out of order.



It is claimed that an animal cannot possibly open the gate secured thus, and, of course, the rider can open and close the gate without dismounting. Fixing is performed without much effort, no mortice-head requiring to be cut in the head of the gate, no sawing or cutting of the gatepost being required, and no blocks of wood necessary for nailing to the post. The invention, which has earned the approval of hunting men, is made by the Eckby Patent Gate Catch Company, 120 Edmund street, Birmingham.—*Farmer and Stockbreeder.*

A CLEAN TAIL.

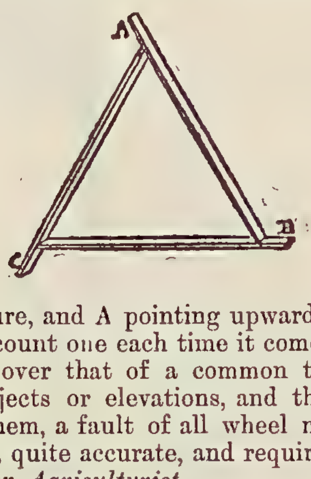
The simple device here illustrated can be used in nearly every cow stable to keep the tails clean and prevent the cows from switching during milking in fly time. A piece of heavy cord, with a loop in each end, is fastened above



the cow at *a*, and the other end slipped round her tail as shown. When she lies down this will keep her tail out of the gutter and filth. When about to milk, hang the cord over a beam or hook at *b*, which will pull the tail above harm's way.—*American Agriculturist.*

A DEVICE FOR MEASURING LAND.

Take three strips of batten 2 inches wide, ½-inch thick, and 6 feet long, and nail them together, as shown in the accompanying engraving. After fastening them together, saw off the ends so that the air-line distance from A to B, from B to C, and from C to A shall be exactly 5½ feet. A man can stand erect in using this, and roll it over at a walking gait, each revolution measuring 1 rod. In commencing, place B at the starting point, letting C be in the



direction you are to measure, and A pointing upwards. A coloured tag should mark A to remind you to count one each time it comes pointing upwards. The advantage of this shape over that of a common triangle is that it permits straddling over slight objects or elevations, and thus does not measure the circuitous distance over them, a fault of all wheel measures. This measure is very light, a rapid worker, quite accurate, and requires no stooping on the part of the operator.—*American Agriculturist.*

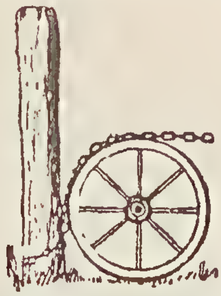
A STAKE PULLER.

The illustration shows a simple, effective, and very convenient implement for pulling up stakes when removing an old fence. A stout pry has two round iron arms attached by staples to its end, as shown. The iron has its ends

turned in and drawn to a point so that it can be driven into the stake, when the latter can be pulled up with ease. If the stake is large the arms can easily be sprung apart so that the points can be driven in on each side.—*Orange Judd Farmer.*

TO HAUL UP POSTS.

R. A., Moree, writes:—Some of your farmers' devices are not half bad. Here is one I use. It is not my idea. I saw it in an American paper some years ago, and it is all right. It is a plan of pulling up old posts. In this locality we get some kind of a wheel that has a broad tire, and by hitching a



log chain to the post next to the ground, and passing it up over the top of the wheel, a team hitched to the other end can soon lift a post out of the ground. Posts can be pulled faster by this method than any I have ever tried.—*Station and Farm.*

INFLAMMATION OF KIDNEYS IN HORSES.

Open the bowels by giving 1 pint or 2 pints of linseed oil two or three times, at intervals. Apply fresh sheepskin, skin side in, to loins. Give two scruples white hellebore twice daily, and abundance of linseed tea. If in much pain, add 1 oz. tincture of opium to the purgative.

REVISION OF LIST OF SOCIETIES.

During July the list of Agricultural and Horticultural Societies and Associations, as published in the *Journal*, will be revised. Secretaries of societies who have not as yet replied to the inquiries made by the Department of Agriculture by circular in December last are requested to do so before the 30th June instant.

THE LOGAN AND ALBERT AGRICULTURAL AND PASTORAL SOCIETY.

In consequence of the long-continued drought, the committee and members, at a special general meeting, held on the 11th instant, unanimously decided not to hold any show of this Society during the present year.

In answer to inquiries, which, by the way, should be addressed to the Secretary of the Society, we refer our correspondents to Rule VI. of the Society's Rules, which reads as follows:—

The annual subscription of members shall be one guinea; ladies, 10s. 6d.; payable before 30th June in each year, but, if unpaid on 31st December, names to be erased from roll.

Members have free admission to the grounds on all occasions on production of member's ticket, also free entries for the Society's prizes.

AGRICULTURAL CONFERENCE.

The next Agricultural Conference will be held at Toowoomba on the 9th (evening), 10th, 11th, and 12th June.

NATIONAL AGRICULTURAL AND INDUSTRIAL ASSOCIATION OF QUEENSLAND.

Entries for the Twenty-seventh Annual Exhibition of the Association will close on 15th July. Late entries will close on 19th July.

Answers to Correspondents.

LIME IN AGRICULTURE.

T.L., Shannon Vale, Mosman River—

Question 1.—Is lime of itself a manure?

Answer 1.—There are different opinions on this point. Some maintain that lime is a direct manure, but all evidence goes to show that lime is no substitute for manure; it is a mere addition or reinforcement which may occasionally be employed with advantage. The benefit derived from an application of lime is due more to its *chemical* and *physical* action on the soil than merely an increase of lime available as plant-food. It is not a direct manure, but it promotes a rapid decomposition of the organic matter in the soil, and causes its nitrogen to be converted into nitrates, and this is the form in which nitrogen is best assimilated by plants.

Question 2.—How should it be applied—slaked or unslaked?

Answer 2.—The favourite way of applying it is as quicklime, buried in shallow holes in the soil, or placed in little heaps on the surface, and covered with earth. The lime in either case soon slakes and falls to a fine powder, which is then spread on the land.

Question 3.—How much would you apply per acre to the following descriptions of soil:—Sandy soil, light loam, heavy loam, clay, and stiff clay?

Answer 3.—Poor sandy soils are unfit for liming, because the lime in such soils would render the little plant-food in them available, and would rapidly exhaust them. Still lime, if moderately applied, will make a sandy soil more tenacious. Quicklime should not be used on light loams. It is too exhaustive, and very little slow-acting carbonate of lime should be used on them. Lime will make a heavy loam more retentive. On such soils (loams) half-a-ton is a fair quantity for an acre of loamy soil possessing a moderate degree of fertility. For clay and heavy clay soils, lime should be applied every six or eight years in quantities not larger than 1 or 2 tons per acre. This is the most modern plan.

Question 4.—Should lime be ploughed in or applied on the surface?

Answer 4.—Lime should only be ploughed in on swampy land. On others, when spread on the surface, incorporate it with the soil by means of a harrow, and harrow the land a second time after a few days.

Question 5.—Is lime of the same benefit if applied to imperfectly drained land compared with drained land? Give your reason.

Answer 5.—On some undrained soils lime is excellent for correcting the acidity. It will destroy plants that grow in swampy land. It is one of the most powerful agents in causing inert substances (where, owing to defective drainage, organic matter does not readily decompose) to yield an abundant and available supply of plant-food. In this case the lime *may* be ploughed in. If left on the surface it absorbs carbonic acid from the atmosphere and becomes gradually converted into carbonate of lime or chalk. Doubtless the use of lime on land damaged by seepage would be beneficial.

TEXAS FEVER.

PERPLEXED.—

Question.—In your issue of April, in the very interesting article on the above subject from the *Florida Agriculturist*, there are many statements with which I think anyone with experience with this pest must concur. But there is one with which I must beg to differ. It asserts: "Carcasses are absolutely harmless so far as the power to perpetuate the disease is concerned. The virus is not carried to other cattle by means of carnivorous birds or animals. In order for the dead cattle to become a source of infection some of its blood would have to be carried by *biting insects* and inoculated into the skin of susceptible bovines."

But after reading the article one would naturally ask where the ticks disappear to when a beast dies—whether from redwater or otherwise. We know that there are many ticks that do not carry the poison. And is it not feasible that it is the progeny of these ticks that are on the cattle when they die that is the sole cause of the disease. And the difference between what is commonly called the *redwater tick* and the non-poisonous one is, the redwater tick is hatched and reared on a putrid carcass and the others are not.

One of the names given to this disease in the paper is town-cow disease—very suggestive of the tick being a scavenger.

My experience with ticks for about three years has pointed to the above conclusion; and by burning dead cattle I have been almost immune from fever. Horses by instinct always shun dead beasts; cattle are otherwise. Horses do not get the disease.

I trust you will consider the above worthy of looking into further.

Answer.—Experience has demonstrated most clearly that ticks carried by, and that have matured on, horses, sheep, and wild animals that are not susceptible to tick or Texas fever, do not produce the disease when their progeny become attached to cattle. Ticks are only pathogenic (disease-producing) when they develop on cattle suffering from or that have passed through tick fever, either naturally acquired or imparted by means of inoculation.

ARROWROOT FODDER—WEIGHTS OF SEEDS.

TRUE BLUE, Palmwoods—

Question 1.—What is the value of arrowroot stalks and leaves as food for cattle?

Answer 1.—No value whatever. Cattle, at a pinch, will eat the *Maranta Arundinacea*—West India arrowroot, but they will not touch the *Canna edulis*—Queensland arrowroot. Both are really valueless, consisting as they do of a certain amount of succulent matter with a great deal of fibre. The Queensland arrowroot plant secretes an acrid juice which a goat would reject in favour of a dish of coach varnish.

Question 2.—What is the duty on vegetable and flower seeds entering the Commonwealth?

Answer 2.—Both are free of duty.

Question 3.—What is the weight of a pint of good turnip seed?

Answer 3.—13 oz.

Question 4.—What is the weight of a quart of good dwarf bean seed?

Answer 4.—About 2 lb.

PREVENTION OF BLACKLEG.

D. T. Morgan, Rosedale—

Question.—Will you be good enough to give me a preventive for blackleg in cattle? Farmers in the old country used to bleed hand-fed calves before they were turned out to grass in spring time. Could you tell me what this was done for?

Answer.—Mr. P. R. Gordon, Chief Inspector of Stock, says:—Blackleg, or symptomatic anthrax, is such a malignant disease, and its course is so very acute, that treatment is generally out of the question. Immunity may be gained by *protective inoculation.* This method has been successfully practised for a number of years in more advanced countries of Europe and America. The vaccine may be obtained through Messrs. Zoellar and Co., Brisbane.

CORN FEVER.

Corn Dust, Crow's Nest.—

Question.—Can you suggest a remedy for what is commonly called "corn fever"? It affects different people in different ways, but mostly the head is affected with a dry burning heat, the skin feels dry, and it is a relief to get hot water and inhale the steam. Sometimes the bowels pinch and feel cramped, and there is an inclination to vomit. I have been told there is a remedy for the wheat dust when threshing, but do not know what it is.

Answer.—Corn fever is allied to hay fever. A good remedy is as follows:—Antipyrin in 5-grain doses every four hours. Spirit of camphor is a good remedy, so is tincture of belladonna. Carbolised smelling salts will probably give immediate relief.

DISEASE IN POULTRY.

Farmer, Wallumbilla.—

Question.—Would you be kind enough to give through your next most valuable *Journal* a cure for what I consider the blight among fowls. It mostly attacks young chickens. First there comes a white scum over the eyes and blinds them. Secondly, the throat is all ulcerated inside, and a nasty smell comes from it. I have tried sulphur, kerosene oil, castor oil, in fact everything I knew. If you would be kind enough to tell me what the disease is, and suggest a cure, I should feel very thankful, as I have lost a great number of chickens, also a few hens I am only a beginner in poultry farming and do not know much about the ailments of fowls.

Answer.—The birds in question are suffering from "diphtheric roup." Treatment:—Isolate in a house free from draught and give each from one-third to half a teaspoonful of Epsom salts; then get a bottle of the ordinary chlorate of potash and perchloride of iron mixture from the chemist, and, six hours after the salts, give one-quarter ordinary adult doses; feed on good soft food, unprepared, but mixed with hot water and a little brandy. Then get the following dressing:—Carbolic acid, 1 dr.; sulphurous acid, 3 dr.; tincture perchloride of iron, ½ oz.; glycerine, ½ oz.; with a camel hair brush touch all the parts which show sores morning and evening, taking care in anointing the throat not to choke the bird by a drop going the wrong way. This disease is highly contagious in the fowlhouse.

FARMERS' CANE.

ARTHUR BYFORD, Kolan River, Bundaberg—

Question 1.—If a farmer agreed to plant a patch of cane and keep it in good and clean state of cultivation, would it be necessary for him to keep it free from weeds, both between rows and stools?

Answer 1.—Yes; until the cane covers the ground and so retards the growth of weeds.

Question 2.—Would it be necessary to maintain a loose surface during the whole period of growth?

Answer 2.—No; because when the cane is well-grown by means of good cultivation and the maintenance of a loose surface during the early stages of growth, horses cannot be used between the rows. The dead trash also covers the ground and acts as a mulch, preventing the hardening or caking of the surface.

Question 3.—Would it be necessary that the cane be trashed?

Answer 3.—Cane is all the better for being trashed, because air and light can pass more freely through it and hasten the ripening. Still, many farmers do not consider the work necessary. Millowners pay slightly less for untrashed cane than for trashed. This does not apply to self-trashing varieties.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MAY. Top Prices.
Apples, eating, per case	8s.
Apples, cooking, per case	7s. 6d.
Pears, quarter-case	8s.
Pears, half-case	15s.
Oranges, per case	5s.
Seville Oranges, per case	4s.
Shaddocks, per case	3s. 6d.
Mandarins, Scarlet, per case	10s.
Mandarins, Emperor, per case	7s.
Mandarins, Thorny, per case	6s.
Lemons, Lisbon, per case	8s.
Lemons, rough, per case	2s. 6d.
Plums (late), quarter-case	4s.
Bananas, per dozen	$2\frac{1}{4}$d.
Bananas, per bunch	1s.
Pineapples, rough, per dozen	5s. 6d.
Pineapples, Queen, per dozen	6s. 6d.
Tomatoes, quarter-case	4s.

AVERAGE TOP PRICES FOR APRIL.

Article.		APRIL. Top Prices.
		£ s. d.
Bacon	lb.	0 0 8
Bran	ton	7 10 0
Butter, First	lb.	0 1 4⅛
Butter, Second	„	0 1 0½
Chaff, Mixed	ton	6 5 0
Chaff, Oaten	„	5 10 0
Chaff, Lucerne	„	9 10 0
Chaff, Wheaten	„	4 17 6
Cheese	lb.	0 0 8¾
Flour	ton	9 18 9
Hay, Oaten	„	5 15 0
Hay, Lucerne	„	7 12 6
Honey	lb.	0 0 2
Rice, Japan (Bond)	ton	15 0 0
Maize	bush.	0 5 0¾
Oats	„	0 3 3¾
Pollard	ton	8 5 0
Potatoes	„	6 10 0
Potatoes, Sweet	„	4 2 6
Pumpkins	„	5 12 6
Sugar, White	„	20 15 0
Sugar, Yellow	„	18 10 0
Sugar, Ration	„	15 0 0
Wheat	bush.	0 4 2½
Onions	cwt.	0 8 7½
Hams	lb.	0 0 11
Eggs	doz.	0 1 6½
Fowls	pair	0 3 3
Geese	„	0 4 11¼
Ducks, English	„	0 2 11¼
Ducks, Muscovy	„	0 3 6
Turkeys, Hens	„	0 6 4½
Turkeys, Gobblers	„	0 12 4½

ENOGGERA SALES.

Article.	APRIL. Top Prices.
	£ s. d.
Bullocks	9 9 3
Cows	6 15 7½
Wethers, Merino	0 15 1½
Ewes, Merino	0 10 9
Wethers, C.B.	0 14 7½
Ewes, C.B.	0 11 4½
Lambs	0 9 11¼
Baconers	2 10 8
Porkers	1 14 10½
Slips	0 15 7½

New Publications.

THE DAIRYMAN.

We have received the first number of a very neatly got up periodical entitled *The Dairyman.* It is published in Sydney and, as the editor says, is devoted to the dairying industry, dairy stock interests, and the trade. The publication is replete with useful and varied information in concise and readable form, and should be a valuable aid to dairy farmers. We take from it the following article on

EDUCATION IN DAIRYING.

A representative of one of Sydney's largest butter exporting firms, in the course of conversation, said that, while the prospects in connection with the butter industry are most encouraging, the absolute necessity for improvement in quality must be kept steadily in mind by producers. He says that the output of leading factories is probably better this season than ever it was previously, but it is unfortunately only too true that an immense quantity of inferior butter is made and exported to the home market, where, doubtless, its presence adversely affects the reputation of the Australian product. It is of the utmost importance to bring up the average standard of quality, and this can, he urges, best be done by educating the producers. And to be effective, the instruction must be brought to the farms, for the farmers have no time to leave home to seek it. While he thinks that the establishment of a dairy school or college may be desirable enough from some points of view, yet the influence of such an institution will be so limited, and so slow in its effects, that we cannot afford to wait until its value has been demonstrated. The great body of producers must be reached through the medium of itinerant instructors, who should be men competent to impart valuable information, and capable of gaining the confidence of those with whom they have to deal. Work that has already been done in this direction by some of the experts of the Department should, he urges, be followed up, and so systematised that every district in the State, where dairying is a staple industry, would be reached, and producers educated up to a knowledge of the principles which govern the production of high-class butter for oversea markets.

SEED CATALOGUES.

We have received from Mr. S. H. Eaves, Seedsman and Florist, Brisbane, "Sutton's Abridged List of Flower Seeds, Reading, England," and "Eaves' General Catalogue of Seeds, Plants, Bulbs, Shrubs, Trees, &c." The former is especially compiled to meet the requirements of amateurs and gardeners, and details varieties and prices of seed, &c. The latter offers the same advantages, with the addition of a calendar of operations for the year, with instructions to gardeners as to general garden work, useful tables, &c. These catalogues are profusely illustrated, and are issued free of cost. They should prove of great value to both professional and amateur gardeners.

Orchard Notes for June.

By ALBERT H. BENSON.

The marketing of citrus fruits is still one of the principal operations in many orchards throughout the State, and the remarks anent this matter that have appeared in these notes for the past two months should be borne in mind and acted upon, as, no matter what the quality of the fruit may be, it always sells best when well packed and attractively got up, as the better it looks the better it sells.

I cannot lay too great stress on the extreme importance of handling the fruit carefully and of sweating it prior to shipment. The common practice of pulling the fruit from the tree and packing and shipping it straight away is responsible for a very large proportion of the loss so commonly met with in marketing the fruit early in the season. The skin in the earlier stages of ripening is rigid and full of moisure, so that it is easily bruised, the cells of the skin being ruptured. Fungus growths of various kinds attack the injured skin, with the result that the fruit soon becomes completely rotten, and is covered with a mass of greenish or bluish mould. This loss can be reduced to a minimum by cutting the fruit instead of pulling it, and by handling it like eggs instead of like road metal. In addition to the ordinary loss on the fruit by bad handling a further loss takes place when it is found necessary to cyanide the fruit, as, for example, when it has to be shipped to the Southern States, as the gas at once finds out every bruise, case-mark, or injury to the skin, such as plugging—viz., pulling the stem out—and turns the same black, thereby greatly detracting from the value of the fruit.

In many parts of the State deciduous fruit trees should be pruned during the month, and I strongly advise fruit-growers to read my remarks on this subject which appeared in a previous issue of this *Journal*, as thorough pruning is seldom carried out, many trees being allowed to grow of their own sweet will without let or hindrance. This neglect to properly prune fruit trees is conducive to the rapid spread of many insect and fungus diseases, as when trees are allowed to grow into a dense bush it is impossible to keep them clean by means of any of the ordinary methods adopted for the eradication of disease, such as spraying, &c. ; and when they are allowed to straggle all over the place the straggling limbs are very apt to become more or less diseased.

Old neglected trees of good varieties, and of which the roots are still healthy, should be cut hard back, and all dead, broken, or badly diseased branches should be cut off and a new head be allowed to form ; but where such trees only produce inferior fruit that is of no commercial value, they should be either destroyed or, if wished, they may be grafted on next spring with good valuable varieties. Old neglected trees are the breeding-grounds of many diseases, and when they are of no value whatever they should be destroyed, as they are a menace and source of infection to the neighbourhood in which they are growing.

Do not be afraid to prune too heavily, as it is better to lose a crop and thereby get your tree or trees into a healthy state than to leave them in an unhealthy and unpruned condition and get a poor crop of inferior fruit. Prune hard, and gather up and burn all prunings ; do not let them lie about, but burn them up, as by doing so any diseases that may be on the wood that has been pruned off will be destroyed. Where trees are hard cut back and only the main limbs are left, it is advisable to follow up the same pruning with a dressing that will destroy all insects or fungus pests still remaining on the tree, and for this purpose the best remedy is to paint the stems and branches with the following mixture, prepared thus :—Boil 2 lb. of sulphur and 1 lb. of quicklime in 2 gallons of water for about one hour, then add fine clay to the mixture till it is as thick as paint, and apply with a brush. Fine flour can be used in the place of the clay if desired, and will render the mixture more lasting.

Where San José, Greedy Mussel, or Parlataria Scales are present, this method of treatment is the most efficacious, and is even better than spraying with the sulphur, lime, and salt wash mentioned in my pamphlet on spraying, This mixture is also of value for painting the stems and main branches of citrus-trees covered with mosses or lichens, or attacked by White, Red, Circular. Black Mussel, or other scale insects.

Where the ground is ready, plant deciduous trees this month ; do not plant too deep, and cut back hard at planting. Clean up the orchard thoroughly, and plough and leave the ground rough as soon as the trees are pruned and the prunings are burnt. Gather up and destroy all fly-infested fruit of all kinds, as the more thoroughly the fly is kept down during the winter on the coast, the fewer flies there will be to deal with in spring. Where not already done, see that pineapples are protected from frost, and keep the ground between the plants well worked in order to retain moisture, as the winter months are usually dry and the plants are liable to injury through drought. The same remarks apply to bananas, and the unripe bunches of fruit should be protected from slight frosts or cold spells by any suitable available material.

Farm and Garden Notes for July.

This is a very good month for sowing lucerne, as the weeds will have quite slacked off, and there is little danger of the young lucerne plants being choked. Select the richest and deepest soil for this crop. A calcareous loam is the best. Reduce the soil to a good tilth, and if a few nice showers come on during the month, granting that the seed is good, there will no fear of failure. Oats, barley, and vetches may be sown.

Get the land ready for potatoes, maize, sugar-cane, tobacco, field carrots, mangel-wurzel, Swedes. Unless in very early, sheltered situations, potatoes and maize should not be planted until next month. There is too much likelihood of frosts occurring in July.

Rice may be planted in the far North. The harvesting of the coffee crop should be well advanced. Take up yams and gather tobacco as it ripens.

Kitchen Garden.—Make successive sowings of carrot, parsnip, broad beans, lettuce and other salads, peas, turnips, beet, leeks. Plant asparagus and rhubarb, cabbage, and cauliflower. If you have already a good show of peas, stake up the plants, and nip off the tops of broad beans. In warm localities melons, marrows, cucumbers, and squashes may be planted towards the end of the month, but do not sow French beans, dwarf, or scarlet runners, in cold, exposed situations. The drying westerly winds will necessitate the soil being kept in fine tilth to prevent the moisture from evaporating. If the soil is allowed to cake and harden, nothing but disappointment can be expected. If you have the means of irrigating the vegetable garden, do so thoroughly; a mere surface wetting is worse than useless, the ground requires to be thoroughly soaked. Any land now vacant should be ploughed or dug up and left in the rough. Harrowing and pulverising the newly turned up soil too long before it is required only encourages the growth of weeds, and also deprives the soil to a great extent of the sweetening influences of the sun and air.

Flower Garden.—Winter work ought to be well advanced by this time. Fill out all blanks in the flower beds, and where the plants are over-crowded, thin out. The roses, which should all have been pruned, will now require looking after. Wherever a shoot is inclined to grow inwards, rub it off, or if a fine young shoot is beginning to grow ahead, cut off the branch which it is replacing. This may be done with most plants. Turf and top-dress the lawns. Overhaul the fern house, top-dress here also with a mixture of sandy loam and leaf-mould. Sow zinnias, amaranthus, balsam, dianthus, chrysanthemum tricolor, marigolds, cosmos, cornflowers, coxcombs, phloxes, sweet peas, lupins, &c. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c.; plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Take up any dahlia bulbs left in the ground, and store them away in some warm, moist place, where they will start gently and be ready for planting out a month or two later.