VOL. II. MAY, 1891. PART 5.

AGRICULTURAL GAZETTE OF NEW SOUTH WALES.

SYDNEY: GEORGE STEPHEN CHAPMAN, ACTING GOVERNMENT PRINTER.
[1s. for a Single Number, or 10s. per Annum.]

11b 83—91

THE

AGRICULTURAL GAZETTE

OF

NEW SOUTH WALES,

ISSUED BY DIRECTION OF

THE HON. SYDNEY SMITH, M.P.,
SECRETARY FOR MINES AND AGRICULTURE.

H. C. L. ANDERSON, DIRECTOR.

VOL. II. PART 5.

MAY, 1891.

By Authority:
SYDNEY: GEORGE STEPHEN CHAPMAN, ACTING GOVERNMENT PRINTER.
1891.
[1s. for a Single Number, or 10s. per Annum.
11*b* 83—91 (*a*)

CONTENTS.

Planting a Vineyard.

By J. A. DESPEISSIS, M.R.A.C.

In forming a vineyard, it should always be borne in mind that the work is being done for a long succession of years, and that its future success depends very much on the way it has first been planted. No return may be expected for the heavy outlay it involves for the first four seasons, although it is safe to expect that in subsequent seasons, and for a great many years after, the vine-grower will be recouped handsomely for the money, thought, and care spent in first establishing it.

In the matter of vine-growing, especially, it is more profitable never to do things by halves, and each vine-grower should be well impressed with the fact that a 20-acres vineyard, well planted and carefully tended, will produce a crop nearly as heavy as a 40 or 50 acres of slovenly cultivated vines, just stuck in a crude, unhealthy soil, badly drained, aërated, and stirred. The vines, moreover, will be more luxuriant, longer-lived, the crop more healthy and more abundant, while the produce will be more easy to handle, infinitely superior in quality, and at the same time the toil, risks, and anxiety to the grower, will be considerably lessened.

In a country like Australia, where vine-growing has not yet attained great importance as one of the leading national industries which can be predicted for it, many embarrassing questions present themselves to intending vine-growers, to a great many of whom the cultivation of the vine and, still more, the art of wine making, is quite a novel experience. It may be said that a considerable amount of judgment has to be exercised by them in the successful pursuit of an industry to which they have not been brought up, but up to which they are getting gradually educated.

Another class of vine-growers, and yet not always the most successful, are those who, coming from countries where vine-growing has been for centuries the leading industry, think at first that the colonial methods are radically wrong, and substitute, for a time at least, under circumstances very dissimilar, some of the time-honoured practices they have been familiar with from their childhood. Soon, however, they gain local experience, and as they modify their views the better they thrive.

Differences of climate and of soil, it is well known, dictate the choice of different varieties of grapes, and, also, the distance apart they should be planted, the height of the stock above the ground, and the method of pruning. There are certain principles, however, that in vine-growing hold good under all climes, and which may only be modified to suit circumstances.

Choice of Soil.

The vine is one of the hardiest of cultivated plants, although the quality of its produce is influenced to a very great extent by local conditions. It grows in almost all kinds of soil. A typical and congenial soil, however, for

vines, is a porous, easily working loam, deep in preference, with a healthy subsoil, naturally well drained, to which both air and warmth can penetrate from the outside, and which at the same time is sufficiently retentive of moisture to freshen the roots of the plant and permit it to resist the most severe drought.

The object the vine-grower intends to pursue should to a great degree influence his selection of soil for planting his vineyard.

For "table grapes" it may be stated that the richer the soil the finer will the grapes be, and the more handsome the well nourished bunches, with well set and nicely swollen berries.

The choicer "wines," on the other hand, are produced in soils of a poorer description, and especially on light sandy loams. In the case of wine it often happens that quantity is adverse to quality, and on very rich alluvial flats, for instance, the must contains sometimes an excess of albuminous matter, which affects the keeping quality of the wines, while the bouquet is lessened, and a peculiar earthy flavour, disagreeable to the palate and the nose, is distinctly perceptible.

A very sandy soil gives generally a dry thin wine, and if the season be moist the colour may be poor. The wines, however, produced on these soils are generally straight to the taste—that is to say, can be blended with most other wines, in order to dilute them, without changing their respective characters.

A heavy clay soil, on the other hand, produces a full-bodied wine, heavy, rich in extract, and in some cases may impart to it a peculiar taste known as an "earthy taste."

Between these two characters of soils, there are other intermediate ones that partake more or less of the character of the one or the other, according to the respective proportion of their sandy or their clayey constituents.

On limestone formations, the wine will be delicate to the taste, with a fine brilliant colour and a pleasant flavour.

Volcanic soils will produce vigorous dry wines.

Besides the geological character of the land, the natural flora which cover it give some indication as to its suitableness for wine-growing. In this country, generally, wherever the native forest Apple tree, the *Casuarina* (she-oak), the white Cedar, and the yellow and white Box grow, the land may be almost certain to be eminently adapted for the growth of the vine.

In selecting a site, it is always advisable, in Australia, to have it as well sheltered as possible from the drying westerly winds or the scorching setting sun.

An easterly aspect is generally the best, as the vines then get the full benefit of the rising sun. In the zone, which extends along the coast, a north-easterly aspect is always the best, as great damage is often caused in vineyards by the wet southerly squalls, and a great quantity of grapes burst and rot on the bunches. Even the north-easters are very troublesome near the coast, and whenever it is possible the vineyard should be planted in an amphitheatre, or on the slope of hills formed in a circus, and thus affording shelter from all quarters.

It is a fact worthy of notice that it is extremely difficult, in this Colony, to get the wine grapes to ripen evenly and thoroughly within a distance of 10 to 15 miles from the coast, while, other things being equal, the fungoid pests are always more troublesome in the damp coastal atmosphere than a few miles further inland.

A slope always assists drainage, but more especially in the drier districts of this Colony a vineyard always looks more luxuriant, and gives a better

yield on the flats and on slightly undulating country, the reason being, that during the long droughts and excessive heat which sometimes prevail, the slopes often get too dry, and the vine suffers considerably. During the heavy downpours of rain, too, that come down occasionally, tons and tons of soil are sometimes washed down the steep slopes, leaving the land denuded and deeply cut by the rush of water down the incline.

In the cooler climates, such as France, the slopes are generally planted in vines, in order to utilise the full amount of sunshine and warmth; but in this country of light and heat, shelter from the wind is of far greater importance, and should mostly be studied in establishing a vineyard.

Preparing the Soil.

The site of the vineyard having been selected, it remains to clear it if it has not yet been put under cultivation, and to prepare the soil for the plough. The grubbing is often done by contract, and the roots should be run to a depth of 18 to 20 inches, no holes to be filled in until inspected and authority given to proceed with the work. Autumn is the best time for ploughing, when the rain has softened the earth. Hand trenching is always a very costly operation, and except when the patch to be planted is very small, can better be dispensed with. The vine, however, like all other fruit trees that occupy the ground for a number of years, does best in a thoroughly stirred soil. The character of the soil, regulates to a great extent the depth of that ploughing—a moderate depth is sufficient in rich loose loams, while, conversely, in poorer soils or in heavy clays the plough should be run deeper.

It is reckoned that 1 inch of rainfall, covering 1 acre of ground, is equal to 100 tons of water per acre; similarly, taking the density of the soil as 2, as compared with water, we get for every inch we stir the soil deeper, 200 tons of soil per acre, which, by being broken up, are more easily penetrated by the rootlets of the plants in search of food. The soil at the same time, is more thoroughly acted upon by air, warmth, and water, and reduced by their combined agencies during the process of weathering, being thus rendered more healthy, more mellow, and quicker as a feeding ground for the plant. A deeper subsoiling has, besides, the advantage, which should not be overlooked especially in a hot and dry climate, of promoting the growth of the roots at some distance from the surface, and thus lessening the effects of drought.

In first ploughing or subsoiling in heavy and retentive soil, the furrows should always be in the direction of the fall of water, otherwise, it will lodge in the subsoiler's tracks, and damage the vines greatly in wet seasons.

Although the heavy soils are those most benefited by thorough tillage, it is generally advisable, and experience has demonstrated that even in the loose and shifting sands, a deep stirring is always accompanied by a corresponding vigour and increase of yield in the case of the vine.

In most cases, surface ploughing and deep subsoiling should be recommended in preference to trenching proper. There are some special cases, however, when deep trenching previous to the establishment of a vineyard is beneficial; as, for instance, when a loose surface sand overlays a more compact subsoil, which is susceptible of improvement by being exposed to the disintegrating action of air, sun, and rain. In that case, a deep furrow is turned by means of a strong trenching plough, or two ploughs are made to run one after the other, each turning a furrow about 8 to 9 inches deep. In other cases, however, the surface soil is much better than the subsoil, which is little susceptible of improvement by the process of weathering.

The most economical and the best plan of ploughing this class of land, is to turn with an ordinary plough worked by three or four powerful horses, a furrow 6 to 8 inches deep, and follow up with a strong plough with the mould-board detached, or a subsoiler plough with a team of four to six horses.

In first breaking up the land, bullocks are sometimes preferable to horses, as they give a more steady and better equalised pull in overcoming the considerable resistance offered by the meshwork of roots that exist in virgin soil.

A team of eight to ten bullocks, according to the character of the soil, for the first ploughing, and another one of ten to fourteen for the subsoiling, will do the work comfortably without too much strain on the animals.

In some instances, deep subsoiling or trenching may be unnecessary, or not to be recommended, such as, when the surface soil consists of a very thin layer overlying a substratum of loose and broken stones. In that case, the naturally brashy character of the subsoil, by permitting the roots to penetrate it, renders deep tillage either unnecessary, or even unadvisable.

Under cooler climates, when the soil does not receive much warmth from the sun, and this case does not concern the Australian vinegrower, it is desirable to stir the soil as little as possible, and moreover, to plant thickly, so as to dwarf the vine, and favour the growth of superficial roots, which will benefit by the full amount of heat from the sun's rays, while the grapes will be richer in glucose, and the wine of a better quality. In Champagne and Burgundy, for instance, the soil is only ploughed about 10 inches on an average, as against 18 to 24 inches in the South of France and in Algeria.

In Australia, a thorough stirring of the soil to the depth 16 to 18 inches, according to localities and to soils, would certainly be not excessive, and would soon repay its cost over and over again, by the surplus crops which may be expected.

The best time for ploughing is the autumn. After ploughing a thorough harrowing should be given, and as much couch and noxious weeds as possible removed and burnt.

The land is left in this rough condition all through the winter, and is again ploughed crosswise—not subsoiled—in the spring, and prepared for planting by means of more harrowings and rolling if necessary.

Should the ploughing be delayed till the spring, a quantity of bad seeds will be brought to the surface which will germinate and soon overrun the field; while, on the other hand, if the soil be ploughed in the autumn, the seeds which germinate in the early spring are killed by the second ploughing, harrowing, &c., which precede the planting, and besides, the land will have been thoroughly sweetened by the action of rain and air during the winter months, and the cuttings will strike better.

Laying out the ground.

With a view of facilitating the ploughing, scarifying, harrowing, picking, and other mechanical tillage operations, a vineyard should always be planted according to a symmetrical plan. Laying out the ground is therefore the next thing to attend to. Before this is done it must be decided—

1. What disposition to give to the vines, and whether it is proposed to plant them in squares, in quincunx, or in lines.
2. What distance is to be left between the vines.

In this climate, where the sum of the sun's heat is always sufficient for the complete ripening of the grapes, the question of orientation is not so

important as under colder climates, and the direction to be given to the lines will be to a greater extent influenced by the shape of the field, the intensity of the westerly winds if in the interior, or the sea breezes if in the coastal region. In places, also, where hail-storms sometimes occur and follow certain winds which generally come from the same quarter, the edge of the lines should be pointed towards the direction the wind blows, and never the flank, if it can be avoided.

The laying out the lines along the longer axis of the field rather than in the direction of its shorter axis also saves a considerable amount of time and exertion on the teams which have less turning to do.

If the vineyard is to be laid on a slope with a very marked incline, the lines and the ploughings should follow the contour of the slope and be laid perpendicularly to its fall, so as to prevent in some measure the soil being washed down the incline during heavy downpours of rain.

Whatever disposition is given to the vineyard, the land should be exclusively planted in vines, and no other crop put in.

Planting in lines, when the distance in the lines from vine to vine is much less than the distance between the rows, is not the most favourable one to allow the full development of the plants, as it has been observed that whenever the roots of vines meet in the soil their vegetation receives a check. There may be as many grapes formed, but they are not so large.

In fact, for a given number of vines planted in a given area of ground, the average yield of the vineyard planted in lines has been found to be in some cases as much as one-sixth less than the average yield of vines planted at equal distances from each other.

In hot and dry districts where a thick growth of leaves would tend to cause the evaporation from the ground of a considerable amount of what moisture it contains, wide planting is generally resorted to, while in the cooler and moister districts, where the object is to promote the evaporation from the ground of as much moisture as possible, and besides encourage the growth of the roots nearer to the surface, close planting is the most profitable.

If we take France as an example, we notice a striking difference between the Champagne district, for instance, where there are as many as 16,000 to 20,000 vines to the acre, while the number decreases the further south we go, being 10,000 to 12,000 in Burgundy, 4,000 to 5,000 in the Hermitage, 2,000 in the Herault, and 1,000 in Algeria.

In Australia we find a considerable falling off in the number of vines per acre, viz.:

ft.		ft.			
6	x	6	or allowing space for roads,	1,000	vines per acre.
7	x	7	do	800	do
8	x	8	do	650	do
9	x	9	do	525	do
10	x	10	do	425	do

The distance 10ft x 10ft and 9ft x 9ft are certainly excessive and an unwarrantable waste of space, while the cost of periodical ploughings and scarifyings, expenditure of money on land, putting up trellises, fencing, and in some cases rabbit-proof wire netting, are proportionately increased.

In the drier districts the distance 8ft. x 8ft. is a favourite distance, and it allows drays to enter the vineyard and carry away the grapes and the cut canes after the pruning.

Should the vines be trellised I should, however, prefer 8 ft. between the rows and 6 ft. in the rows.

In many cases, and the distance which in my mind suits best, the widest vine-growing area of this Colony is 7 ft. by 7 ft. if trained on stakes, and 7 ft. x 6 ft. if trained on trellises.

For the moister districts 6 ft. x 6 ft. is quite sufficient and answers very well, while in some exceptional cases, such as in moist and cool districts, where the vines do not grow very rank and all the tillage operations are done by hand labour, 5ft. x 6ft. and 5ft. x 5ft. are often advantageous.

The idea of planting wide apart is also to dispense with manures, and allow the roots a larger range to feed upon. It may be asserted, however, that in the great majority of cases, by judicious manuring and by the timely application of some 30s. to 40s. worth of suitable fertilisers per acre, an increase of threefold the money expended would be almost a certainty, while the yield would be more regular, the number of vines per acre might be increased, and the cost of tillage operations correspondingly reduced.

The explanation of the diminution of plants per acre, as shown above, as we proceed from the cooler districts towards the hotter or drier ones, is that it has been noticed that the development of the roots in depth corresponds with their development in surface. In the south of France, for instance, and in Algeria, where the object is to promote a luxuriant growth and an abundant yield, they must encourage by every means the growth of the deeper roots, which makes the plant independent of droughts, and get for it nourishment proportionate to its yield. It is also evident that in dry soils, where the mineral food required by the plant is not moistened and in a state fit for assimilation, the plant requires a greater cubic space of ground than in moister and richer soil.

Besides planting in lines, the vines are very often, and in this country very generally, planted in squares and quincunx.

The planting in squares is the simplest and, considering it all round, the one to be generally recommended, as the field implements can be run from one end of the vineyard to the other without turning, and the working is thereby greatly facilitated.

Planting in quincunx, or in diamond shape, with a vine at each corner of an equilateral triangle, is theoretically the best for putting in a given area the greatest number of vines, and it also allows the teams and implements to travel in three directions ; but it is questionable whether working the teams only in two directions, as in the case of vines planted in squares, is not amply sufficient, and, if the vines are trained on trellises, the tillage operations need of necessity be made in a straight line only, and in that case the advantage of having the plants disposed in quincunx almost disappears. With the quincunx disposition a very considerable amount of time and labour is wasted in having to turn every few vines as the implement which works the vineyard diagonally gets nearer and nearer to the corner of the field.

Whichever disposition it has been decided to give to the vines, it is important that the operations of pegging out should be carried on with great care, as even a slight variation to the right or to the left of the rows would destroy the symmetry of the vineyard as long as it remains, and would besides make the working of it far more difficult, and expose the trees to considerable damage by the implements and animals in cultivating the land. Besides, the labour is the same, whether carried out in a slovenly manner or according to a methodical plan, while, in the latter case, the value of the vineyard, all things being equal, is considerably enhanced.

Provision should be made for a commodious headland all round the vineyard of about 18 feet to allow the turning of the teams and the free circulation of trucks and drays employed in removing the crop and the cut canes after pruning, and in carting stakes or manure on to the land.

Should the interval between the rows be rather narrow, ample road accommodation should be provided. For this purpose the vineyard may be divided into blocks of about equal size by roads 16 feet wide, running at distances of (say) 2 chains, with gangways cutting the trellises at right angle every chain should this mode of training be adopted. Ditches for carrying away the running surface water should follow the depressions of the field.

It is preferable not to have a quick hedge growing around a vineyard, for in that case the first row or two of vines close by always suffer to a certain extent from the proximity of the roots from the hedge. A quick hedge is, however, sometimes necessary for the protection of vineyards, situated near a town or village, or along a public road. It is better, however, to dispense with them whenever possible, for although they protect the grapes to a certain extent against pilferers, they harbour a host of troublesome birds that do a vast deal of damage in the vineyard about the time the grapes ripen. Should a hedge or some trees exist already, and be found useful, a deep trench at least 2 feet deep should be run along it so as to cut off the growth of the roots toward the direction of the vines.

For pegging out the ground, one of the easiest ways to set to work is to take a wire-line about a chain in length, along which the proper distances have been previously marked out with a piece of solder, or simply by twisting the wire (if a single wire) at the exact distance apart the vines are intended to be put.

In measuring the ground, small stakes about 18 inches long and 1 inch square, with pointed end, are set for each mark along the line to indicate the place each vine is to occupy, the line having been previously set parallel with the headland. To measure the other side of the field, the wire is moved and set at right angle to its first direction and stake set as before. Then proceed to the opposite side parallel with the first one and do exactly the same. These two rows of pegs will mark the spaces between the lines, then if the line is turned at right angles to them the point of intersection will mark the places at which the vines will stand.

Should the vines be planted in a parallelogram shape instead of square, two wires will be required, with the distances between the rows marked off on one of them, and the distance in the lines on the other.

If the field is uneven, the lines may be slightly crooked; but when the laying off is finished it is easy to ascertain whether it has been done with care, for the stakes will be perfectly straight, and in line from any direction.

A rope with knots on it is sometimes used, but with no good results, the lines being often more or less crooked, as the rope contracts when moistened by the dew or rain, and stretches when it dries in the sun.

It is, whenever possible, advisable to lay the rows in a perfectly straight and continuous line, in the direction of the length of the field, as this plan considerably lessens the working of field implements, which, during the operations of ploughing and scarifying may be started at one extremity of the field and pulled up at the other end, crossing over the road without having to turn every few yards.

I would strongly advise scarifying the roads as well as the space between the vines, and keeping them clean and bare of weeds, as the roads on which grasses are allowed to grow prove a never ending source of trouble and

infection to the vineyard, the implements in turning carrying along with them fragments of these grasses that soon spread about and necessitate almost continuous scarifyings.

Planting.

Before planting a vineyard, it should be decided what class of wine it is intended to produce, or whether it is thought more profitable to dispose of the crops under some other form, such as selling as table grapes or dried and turned into raisins.

The natural circumstances of soil, climate, and orientation, should also influence the selections of the varieties it is intended to grow.

If it is intended to hasten the ripening of some late varieties of wine-grapes, the slope that receives the greatest sum of degrees of heat might be set apart for them. Again, some vines, such as the Malbeck for instance, are much liable to the accident of *coulure* or of imperfect setting of the flowers, when grown on low ground with bad drainage, and do far better on undulating ground. Table grapes should be planted in the richest soil on the vineyard, more especially if they can receive a few extra waterings from the time of flowering till the moment the berries change colour.

Whatever kinds of grapes are planted, let each variety stand separately. I have seen, on some of the most famous and ancient vineyards in the Medoc near Bordeaux, the Cabernets, the Malbeck, the Merlot, and the Verdot planted indiscriminately in the same field, but that practice has gone out of favour now; and although it is advisable to blend the grapes in the fermenting vats together, so as to insure their several constituents to get incorporated thoroughly with each other during the process of fermentation, this blending can be just as easily made in the suitable proportions without the different varieties of vines being grown indiscriminately together.

The advantages of keeping the varieties separate may thus be summed up:—

1. The vines look more uniform in the field, their habits of growth being similar, and a more delicate and perhaps superior variety of vine is not thus exposed to be dwarfed and choked in its growth by a stronger and more common sturdy vine.
2. Should a particular variety show a greater liability to be attacked by fungoid and other pests, it may receive extra attention, with a view of preventing the occurrence, or even curing the disease.
3. The pruning according to the habits of growth of different varieties, the summer topping, peculiar mode of training, manuring, and getting cuttings true of their kind, for future planting, are made far easier.
4. The ripening of various grapes coming at the same time in the same district, under similar circumstances of treatment, the operation of vintaging can be carried on in a more systematic manner, the earlier varieties being picked prior to the later ones.

More especially in the case of a vineyard planted for wine-making, great thought and consideration should be given to the proper selection of a few of the choicest varieties which have proved best suited for the climate and soil, and on no account should the vinegrower have such a miscellaneous assortment of all kinds and descriptions of vines as are seen at some of the vineyards in these Colonies.

The most economical, and the quickest way of stocking a vineyard is by using *cuttings*, as *seedlings* do not bear a crop until the sixth year at least,

and besides, like most of our intensely cultivated economical plants, they are altogether unreliable as regards what their fruit will be like, and they also show a great tendency for sporting and developing endless varieties of grapes.

The best cuttings are obtained from the middle portion of the bearing canes of the previous season, the wood being well summered, keeping for a long time, and striking root and budding readily.

The very tender cuttings are those that grow quickest; but they are also very apt to soon get dry, on account of the pithy condition of the wood, and are not to be relied on in average seasons and open-air cultivation on a large scale. It often happens that the plants they grow are, besides, of a weak constitution. On the other hand, hard and tough wood do not strike root so easily, and show a tendency to grow more wood than fruit. Whenever, therefore, it is possible to do it, the middle part of a cane, made of well summered wood, should be chosen, and the intelligent and industrious vinegrower only raises from canes which come from prolific stocks, and have themselves carried a heavy crop of fruit.

The joints should be short and numerous, and no cutting should be taken from a vine attacked by any fungoid pest, such as *anthracnose* or *oïdium*, &c., as they are as a rule less vigorous, and there is always the risk of propagating the disease and infecting the young vineyard with the disease.

These details having been attended to, cuttings will be obtained that will strike more readily and produce stocks that will soon bear a heavy crop of fruits.

The cuttings that strike best are those that have been freshly cut from the vine tree, and planted soon after.

This, however, is not always practicable, as late pruning delays the bursting of the buds in the spring, and causes the vine to weep, thus weakening it, whilst, in some cases, cuttings may have to be obtained from great distances.

A good packing for vine cuttings, when sending them a long distance, is to tie them into bundles of 50 each, and put around them some straw very slightly moistened with water, and wrapped in more dry straw and then put them in cases, which on arrival should be opened, the bundles taken out and placed in an open furrow in some place of the vineyard not liable to be flooded, and where the soil is loose and in a healthy condition.

The best time for planting is about the middle of the spring, in pretty moist districts, as at that time the surface soil has been sufficiently penetrated by the warmth of the atmosphere to favour the growth of the tender rootlets. In drier places, where the hot weather comes early, and the rainfall gets scarce as the spring draws on, the planting should be done at the beginning of the spring.

It is of great importance to only plant such cuttings as are likely to strike, as if many blanks have to be filled in the season after, it is always at greater expense, whilst the vineyard does not attain to its full bearing capacity until perhaps the fifth or sixth year. For this purpose, should the vine-grower entertain any doubt as to the striking capabilities of his cuttings—and some varieties, such as the Brown Muscat, for instance, are very hard to strike—the bundles are often taken from the trench where they have been lying, and placed a few inches deep into water. After three or four days, the bark gets spongy, and small wart like swellings, covered with a little gelatinous substance begins to show at the base. The cuttings should then be planted without delay, as the rootlets of the plant, looking like delicate white little threads, soon break out and might be damaged during the operations of planting.

A sufficient number of cuttings only should be taken out for the day's planting, and holes should have been dug wherever a small stake has been set to mark the place where a vine will stand.

In soils of average, fair, and fine quality, freshly broken up, as is the case generally in Australia, no application of manure is necessary until the vineyard has been yielding its annual crop of grapes for a number of years.

The cuttings should be slightly bent in planting and placed a little slanting, especially in a soil dry and hot at the surface, as is generally the case in this country, and not horizontally, and only 5 or 6 inches below the surface of the ground, as is sometimes practiced in moist and cool climates, where the object is to place the cuttings as much as possible in the warmer layer of the soil.

Sandy loams do not show a tendency to crack in dry and hot weather; but in heavy soils, the ground, by contracting in dry weather, very often leaves an open space round the cutting, especially if it has been put in vertically, and without having been slightly bent. In that case, if some sand can conveniently be put round the cutting, well and good; if not, the hole should be well trampled down, up to about two-thirds of the length of the cutting, and the remaining third banked up with the gritty and well-pulverised soil, which should not be trampled down.

Short cuttings, with only one joint and two buds, will produce very vigorous roots, which will strike down deep into the ground, but they are also more apt to be affected by droughts, and are more suitable for stocking a nursery, where a convenient state of moisture can be maintained. A long cutting, on the other hand, by being deeply set in the ground, will be more independent of rain, but the roots which will come from each joint will be proportionately smaller.

Cuttings, 15 inches to 18 inches long, are about the best for planting in this country, and only one of the buds should show above ground and not two or three as I have seen it practiced sometimes. The complete covering of the cutting and of the terminal bud under some sand or loose soil, delays the growth of the leaves, which are the essential organs of evaporation of the plant, whilst the young roots gradually take hold of the ground and supply food for the requirements of the young plant. If more than one bud be too much exposed to the air and light, the leaves may grow too fast, and as the evaporation through these organs is excessive, compared with the amount of moisture the tender rootlets can absorb, the young plant, after having shown a fictitious growth for a while, soon withers and gradually dies away.

A percentage of misses, variable with the season, the nature and state of the cuttings, the variety of vine (Muscat strikes with great difficulty) is to be expected, and, for filling up these blanks, which may amount to 60 per cent. or more in some cases, it is always advisable to keep a small nursery, from which rooted plants may be obtained.

Planting with *rooted plants* is almost a certainty, and these may be put in the ground during the winter, or, better still, in the autumn, unless the soil be too wet. They then make a start early in the spring. It is a common belief that plants are quite inactive during the winter; but this is not the case, and their roots carry on more or less actively their functions during that period, and grow a number of rootlets. Early planting, therefore, enables the plant to take hold of the ground, and make a vigorous growth when the spring comes round.

In rooting up from the nursery, care should be taken to injure the roots as little as possible.

The operations which follow the planting of a vineyard may be summed up as :—

Keeping the ground scrupulously clean and free from weeds, which would, by coming into competition with the young roots of the vines, chiefly spread near the surface, rob them of part of the assimilable plant-food contained in the soil.

Running a light scarifier, as often as occasion requires, to keep the surface loose and promote absorption of moisture, while counteracting the excessive evaporation rendered more sensible by the capillarity of a hardened crust on the surface of the soil.

Pruning low the first winter, and rather late in the season than otherwise, as young vines have a tendency to push the growth of the leaves too early in the spring.

Tying up the young shoots against a stick to prevent their being severed from the stock by high winds.

Giving to the stocks the required height at the second or third pruning.

Filling up with rooted plants of one or two years' growth, as the case may be, any blank in the field.

Rubbing off tender branches of grapes, should any appear too early, in order not to tax the energy of the young plants.

The fourth year the young vineyard may be expected to bear a fair crop of grapes, which goes on increasing for two or three years, the yield being pretty well the same after that for a great number of years.

In some future number of the *Agricultural Gazette* I purpose giving some advice as to the varieties of grapes most suitable for different parts of the Colony, and also intend to deal in more detail as regards the management of a vineyard, from the time of planting until the time the vines may be expected to yield their full yearly crops of grapes.

The Grasses of New South Wales.

(*Continued from Vol.* II, *page* 120.)

By F. TURNER, F.R.H.S.,
Botanist to the Department of Agriculture, New South Wales.

CYNODON DACTYLON, *Pers.* ("Couch Grass," "Doub Grass," "Bermuda Grass.")

Flora. Austr., Vol. VII, p. 609.

STEMS prostrate, often creeping and rooting to a great extent, the flowering branches shortly ascending. Leaves short, of a glaucous green; spikes two to five, often purplish, 1 to 2 inches long; spikelets sessile, outer glumes narrow, acute, persistent, keeled, under 1 line long. Flowering glume rather above 1 line long, broadly boat-shaped, the keel usually minutely ciliate; palea narrow. Rhachis of the spikelet produced into a point or bristle shorter than the glume, and often very minute.

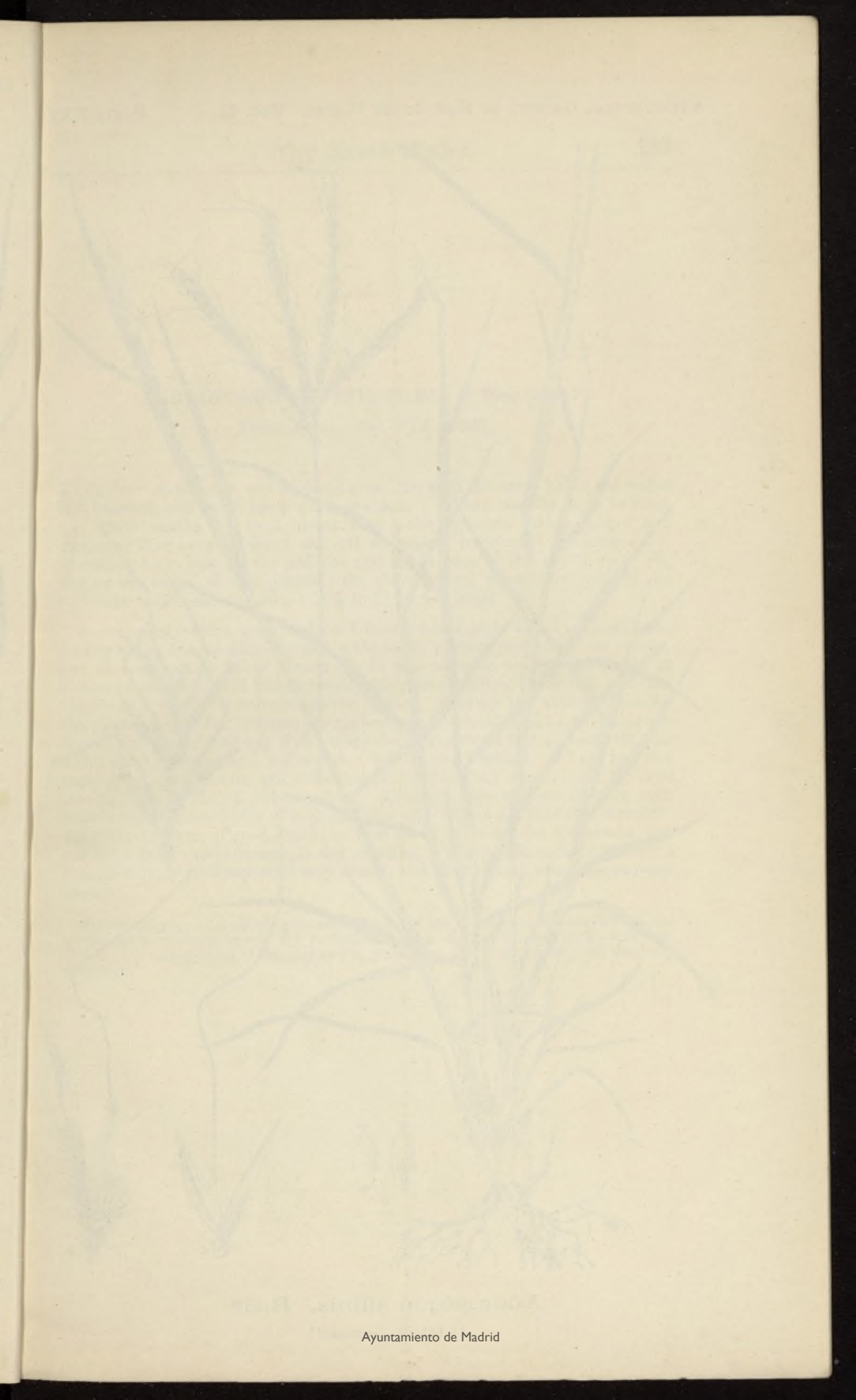
A perennial species with prostrate stems, often creeping and rooting at every joint. When it gets thoroughly established on good soils, however, the stems will grow from 1 to 2 feet high if left unmolested for a time. In the coastal districts, where the frost is not too severe, it is the best native grass we have for making lawns. It is also valuable for consolidating earth banks, binding loose sand, and protecting river banks against the fury of flood waters. This grass should never be sown or planted except in places where it is required to remain permanently, because its numerous underground stems are most difficult to eradicate if they get established in cultivated land. The drought-enduring qualities of this grass are something remarkable, and if it once gets well established in the soil, particularly in the coastal districts, it is neither affected by dry weather nor close grazing, nor from being constantly trampled upon by stock; but it does not seem to grow very well on our arid central plains. It is a most valuable pasture grass on the eastern side of the Dividing Range, which stock of all kinds eat greedily, and fatten on. When grown under close paddocking, three crops may be cut in some places in an ordinary season; and if dried quickly it makes splendid hay, which will keep for several years if carefully stacked. Animals will thrive on its underground stems. They are said to possess some of the medicinal properties of sarsaparilla. Surgeon F. H. Thornton, B.A., M.B., says:—"The expressed juice is astringent, and is used as an application to fresh cuts and wounds. It is also diuretic, and is used in cases of dropsy and anasarca, also as an astringent of chronic diarrhœa and dysentery." Surgeon F. M. Houston says:—"The juice of the green grass is useful in catarrhal ophthalmia, is astringent, used also with much benefit in hæmaturesis." A cooling drink is also said to be made from the roots.

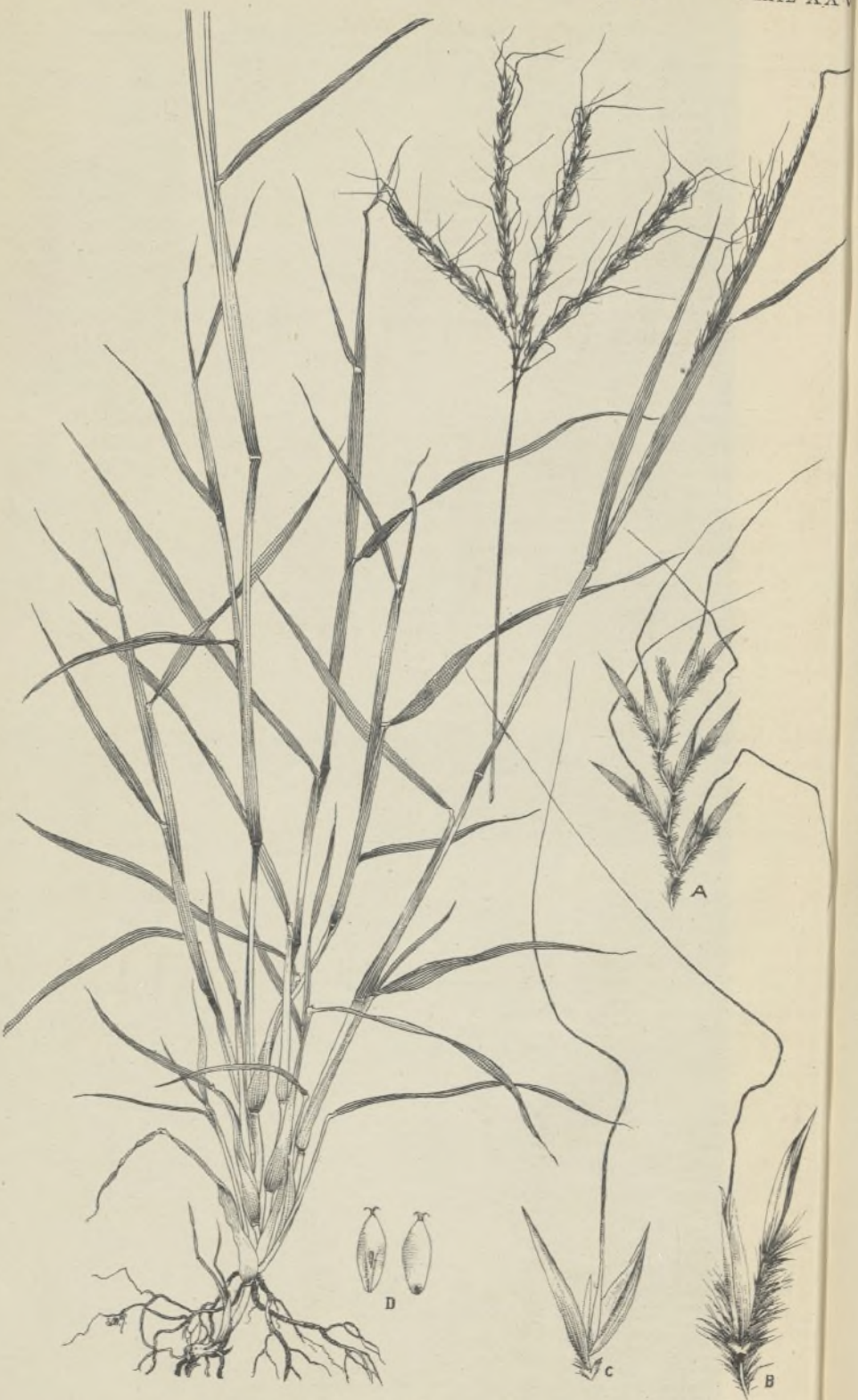
Baron Von Mueller and L. Rummel give the following chemical analysis, made on the very early spring growth of this grass:—Albumen, 1·60; gluten, 6·45; starch, 4.00; gum, 3·10; sugar, 3·60 per cent.

Reference to Plate.—A, showing the arrangement of the spikelets on the rhachis; B, an open spikelet, showing the arrangement of the glumes and palea; C, grain;—all variously magnified.

Cynodon dactylon. Pers.

"Couch Grass," "Doub Grass," "Bermuda Grass"





Andropogon affinis. R.Br.

"Blue Grass."

ANDROPOGON AFFINIS, *R. Br.* ("Blue Grass.")

Flora Austr., Vol. VII, p. 530.

VERY near *A. sericeus*, and perhaps a variety, with the same habit, the nodes less bearded, and sometimes quite glabrous. Spikes, usually three or four, not quite sessile, 1½ to 2 inches long; the spikelets rather longer and narrower than in *A. sericeus*, and not so closely imbricate; the long, silky, spreading hairs only on the pedicles and at the base of the sessile spikelets, not on the backs of the glumes; the third glume more developed in the spikelets examined; the awn ¾ inch to 1½ inches long.

A perennial species, growing from 1 foot to 2 feet high, which is found principally in the coastal districts, and in the south-western portions of the colony, and in some places fairly plentiful. It is a valuable pasture grass, and in sheltered situations will make considerable growth during the winter months; therefore it is doubly valuable to the grazier. During the summer months this grass yields a fair amount of rich herbage, much relished by all herbivora. It will also make good hay if cut when the flower stems first appear. It will stand close feeding, and withstand a lot of dry weather. I have had this grass growing on lawns, and notwithstanding that they were constantly kept mown, it was almost irrepressible. Although this species may be seen growing on various kinds of soil, still the one that suits it best is a moderately strong loam, of good depth, so that its long roots can penetrate and get away from the influence of dry weather. When left undisturbed for a time this grass produces seed very freely, and they ripen during the summer months.

Reference to plate.—A, showing the arrangement of the spikelets on the rhachis; B, the sessile and fertile spikelet and the pedicillate barren one; C, the open fertile spikelets, showing the arrangement of the glumes; D, grain, back and front views;—all variously magnified.

PANICUM PARVIFLORUM. *R. Br.* ("Small-flowered Panick Grass.")

Flora Austr., Vol. VII, p. 470.

A TALL, but slender, usually glabrous grass; leaves long and narrow; the ligula scarious, often long, jagged at the end; panicle branches often numerous, spreading, simple, filiform, 2 to 4 inches, or in some specimens 5 to 6 inches long, the lower ones distant, the upper ones often crowded; spikelets ovoid, glabrous, $\frac{1}{2}$ to $\frac{3}{4}$ lines long; mostly in pairs along the flexuose rhachis, only on a longer pedicle than the other, but in the lower part of the branch often clustered, the longer pedicle bearing two or three spikelets; outer glume very small, ovate, usually one-nerved; second and third glumes nearly equal, both empty, membranous obtuse; the second usually three-nerved, the third five-nerved; fruiting glume as long, more acute, smooth.

A slender, glabrous, perennial grass, growing from 1 foot to 3 feet high, and found generally in the coastal districts, and in some places it is fairly plentiful. It is generally one of the first native grasses to make its appearance after a clearing has been made in the scrub.

It is not particular as to soil or situation, for I have seen it growing on dry stony ridges, and on rich alluvial bottoms; but, of course, on rich soils it yields a far superior herbage. Its strong, penetrating roots will enable it to remain green during a long spell of dry weather. In sheltered situations it will grow nearly all the year round; but during an ordinary summer it will yield a quantity of rich, succulent herbage, which is greedily eaten by all herbivora. It is well worth cultivating where dairy cows are kept, and it should make good hay if cut before the flower stems appear. It might also be grown for ensilage. It produces an abundance of seed, which ripens during the summer and autumn months. There is a variety (*var. pilosa*) of this grass, which is sometimes found in the coastal districts, but with the exception of being hairy, it has all the characteristics of the species.

Reference to plate.—A, showing the arrangement of the spikelets on the flexuose rhachis; B, showing the relative size of the outer glume as compared with the third glume. C, an open spikelet, showing the four glumes and palea; D, grain back and front views;—all variously magnified.

Panicum parviflorum. R.Br.

"Small-flowered Pannick Grass"

Eragrostis leptostachya. Steud.

"A Love Grass."

ERAGROSTIS LEPTOSTACHYA, *Steud.* ("Love Grass.")

Flora Aust., Vol. VII., p. 645.

STEMS slender, usually about 1 foot high; leaves at the base narrow, convolute, or setaceous, glabrous. Panicle loosely pyramidal, 3 to 5 inches long with slender, divided, spreading branches. Spikelets on capillary pedicles of 1 to 3 lines, loosely spreading, about 2 lines long, narrow, but much broader than in *E. pilosa*, much smaller than in *E. brownii*, loosely six to ten flowered, usually dark coloured, glumes acute, more spreading than in *E. pilosa* the lateral nerves faint and almost marginal. Palea nearly as long, glabrous, grain ovoid, smooth.

A slender perennial species, growing about 1½ feet high, although I have occasionally seen it 2 feet high. It is found in the coastal districts from Illawarra to the Tweed, in the New England district, and also on the Blue Mountains. In some situations it is fairly plentiful, and on good soil it yields a rich, succulent herbage, much sought after by all pasture animals. On the Hon. Dr. Norton's estate on the Blue Mountains it is growing very plentifully, and cattle eat it in preference to any other kind of grass. When I was there a short time since, I saw that this particular species was cropped very close down to the ground, although there were several other species of grasses growing there, and some of them rather tall, and afforded a bulk of herbage. The grass under notice will grow on land where it is partially shaded with trees, and in such circumstances will afford a tender herbage during the winter and early spring months. It is much improved by cultivation, and if cut when the flower stalks first appear it makes good hay. It produces an abundance of seed, which usually ripens in October and November, but in good seasons the seeds ripen during the summer and autumn months.

The following report has been furnished by the Hon. Dr. Norton, M.L.C.:—

"1st May, 1891.

"After an experience of upwards of ten years at Euchora, Springwood, I feel justified in stating that the above-named grass is one of the most valuable of all the Australian grasses.

"Mixed with other native grasses, it grows freely on my land, and is greedily devoured by the cattle in preference to all other kinds.

"The milk produced by the cows which feed on these grasses is particularly rich, and makes most excellent butter.

"The growth in places protected from the cattle is so great as to supply me in ordinary seasons with an abundance of hay for the winter, and both cows and horses seem almost more fond of this than of the grass in its green state.

Reference to plate.—A, spikelet; B, floret; C, grain, back and front views;—all variously magnified.

New Commercial Crops for N.S.W.

(Continued from Vol. II, page 111.)

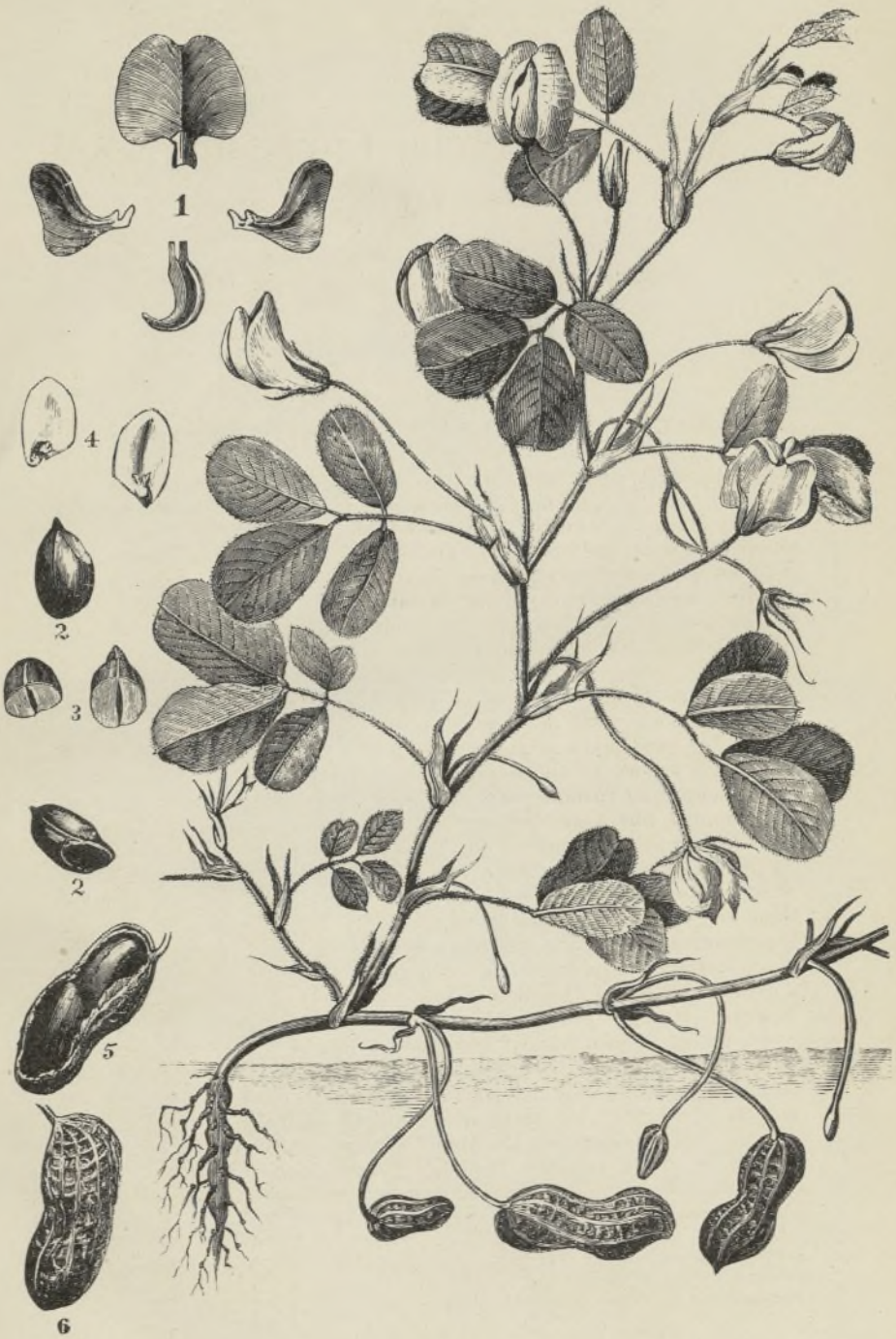
By FRED TURNER, F.R.H.S.
Botanist to the Department of Agriculture, New South Wales.

The Cultivation of the Pea-nut *(Arachis hypogæa*, Linn.)

The pea, earth, or ground nut, is an annual of the leguminous order, or pea tribe of plants. Before it blooms it generally assumes an upright habit, usually attaining a height of about 1 foot; but when the flowers appear the plant falls over, and makes its subsequent growth in a procumbent position. The leaves are abruptly pinnate, bearing two pairs of leaflets without any tendril; stipules elongated and adnate to the leaf-stalks. The flowers are yellow, and are arranged, five to seven together, in the axils of the leaves. These are succeeded by pods about 1½ inches long, and contain two, and sometimes three, seeds, seventy-five of which weigh 1 oz. The most remarkable feature of the plant is that it thrusts its fruit into the ground to effect its maturation. This peculiarity, however, is not confined to this genus of plants, but exists likewise in an allied genus (*Voandzeia subterranea*, Thours.), commonly known as the Bombarra ground-nut. This plant is a native of Madagascar and various parts of Africa, and has been grown successfully in this country, but it will be more fully noticed in a separate article.

The pea-nut is a native of the West Indies and West Africa, but it is now cultivated extensively in many of the warmer parts of the earth for the sake of its seeds. There are two well-marked varieties of the plant, and both of them are, or were, growing in this country a short time since, but only in experimental stages, the difference between them being that one has a small pod and the other a large one. The pea-nut can be grown successfully over a greater portion of the eastern side of the Dividing Range in New South Wales. Having proved that the Australian climate is suitable to its development, I can highly recommend this valuable economic plant for cultivation to the farmers in the coastal districts of this Colony. Its cultivation is withal so simple, and as it only occupies the land for about five months of the year, the produce can soon be turned to profitable account. Taking into consideration the quantity of pea-nuts that are consumed in the Colony, it would take the produce of many acres to supply the annual demands. The chief commercial value of this plant, however, is the valuable oil that can be expressed from its seeds.

**Reference to plate.*—1, Petals; 2, different views of the pea-nut; 3, transverse section of a pea-nut; 4, a pea-nut laid open to show the embryo; 5, an open pod, showing the arrangement of the pea-nuts; 6, a pod.



Arachis hypogæa. L.

"Pea-nut."

Professor Church, (to whom we are also indebted for the engraving of the plant), gives the following analysis of the pea-nuts :—

Composition of Pea-nuts.

	In 100 parts.	In 1 lb.
Water	7·5	1 oz. 87 grs.
Albuminoids	24·5	3 ,, 403 ,,
Starch	11·7	1 ,, 382 ,,
Oil	50·0	8 ,, 0 ,,
Fibre	4·5	0 ,, 315 ,,
Ash	1·8	0 ,, 126 ,,

It will be seen by the foregoing analysis that the pea-nuts contain 50 per cent. of their weight in oil. This excellent result must not be expected, however, as a general thing, for the yield varies in nuts that are grown on different soils, and it will be safe to put it down at a lower figure. The oil is thin, of a clear, pale, straw colour, somewhat resembling poppy and the finer kinds of olive oils. It will not become rancid, and it is said to be improved with age. In commerce it is known as "nut oil," and it is said, on good authority that olive oil is not only adulterated with it, "but often substituted for it." It is a valuable oil as a lubricant for delicate machinery, and as it does not clog the bearings, it possesses great advantages over many other kinds of oil. The oil is extracted from the pea-nuts by two processes—one of them by simple pressure, and the other by the application of heat. Whilst a greater percentage of oil can be obtained by the application of heat, that obtained by the simple pressure process is more valuable as a commercial article. After the greater part of the oil has been extracted from the pea-nuts by pressure, the residue, or cake, can be used for feeding cattle, and it is considered very fattening. Moreover, it can be used as a fertiliser for sugar-cane lands, and also for other crops that are exhaustive to the soil. Besides the valuable products already mentioned, the pea-nut has many other important economic uses. Owing to the fact, however, that the nuts contain such a large percentage of oil in a fresh state, they require a considerable admixture of starchy food in order to render them easy of digestion. Enormous quantities of parched pea-nuts, however, are consumed nearly all over the world, more particularly in America, and they are far from being unknown in this country, for boys may often be seen eating them, although they are sometimes inferior to what they would be if grown and parched in the Colony. I read a short time ago where one American writer of authority stated that the manufacture of chocolate cakes out of pea-nuts alone, and without a particle of cocoa, is an immense and profitable manufacture in the States. Although so much has been said about this valuable economic plant, its uses are not nearly exhausted. As a green crop it makes valuable forage, and after the pea-nuts are picked off the dried stems, the latter make valuable fodder, which herbivora of all kinds are remarkably fond of, and they are said to be very fattening.

The soil best suited to the growth of the pea-nut.—The soil best suited to the growth of this plant is of a light sandy nature, or one inclined that way. It is important that the surface soil should be loose, so that the young pods have no difficulty in pushing their way into the ground to effect maturation. After a suitable piece of ground has been chosen it should be thoroughly cleaned of all weeds and rubbish, and ploughed with a light one-horse plough to a depth not exceeding 6 inches. If it is not naturally fertile, some manure should be applied. If well

rotted farm-yard manure is not available, then those commercial manures should be applied that are rich in phosphates. Superphosphate of lime is considered an excellent manure to apply to the land where this crop is grown on. The advantage of shallow cultivation will be apparent when it is explained that after the embryo nuts are fertilised the stalks they are attached to will continue to push themselves into the ground until a firm bed is reached for the pea-nuts to mature on. When the pea-nuts are matured as near to the surface of the soil as is practicable, the harvest operations are not nearly so laborious, because the produce is more easy to bring to the surface, and a less number of nuts will be likely to be left in the ground. If the soil can be left in a rough ploughed condition for a month or so previous to planting, so much the better—the sun and air will get into it and sweeten it. If weeds should spring up, however, the scarifier should be put over the land to kill them. The scarifier should be freely used on the land a few days previous to planting, so that it will be in the best possible tilth to receive the seed, and be cleaned thoroughly free from weeds.

Sowing the seed.

From The Hunter to The Tweed the seed should be sown at the end of September or beginning of October. South of that portion of the Colony, the sowing had better be deferred until the end of October or beginning of November. The rows should be 3 feet apart, and the seeds sown 18 inches apart in the rows. This will allow the land to be easily worked with a horse and light plough or scarifier. It will take 25 lb. of seed to plant an acre. Like many other kinds of seed that contain a large percentage of oil, the pea-nut soon loses its germinating power, even when kept under the best of circumstances. The first requisite for a good crop of pea-nuts is good seed. In countries where the crop is grown on commercial lines the selection of seed is a most important matter. They are all carefully shelled and hand-picked, and only the plump, perfect ones, with unbroken skins, being kept for sowing. If this matter is not carefully attended to there will be a great many blank places in the field. A few years ago pea-nuts were planted by hand, but it was a very tedious and laborious process. Of late years, however, a simple but effective mechanical contrivance has been brought into use, which deposits pea-nuts at regular distances in the rows and covers them carefully over. With the aid of one of these machines a man can plant about 7 acres per day. It is advisable to sow a few extra seeds in some portion of the field to provide plants for any blanks that may occur. It will also be necessary to keep a close watch on the field until the seedlings are well above ground, for many birds and small animals are so fond of pea-nuts that if the fields are unprotected there would be many blanks to fill up. The young plants will begin to appear above ground in about ten days or a fortnight, according to the state of the weather. When the plants have appeared above ground they are a very pretty sight, and look very much like a lot of young red clover plants, as we see them in spring time in the old country.

Cultivation.

The cultivation consists mainly in keeping down weeds, and a small one-horse plough or scarifier is the best for this purpose. If weeds should spring up between the plants in the rows, a hoe must be used to eradicate

them. One ploughing or scarifying, or at most two, will keep the ground sufficiently clean of weeds, provided it was in a fairly clean condition at sowing time. By the month of January the plants will have fallen over, and will nearly meet in the space between the rows. A small ridging plough should be put once between each row to lift the soil up to the plants, and where it may not be sufficiently near it might be drawn up to the plants with a hoe, taking care, however, that they are neither disturbed nor covered up. After this the plants will grow so dense upon the ground that they will smother any weeds that may spring up. The crop will require no further attention until it is ready for harvesting, which, under ordinary circumstances, will be in April.

Harvesting the crop.—When the crop shows signs of ripening, the pods will turn brown. As soon as they have arrived at that stage they must be lifted, or they will get discoloured. If this should take place, their value as a commercial article will be depreciated. If only a few rods of ground are under cultivation, the pea-nuts may be lifted with a fork, but where there are several acres the operation is best done with a plough. This should be run under each row, which will sever the main root of the plant, and will leave the plants and pods on the surface. After they have laid on the ground and become partly dried, they should be stacked in the field to complete the operation. This is usually done in the following way:—Select some stout stakes, about 8 feet high, sharpen one end, and drive them into the ground about 18 inches. See that they are left in a perfectly upright position, at right angles. Nail cross pieces of wood, about 3 feet long, beginning at 2 feet from the bottom, and continuing at every 2 feet until the top of the stake is reached. With a fork gather up the plants, and put as many on each stake as it will comfortably hold. If showery weather should ensue before the pea-nuts are sufficiently dry it will be advisable to put a cap of hay or straw on each stake to throw the rain off. After they have become sufficiently dry, the pods may either be picked off in the field or the stacks stored in a barn for the pods to be picked off at some future time. The picking is the most tedious process of all, for it has to be done with hand labour. If an efficient but simple machine could be invented to strip off the pods without injuring them it would not only facilitate getting the produce to market, but it would prove of inestimable value to farmers in sparsely-populated districts, where it is often a difficulty to get labour of any kind to perform what work there is to be done.

The yield per acre.—As many as 115 bushels of pea-nuts have been harvested from an acre. This, however, is an exceptional case, and the average yield must be put down at a much lower figure. About 25 or 30 bushels are considered a fair crop.

After the plants and nuts have all been cleared off the land, pigs may be turned on to it to eat the nuts that are left in the soil, which are sometimes considerable, no matter how well the crop has been harvested. The pigs will turn the soil upside down in search of the pea-nuts, which they are remarkably fond of, and however lean they may be when turned in they soon become fat. The pork, however, is said to be soft, and before the pigs are slaughtered they should be fed with grain for a time, to make the flesh hard.

The Cultivation of the Common Passion Vine (*Passiflora edulis*, Sims); together with a few Notes on three other species.

My advice having been asked as to the best way to cultivate, on an extensive scale, the common passion-fruit (*Passiflora edulis*, Sims), I thought the best way of giving my ideas in extenso, would be through the columns of the *Agricultural Gazette*, so that the information might reach all our cultivators. There are many places in this Colony where the plant could be cultivated successfully, both for pleasure and profit. At the present time, to many people in our country towns, the fruit is an almost unknown luxury. In favourable situations the plant will produce fruit abundantly, nearly all over the eastern side of the Dividing Range in this Colony, and also in many other places west and south-west of it—in fact, almost anywhere where frosts are not too severe and continuous in winter. In this Colony very little skill is required in the cultivation of the plant; but in Great Britain great care has to be taken to make it produce fruit. I cultivated the plant under glass in the old country, many years ago, for the sake of its pleasant acid fruit; and in the most favourable parts of the United Kingdom it is grown on walls having a southerly aspect. With all the care bestowed upon the plant, however, only an autumn crop of fruit can be obtained, and then it has not such a good flavour as that grown here, without much care or attention, although it is used for dessert. Those persons who grow the common passion-fruit know how well it will keep after being gathered and carefully stored, and how well it will carry without deterioration, long distances, either by rail or steamer, to market. Some persons assert that the fruit can be safely shipped to London without much trouble. If the latter should prove to be a successful undertaking, there is no doubt but that an extensive trade could be opened up for almost any quantity of surplus fruit the colony might ship during December, January, and February, when there would be a scarcity of this kind of dessert fruit in the northern market. Although our local demands for this fruit are now considerable, and are steadily increasing, because it is being better appreciated, still, during the months I have mentioned, there is sometimes a glut in the market which an export trade would considerably relieve, besides benefiting the pockets of our cultivators. Before I enter upon the cultivation of this species for the market, there are others which I have grown in this country, and can highly recommend their cultivation to our farmers who are settled in the north-eastern portion of the Colony. The first is *Passiflora macrocarpa*, Mast., the large fruited granadilla. I have grown fruits of this plant which weighed 8 lb. each. In shape they are nearly oval; the epicarp, or outer covering, is nearly an inch thick, and can be made into pies or cooked in various ways to suit the taste. The pulp has a very delicate flavour, and is very much esteemed for dessert. The plant does not bear a great number of fruits annually—at least, that is my experience of it. To obtain the fruit it is necessary to artificially fertilise the pistil. By the peculiar arrangement of the stamens, the pollen from the anthers does not come in direct contact with the stigmas, and, although, I have seen bees visit the flowers, I never new an instance where the pistil was fertilised by them. Fertilisation is easily effected, however, by using a feather or camel's-hair pencil to convey the pollen from the anthers to the stigmas. The operation should be done on fine days. I found out that the best time was from 10 a.m. to noon. It will only take about five minutes to fertilise twenty flowers.

The second is *Passiflora maliformis*, Linn, the sweet calabash. This plant will require to be planted in a very warm situation to bring the fruits to perfection. They are nearly round, and contain an agreeable gelatinous pale yellow pulp. A good fruit for dessert.

The third is *Passiflora quadrangularis*, Linn, the common granadilla. This is a vigorous growing climbing plant, and in suitable situations will yield good crops of fruit, which is greenish yellow when ripe, and about 6 inches in diameter. The fruit contains a succulent pulp of a sweet and slightly acid flavour. This species and the previous one can be grown successfully against walls and can be used with effect in covering the naked appearance of dwellings, or out-houses. They would serve the double purpose of ornament and profit. The fruit of the three preceeding species will not carry nor keep so well as the common passion fruit; therefore, they can only be cultivated for local consumption.

Site for a Plantation.

The common passion vine is very hardy, and will grow on almost any kind of soil, and in any situation; but, like many other plants in the vegetable kingdom, it well repays liberal treatment with regard to soil. Whatever site is chosen, it should be sheltered against prevailing winds. If this is not guarded against, the plants often get much damaged, and this, of course, tells materially against their productiveness. The soil best suited to the growth of the passion-vine is one of a rather light loamy nature, that is fairly rich in humus, so that the roots will have no difficulty in penetrating deeply into it. This will be of the greatest advantage to the plant, inasmuch as it will not be much affected by a long spell of dry weather. If the soil is not naturally well drained, artificial drains must be put in to take off the superfluous moisture, and to let the air into the land, which will decompose the plant-food in it, and render it more easy of assimilation by the young roots. After the site is chosen and fenced in, and other preliminary work done, the soil should be well broken up with a plough and a sub-soil plough to a depth of at least 18 inches. If the land can lie in a roughly broken up state for a few weeks before the planting takes place, so much the better; it will sweeten and become friable.

Supports for Passion-vines.

The passion-vine will grow on any kind of support, such as a paling fence, trelliswork, or climbing over old trees, and produce a fair amount of fruit; but to cultivate it as a commercial crop some better means must be devised. I have seen several kinds of supports used, none of them, however, to which objection could not be taken. Wire fences, to my mind, are the most objectionable of all, for the simple reason, that the constant swaying backwards and forwards of the fence when the vines have grown over it, by the action of the winds, chafes the vines so much on the wires that they are often cut in two, no matter how tight the fence may be strained.

The best kind of supports for the passion-vine that I could suggest would be an ordinary post, and three or four railed fence, put up about 5 feet high. This is a convenient height for gathering the fruit without having to use steps or ladder. The posts and rails should be taken upon the land when it is perfectly dry if possible; then it will not get unduly hardened while the fences are being erected.

The fences should be set up 7 feet apart, and parallel to each other, and run as near due north and south as possible. This will be of the greatest advantage

to the passion-vines, inasmuch as they will receive sunshine on both sides of the fence. If this is attended to, it will add materially to the productiveness of the plant. After the fences are erected, a light scarifier should be run between the lines of fencing to break up the surface soil. In this state the land can be left until the planting takes places.

Propagation of the Passion-vine.

The passion-vine can be increased by cuttings, layers, and seeds. The latter way generally produces the most vigorous plants; therefore, I will only treat of that mode of propagation. The seeds should be selected from the earliest ripened fruits, which will be in November. They should be sown immediately in a light rich compost in a warm situation, and be protected by a calico or tea-tree shade from the hot sun during the greater part of the day. They should be regularly and carefully watered, and when the seedlings have made three or four leaves, they may be transplanted in rows 6 inches apart and 6 inches apart in the rows, into a somewhat similar compost that they were raised in. The plants should be shaded from the hot sun for a few weeks until they have made considerable root action, when they may be gradually innured to the sun. With ordinary care the plants will be in a vigorous condition by the succeeding March or April, when they may be transplanted to their permanent quarters. A slender stake should be fixed in the ground in an upright position at every 10 feet, but if possible—avoid the posts, for in digging out the holes for the plants it might weaken the fence—close to and just the height of the fence, and be tied to it to train the young plants on.

Transplanting.

Choose, if possible, cloudy weather after a good rainfall for the operation, then the plants will not be long in getting established in their new quarters. If the young plants have been reared near the field where they are to be planted, they may be taken up with a spade in square blocks with 6 inches of soil and roots attached to them, and, to prevent their being disturbed packed in long narrow boxes and carried to the marked places in the lines of fencing and planted. At the base of each perpendicular stake, dig out a hole large enough to receive the soil and roots attached to the young plant. Put the plant carefully in and cover the roots with the finest of the surrounding soil; press it firmly, but not too hard; tie the young plant to the upright stake, then the operation will be complete. The planting, of course, may be done successfully during the spring months, but I prefer the autumn, as it enables the young plants to get thoroughly established before the ensuing summer sets in, and if it should prove to be a dry one, the plants would not be likely to suffer nearly as much as those that were planted in spring. Besides, they would come into bearing at a much earlier period.

Training the Plants.

The young plants will require some attention in the way of training. Every foot or 18 inches of growth the plants make should be tied, but not too tight, to the upright stakes. When they have reached the top of the stakes the leaders should be pinched out, after which lateral growths will be developed. These should be tied but not too tight to the rails of the fence, when the lateral growths of one plant meet those of another their leaders should be pinched out, Then sub-laterals will be developed which

will be the bearing growths. The plants will now take care of themselves, except after the second year when they should be gone over every winter with a sharp knife, or a pair of secateurs to take out all dead and decaying wood, and any superfluous growths that may have formed. During this time, and whilst the plantation is in bearing, the ground must be persistently cultivated with a light scarifier, and where this cannot work, with a hoe. This will not only prevent the growth of weeds, which would, if allowed to develop on the land, rob it of its fertility, but the soil will be kept well loosened to receive any rain that may fall. Unless the land was in an exceptionally fertile condition when the passion-vines were planted, it will require to be manured annually after two crops of fruit have been taken off the plants, as they are very exhaustive on the soil. If farm-yard manure can be obtained so much the better; but failing this, apply bone-dust or other artificial manures. Whatever kind of manure is used it should be lightly ploughed in during the winter months. Although a plantation will continue to bear for several years if attention be paid to it; still it is not advisable to keep the plantation under cultivation after the vines have been bearing annually for ten or twelve years. Generally speaking, after this time, for want of vigour, insect pests begin to be very troublesome; and the amount of labour required to keep them in check would be more profitably spent in preparing a new plantation. Much of the old fencing will be found to be quite sound, and can be used, after being carefully cleansed of any insect pests that may have found a secure hiding-place in the cracks of the wood, for supports for the vines in a new plantation.

Gathering the Fruit.

When the fruit begins to ripen, the vines should be looked over at least once in three days, and the ripe fruit gathered. By taking the fruit off the vines as it ripens, it will induce more lateral bearing shoots to develop, and of course larger crops of fruit will be obtained. A convenient contrivance for bringing the fruit out of the rows is a light hand cart, made of lattice work and set on two wheels with broad tires. Its size should be such that it will go easily between the rows of vines.

Australia, and not the United States, should have the Salt-beef Trade of the World.

By ALEXANDER BRUCE,
Chief Inspector of Stock.

Although the wholesale price of the best beef in America usually ranges from one-fourth to one-half above the price of meat of the same quality in this Colony and Queensland; and although, as a rule, our cattle are better bred than the American—it is a notorious fact that, instead of the British, Continental, and American vessels, which trade with the Colonies, obtaining a large supply of salt-beef on coming out here, they bring sufficient Chicago salt-beef to take them back again; and they do not, except under very exceptional circumstances, purchase any salt-beef cured in the Colonies, there being little cured here, and that, as a rule, not of the best quality.

The fact is, the Americans have a monopoly of the salt-beef trade, which is anything but an unimportant one, and they have, I believe, succeeded in securing this:—

(1) Through their having a very large supply of fat cattle, and through the price of beef in America being low compared with what it is in Great Britain and on the Continent.
(2) Through the enterprise and energy for which the Americans are noted.
(3) Through their having an abundant and cheap supply of natural ice; and,
(4) Through the careful and thoroughly honest way in which they have conducted the trade.

1.—*The number of Cattle in America, and price of Beef.*

In the United States of America there are about 50,000,000 of cattle, and in 1890 no less than 3,484,000 passed through the Chicago yards alone. With so very large a number of cattle, notwithstanding their great and increasing population (it is now put at upwards of 63,000,000), a heavy surplus is still left for exportation. A great deal of this surplus, previous to 1881, found its way to the British and other European markets, to a considerable extent as live cattle, and the rest in the shape of salted and tinned beef. In that year, however, a commencement was made at the fresh or chilled meat trade, which has assumed large proportions. There is now a weekly importation into Great Britain alone of from 3,000 to 5,000 bodies of chilled beef, in addition to from 5,000 to 6,000 head of live fat cattle, and large quantities of salted and tinned beef.

It is these heavy supplies of American meat which keep the price of Australian and New Zealand frozen beef so low—the retail butchers in England and Scotland naturally preferring the live cattle and chilled beef to the frozen Australian and New Zealand beef.

In America, fat cattle are sold, as ours ought to be, by the live weight; and the price of prime fat cattle in the Chicago market ordinarily ranges from 17s. to 22s. per 100 lb., which makes the average price (say) 19s. 6d. per 100 lb. live weight.

Then, in order to compare the price of prime American beef with that of a similar description in Australia, it is necessary—as the prices quoted in the Colonies for beef are so for the body which the bullock will make when when killed and dressed—to calculate the price of fat cattle in America in the same way, and to do this we will suppose that the best cattle will, when killed and dressed, give 65 per cent. of their live weight in meat. This would make (say) 35 per cent. of offal, and that again, taken at the price mentioned, and calculating as we do in Australia, would make the average wholesale price of best beef in Chicago a trifle over 30s. per 100 lb., while the average price of similar beef in the Sydney and Brisbane markets is only about 17s. 6d. per 100 lb.;—that is to say, the price of prime beef in New South Wales and Queensland is about 12s. 6d. per 100 lb., or nearly 1½d. per lb. below that of beef of the same quality in Chicago.

From this it will be seen that, so far as regards the price of beef, we are in a very much better position to secure and carry on the salting and tinning trades than the Americans, and there is therefore no reason why these Colonies, and especially Queensland, should not, with their large supplies of cheap prime beef, aided now as they will be by artificial cold, get and keep the beef salting and tinning trade of the world.

2. *The enterprise and energy of the Americans.*

Of the possession of these qualities by the people of the United States of America there can be no question. This is shown by the astonishing progress they have made, and the important and costly works to be met with in almost every portion of their vast territory, and it is well exemplified also by the way in which their enormous surplus of meat has been dealt with, in the first instance, by establishing extensive salting and beef-tinning factories, afterwards in the shipment of live cattle for the United Kingdom and the Continent of Europe, and latterly in the successful establishment of a chilled meat trade. While we were allowing the late Mr. T. S. Mort (who was the first to propose the conveyance of fresh meat by means of artificial cold from Australia to the English and other markets) to struggle almost single-handed, as he did in the most determined manner, at a very great loss to himself, to make his scheme a success, the Americans quickly turned his ideas to practical account, and are now flooding the Scotch and English markets with chilled beef, as well as sending large quantities of beef prepared in other ways to these and other European markets, to the serious depreciation in the price of New Zealand and Australian frozen beef and mutton. They have done this, too, in the face of the fact that Chicago is more than 1,000 miles from the sea-board, which entails an inland carriage of fully that distance by rail before the meat can be put on board the steamers which are to convey it to Europe from New York or Boston.

But while this is the case, the Americans have no prescriptive right to the enterprise and energy necessary for such undertakings; and as it has now been found that the necessary cold can be obtained more cheaply by artificial

means than by collecting the natural ice, we will be in as good a position as they are so far as cold is concerned, when our meat market and chilling and freezing depôts are completed, as they will now soon be; and the necessary enterpise and capital will then be forthcoming.

That there is an excellent opening in the markets of the United Kingdom, and perhaps also, to some extent, on the Continent of Europe, not only for our supplies of beef, mutton, and pork, but also for our dairy produce, there can be no question, provided we are particular to send only the best. In 1889 the value of the animal food and dairy produce imported into the United Kingdom, as given in the returns of the trade and navigation for that year, was as follows:—

(1.) Live cattle, sheep, and pigs	£9,627,000
(2.) Dead meat, including bacon, salt-beef, fresh-beef, hams, mutton fresh and frozen beef and mutton, preserved otherwise than by salt and pork other than as ham	18,258,000
(3.) Margarine	3,652,000
(4.) Butter and cheese	14,738,000
	£46,275,000

3. *The abundant and cheap supply of natural ice at Chicago.*

Prior to the series of discoveries which have brought the system of refrigeration to the pitch of efficiency and economy which it has now reached, the meat packers of Chicago may be said to have had practically a monopoly of cold as applied to the preservation of meat, and that again gave them a monopoly of the salt-beef and salt-pork trades. They could, from the adjoining lake, collect during winter as much ice as they wished, and store it at a cost of about a dollar (4s. 2d.) a ton. In storing it the ice was packed round the curing rooms, so that while it was put in as cool a place as possible, it also kept the curing room at such a low temperature, say from 35° to 45° Fahrenheit—as allowed the work to be carried on all through the summer without any risk.

The salting is done, I believe, in the following way: a layer of broken ice and salt is first laid down, and on that is placed a layer of meat cut up in pieces of the proper size; then another layer of ice and salt, and then another of meat; and so on until large stacks of meat are built up. In this way, in the course of three or four weeks, the salt penetrates through and through the meat, while the blood and other impurities run off, and the meat at the end of that time comes out thoroughly salted without any rubbing, soft and of a good colour, and quite a contrast to the dark ill-looking article, which we, as a rule, have hitherto had to offer to the shipping visiting our ports.

Although in bye-gone years the Chicago packers had a monopoly of cold as applied to the curing of meat, they have so no longer; for it is the case that even in Chicago where they can procure the natural ice at the lowest possible cost, the chilling of the meat for shipment to Europe, and of course also for the cooling of the rooms for salting, is now done with artificial cold; and as this is the case, artificial cold can in Australia be made as cheaply as in America, and we are therefore, with respect to this requisite, in as favourable a position as America, and have nothing to fear so far as regards refrigeration.

4. *The careful and thoroughly honest way in which the Chicago salt-meat trade is conducted.*

The meat having thus become thoroughly salted, the packers next care is to procure good sound casks or tierces. These are made of American white oak, and contain each about 200 lb. Before, however, the meat is placed in tierces it has to be carefully classed—(1st) as regards the quality of the beef, and (2nd) as regards the part of the body from which it is cut; and it is said that the packers in Chicago make four different classes—the best or highest priced being termed "India mess beef." Having been properly classed, the meat is then carefully packed in the tierces, and, if intended for export, is forwarded by rail to New York or Boston, where it is taken out and repacked under the supervision of sworn testors or classers, who classify the meat according to their own judgment, and mark the tierces accordingly.

A system of a similar nature as this, which was at one time followed as regards Cork butter, did a very great deal to raise and maintain the price of that article; and there can be no question but it is the proper course to take, for it gives the purchaser full confidence, and of course with confidence business is sooner done and higher prices obtained. It would, therefore, be the height of good policy if we in these Colonies were to adopt a similar course with the produce we export in every case where it is at all practicable, and especially with such articles as meat and dairy produce. At any rate, whether we adopt this course or not, there is nothing to prevent us from doing so, and it can be safely said, with respect to this portion of the subject also, that the thoroughness, intelligence, care, and honesty which have established the packing trade in America can, if we choose, be displayed also in Australia, and, if so, the same result must inevitably follow, with this difference, that our natural advantages, superior breed of cattle, and low prices must give us, instead of America, the salting and tinning trade of the world.

It is no doubt the case that salt beef is not now in such general use by the shipping as it once was, for the large steamers, which are provided with refrigerating machinery, to a considerable extent at least, carry fresh meat for the crew as well as for the passengers.

Notwithstanding this, however, there is still a large demand for salt beef, and if the trade for that article could be secured for Australia a very great boon would be conferred on our stock-owners; for when a chilled meat trade is established, and a glut of fat stock and low prices come about, the best portions of the carcases can be frozen and shipped to London; some of it, principally the fore-quarters, can be salted, and some of it tinned; while the very inferior can be made into extract. In this way every bit of the meat will be turned to account according to the purpose for which it is best adapted; and as the appearance and quality of the meat will be thoroughly preserved by the trade being conducted, so far as Australia is concerned, on the chilled or fresh meat system, it will, whether it be sold as frozen, as salted, or tinned, have all the goodness and flavour in it, and will be sure, when known, to realise top prices. Then, although the portions taken from each body of beef for salting might not be very great, still, as large numbers of cattle would be dealt with, the whole quantity would be very considerable; and, by adopting the other modes of utilising the carcase, the whole of the surplus would be dealt with to the best advantage, and, what is a matter of the very highest importance, the market would always be cleared and ruinous gluts prevented.

Of course Queensland would, through the establishment of an Australasian salt-beef trade, reap the greatest benefit; but although this is the case, the boon which such a trade would confer on our own stock-owners would be very great; for, if a large portion of the fat cattle and sheep which now come into this Colony from Queensland was diverted—as it would be if freezing, salting, and tinning were carried out there to any great extent—then the price of meat must, as a matter of course, rise in this Colony.

Selling stock by the live weight.—While on this subject, I would suggest that provision should be made at the principal sale-yards in the different Colonies for the weighing of cattle with the view to their being sold by live weight. Cattle are all sold in this way at Chicago, and in all the other principal markets in the United States, and the same system has recently been introduced in England. With proper arrangements there would be no more difficulty in weighing our cattle than in weighing the wild Texas bullocks in America; and it is a very great advantage to the seller to know what the actual weight of the cattle is. It is so also to the buyer at times, for all he then requires to estimate is the quality of the stock. There is then no need, as now, to guess at the weight. The Corporation, again, who own the yards, by charging a small fee for the use of the scales, can recoup themselves for the original outlay and the cost of keeping them repair.

Entomological Notes.

By A. SIDNEY OLLIFF,
Government Entomologist, New South Wales.

The Fly-parasite of the Plague-locust.

Owing to the kindness of several correspondents, who have been at the trouble of forwarding a number of living plague-locusts or grasshoppers (*Pachytylus australis*, Br.) to the entomological laboratory of the Department of Agriculture, I have had an opportunity of breeding the dipterous parasite, which for a good many years past has been known to assist in keeping that pest in check. In December last, Mr. J. P. Buggy referred to the existence of small grubs at Corowa, living at the expense of the locust; and subsequently he forwarded a fly which had been bred from one of these grubs, together with the information that early in February fully 60 or 70 per cent. of the grass hoppers were affected with these parasites. From an examination of a number of locusts forwarded from Corowa by Mr. A. H. Bray, I ascertained that the grub or larva is found within the locust, where it appears to live upon the adipose tissues of its victim, avoiding the vital parts with unfailing instinct. The grub lives indifferently in the thoracic region or the abdomen of the locust, and frequently three or four may be found in a single grasshopper.

Adult Plague-locust with dipterous larva, as yet unbred, emerging from behind metathorax. (Natural size).

The grubs leave their victims when they are full grown, usually by means of an opening which they eat in the side of the locust at the point where the abdomen joins the metathorax; but they do not invariably make their exit from the body of the unwilling host at that particular place, as on one occasion I observed two grubs escaping from a grasshopper at the same time—one from between the first and second abdominal segments, the other from between the head and prothorax. As soon as the grub makes its escape, the grasshopper, which has gradually grown more and more feeble as the enclosed parasite has gained in size, dies. In several instances I observed that the grasshopper died before its enemy had succeeded in making its escape; and in one case a larva was seen vainly struggling to free itself from between the metathorax and abdomen of a dead grasshopper where it was firmly held by the contracting remains of its victim. The grub, which subsequently died without extricating itself, succeeded in freeing more than half its body, but it was firmly held by the tail.

Grasshoppers containing parasitical grubs captured by Mr. Bray on 22nd January (received by me two days later), began to show signs of feebleness on 25th January, and on the following day, several of the larvæ made their appearance. On 27th January, these larvæ, having buried themselves at a

a. Puparium of *Masicera pachytyli* (magnified); *a*1. Same (Natural size).

depth of three quarters of an inch in the earth, at the bottom of the breeding cage in which the grasshoppers were confined, were found to have changed to the pupal state, and five and six days later, on 1st and 2nd February, the perfect flies made their appearance. This fly proved to belong to the family *Tachinidæ*, as suggested in a previous number of this *Gazette*.* The full grown larva measured 7 mm. in length, and is yellowish-white in colour. It has the segments much constricted, and no distinct head. The mouth parts are very obscure, and the

a Tachina fly (*Masicera pachytyli*, Sk.) *a* Parasite of the Plague-locust (magnified). *a*1. Same (Natural size).

*a*2. Antenna of *Masicera pachytyli*.

material at my disposal is not sufficient for a satisfactory examination of them; but the head is provided with two spine-like processes, which appear to correspond to the maxillæ. The two spiracles on the last segment are very conspicuous. The pupa is elongate, ovate, chestnut-brown in colour, and measures 5 mm. in length. As long ago as 1873, this fly was known as a parasite of the plague-locust, and I find that in that year Sir Frederick M'Coy referred specimens submitted to him by the Victorian Department of Agriculture to the genus *Tachina*†, but up to this time no definite account of the insect has been published as far as I am aware. Under these circumstances I thought it desirable to refer the specimens bred by me to Mr. F. A. A. Skuse, who has made a special study of the diptera, and he has been kind enough to furnish me with the following description of the species:—

"*Masicera pachytyli*, Skuse, sp. n. Male.—Long 2; alar, $1\frac{3}{4}$ lines. Yellowish-grey, with black bristles and hairs. Antennæ: third joint twice the length of the second, angular above and rounded beneath at the apex; sixth joint stout towards the base and plumose on its basal half, one-third longer than the third; black, the two basal joints brown. Eyes deep purplish-brown, naked. Head grey, with a dusky stripe on the front extending to the base of the antennæ. Thorax with three, very narrow, parallel, tolerably distinct, dusky stripes: metanotum blackish, abdomen short, about the length of the thorax, arched, obtusely-oval, more or less distinctly tinged with blackish. Legs sordid fulvous-brown, the tarsi black or blackish. Wings hyaline, somewhat greyish; first posterior cell narrowly open (closed by the costal vein); costal vein terminating before the apex of the wing; the distance between the tips of the second and third longitudinal veins considerably longer than that between the tip of the latter and the apex of the wing; elbow of the

* Agricultural Gazette II., p. 78 (1891). † Report of the Secretary for Agriculture, Melbourne, 1873.

third longitudinal vein incurved at the base, with a stump of a vein; great cross-vein obliquely situated, very slightly longer than, and at a right angle with, the last section of the fourth longitudinal vein, which reaches the margin; small cross-vein obliquely situated, opposite the tip of the first longitudinal vein.

"Female.—Long 3; alar, 2½ lines. Differs principally in being larger, blacker, with the legs entirely black.

"*Obs.*—Evidently a new species belonging to the genus *Masicera*, to which genus it is at any rate provisionally ascribed."

Mr. J. R. Garland found this same fly in great abundance at Wagga Wagga in January, and Mr. G. V. Rahn met with it at Germanton. I found a second and much larger dipterous larva in each consignment of locusts which appear to differ materially from the other species. One of these specimens unfortunately died before reaching maturity, but a second, evidently belonging to the same species, is still alive, and I hope to observe its transformations. The accompanying figure will give some idea of its form.

a. Larva of Dipterous-fly, not yet bred, parasitic on the Plague-locust.

At present I shall refrain from speculating as to its affinities; but I shall be glad to receive living locusts affected with either of these parasites, as I am anxious to work out their life history in detail.

Pine Aphis (Chermes, sp.) at Bowral.

Some pine twigs (*Pinus halepensis*) recently forwarded by Mr. R. A. Ritchie, M.L.A., contained great numbers of no less than three different species of insects belonging to as many families, viz.:—1, a small species of *Psocus*; 2, a species of *Psylla*; and 3, a species of *Chermes*, a genus of Aphides which contains, amongst others, a number of gall-making forms. Of these insects the *Psocus* is quite harmless to the trees; the *Psylla*, although a destructive insect, was not present in sufficient numbers to cause any considerable injuries. The real culprit, the *Chermes*, was very abundant. The larvæ of this insect were present in enormous numbers, causing injuries to the shoots and leaves, which they pierce in order to feed upon the sap. A nearly related species, *Chermes abietis*, Linn., is one of the worst enemies of the spruce fir in Northern Europe, and its attacks are much dreaded by foresters, as it is exceedingly difficult to cope with, if it once gets a firm hold. The present species does not appear to have been recorded, but it is so nearly like the *Chermes abietis* that the remedies against the attacks of that species usually recommended may safely be presumed to apply equally well to either one or the other. As a general rule, it may be stated that if only one or two trees out of a number are attacked, it is best to cut them down and destroy the young branches, shoots, and foliage before the insect spreads. If, however, too many trees are affected to allow of such a course, one or the other of the following remedies should be tried:—

1. Kerosene emulsion made as follows:—Take one-fourth of a pound of hard soap, preferably whale-oil soap, and one quart of water. Heat this till the soap is dissolved, then add one pint of kerosene oil, and agitate till a permanent mixture or emulsion is formed. The agitation is easily secured by the use of a force pump, pumping the liquid with force back into the vessel holding it. Then add water so that there shall be kerosene in the proportion of 1 to 15, making 8 quarts in all.

2. To every 36 gallons of water add half a pound of perchloride of mercury, drench the trees on a dry day.
3. To 36 gallons of water add 60 lb. of soft soap. Then add either 14 lb. of bitter aloes or 2 lb of tobacco and boil together. Before using, add 36 gallons of water to every gallon of this mixture.

These mixtures should be applied with a machine spray. Several applications may be necessary.

Mussel-scale (*Mytilaspis pomorum*) at Armidale.

Messrs. Jackes Bros., Armidale, send specimens of the well-known mussel-Scale of the apple (*Mytilaspis pomorum*, Bouché), a species which is also very destructive to pear and plum trees. A good remedy is to apply 1 oz. soft-soap, 1 lb. tobacco water, and four handfuls of sulphur, to 1 gallon of water. This mixture should be applied with a stiff painter's brush to every part of the tree affected with the scale, and it should be thoroughly rubbed in. For the destruction of the young larvæ, which hatch beneath the mussel-shaped mother scale, the application of washing soda in water, in the form of spray, made by dissolving ½ a lb. or more in a pail, has been recommended, and so also has the application of linseed oil. Another, and perhaps the best means of killing the larvæ, is by means of kerosene emulsion, made as follows:

Kerosene oil	2 gallons
Common soap	½ lb.
Water	1 gallon

Dissolve the soap in the water, and heat the solution, adding it, boiling hot, to the kerosene. Churn the mixture with a force-pump and spray-nozzle for five or ten minutes, when the emulsion, if perfect, forms a cream which thickens on cooling, and should adhere without oiliness to the surface of glass. Dilute this emulsion with from ten to twelve times its bulk of cold water, and spray it on the trees. Several applications may be necessary. The spring and early summer—whenever, in fact, the young are found to have left the mother-scales—is the season to apply these latter remedies.

Orange Rust-mite at Emu Plains.

On Saturday, April 19th, the Director of Agriculture (Mr. Anderson) and I, had an opportunity of observing the ravages committed by the rust-mite (*Phytoptus oleivorus*, Ashm.) in several orange orchards in the neighbourhood of Emu Plains. Large quantities of fruit were found to be seriously affected, and we succeeded in securing a number of mites in various stages of growth from green oranges and foliage which we gathered.

Mr. G. Dempsey informed us that he had used sulphur and washing-soap on a number of trees affected with the pest, and that the application appeared to be attended with excellent results, and he kindly showed us the trees, an inspection of which entirely bore out his statements. It would be interesting to have particulars of the effects of whale-oil, or other animal oil soaps, applied in the proportion of 1 lb. of soap to 50 gallons of water, and it is to be hoped that orchardists who are troubled with this rust-mite, will make the necessary experiments and report the results.

Phylloxera.*

THE grape phylloxera has continued to attract the attention, not only of most European Governments, but also of those of Australia and New Zealand. It continues its spread in France, having at last invaded the more valuable champagne districts. The last report of the Superior Phylloxera Commission of that country shows that about 240,000 acres have undergone defensive measures, submersion being employed in 72,000, bisulphide of carbon in 145,000, and sulphocarbonate of potassium in 23,000. The work is practically at an end in such departments as Hérault, Gard, and Gironde, where the American resistant vines have most effectually been used; while the wine growers of Algeria, Spain, Italy, Portugal, Hungary, Austria, and Switzerland are all battling against it, and are all more or less aided by their respective Governments.

The advent of the insect in New Zealand has been the cause of much writing and of much legislation there, and the Government has been quite anxious to get the best and latest information on the subject. There is very little that is available in the way of published experience in this country, as my Missouri reports are now very difficult to obtain. I would repeat here in substance what I have recently written to Sir F. D. Bell, Agent-General at London for New Zealand, because the demand for the information is continuous, and our own people are, to a great extent, unfamiliar with the facts.

During the more than twenty years' struggle in France against the species, innumerable remedies have been proposed, most of which have proved to be absolutely valueless. A few measures have been devised, however, which, under proper conditions, give fairly satisfactory results. These consist in (1) methods which avoid the necessity of direct treatment, comprising the use of American stocks, and planting in sandy soils; (2) the employment of insecticides (bisulphide of carbon, sulphocarbonate of potassium, and the kerosene emulsion); and (3) submersion.

It was early found in the history of this phylloxera, that most of the cultivated varieties of American grape vines, as also the wild species, resisted, or were little subject to, the attacks of the root form (*radicicola*) of the phylloxera, although the leaf form (*gallicola*), which, in point of fact, does little, if any, permanent damage, occurs in greater numbers on many of our wild and cultivated sorts than on the European grape-vines, which are all derived from the single species, *Vitis vinifera*, and which are so exceedingly subject to the attacks of the root form. This fact was first noticed in France by M. Laliman, of Bordeaux, and later by Gaston Bazille, of Montpellier, and was independently proved on a more extended scale by my earlier investigations

* This article is an extract from the address of the President of the Association of Economic Entomologists (Dr. C. V. Riley), delivered at the second annual meeting of the association, held at Champaign, Illinois, U.S.A., on November 11th, 12th, and 13th, 1890. It is reprinted *verbatim* from the Proceedings of the Association, as officially reported in *Insect Life*, vol. III., No. 5, pp. 185-189 (1891).

in the United States. The use of American stocks upon which to cultivate the susceptible European varieties has resulted in an enormous trade in certain American seeds and cuttings, and now supersedes all other methods against the insect.

It was my privilege and pleasure to spend a week in August, 1889, among the world renowned Médoc and Sauterne vineyards of the Bordeaux district in France. Here, by virtue of the rich alluvial soil and the ease with which the chief vineyards can be submerged, the phylloxera has made slower headway, and the opposition to the use of American resistant stocks has been greatest. Yet they have finally vanquished prejudice, and are, either from necessity or choice, rapidly coming into general use. When I say choice, I mean that even where the French vines yet do well, and the phylloxera is kept in subjection by other means, it is found that great vigour of growth and increase in healthfulness and yield of fruit result at once from the use of American stocks.

Without going into a lengthy discussion of the subject of wild American species, those of practical importance to the grape-grower are the following: *Vitis æstivalis*, *V. riparia*, and *V. labrusca*.

The varieties derived from *V. æstivalis* are of value for their fruit as well as for their resistant qualities, and being easily propagated from cuttings, they are very often used in France as stocks. The most important varieties are Jacquez, Herbemont, Black July, and Cunningham.

The varieties of *Vitis riparia*, both wild and cultivated, are, on account of their special fitness, almost exclusively employed in France as resistant stocks, for which they easily take first rank. The varieties used are, first, the wild forms; and, second, the cultivated varieties—Solonis, Clinton, and Taylor. Of the cultivated varieties, the Clinton was one of the first vines tried for this purpose, and has been extensively used with fair satisfaction. The Solonis now ranks above it, but is valueless for any other purpose on account of the acidity of its grapes. In California, the Lenoir, Herbemont, and Elvira, have been used, but late experience shows that the wild Riparia is most satisfactory there, as it is in France.

The different varieties of *Vitis labrusca* are less resistant to the phylloxera than those above-mentioned. Certain varieties have, however, been grown successfully in France, and of these the Concord has given much the best results; but others, Isabella and Catawba, for example, succumb there to the root-louse, as indeed they do in many sections of this country.

Of the many valuable hybrids obtained from the American species of *Vitis* which are serviceable as stocks, the more important are the Elvira, Noah, and Viala. The last named, perhaps, of all the resistant varieties, gives the greatest percentage of successful grafts, and is admirably adapted for grafting on cuttings.

Early in the study of the subject, it was found that the nature of the soil has a very marked influence on the success of the different stocks. The subject has now been quite fully investigated in France, and the latest researches are formulated by the experimental school at Montpellier in the statement quoted below, which will be of interest as giving the various classes of soil, together with the American vines best adapted to each.

1. New, deep, fertile soils: Riparia (tomentous and glabrous), Jacquez, Solonis, Viala, Taylor, and Cunningham.
2. Deep soils, somewhat strong, not wet: Jacquez, Riparia, Solonis, Cunningham, Viala, Taylor.

3. Deep soils of medium consistency, new, and not dry in summer: Riparia, Jacquez, Solonis, Viala, Taylor, Black July.
4. Light pebbly soils, deep, well drained, and not too dry in summer: Jacquez, Riparia (wild), Taylor, Rupestris.
5. Calcareous soils, with subsoil shallow or granitic: Solonis, Rupestris.
6. Argillaceous soils, white or grey: Cunningham.
7. Argillaceous soils, deep, and very wet: *V. cinerea.*
8. Deep, sandy, fertile soils: Riparia (wild), Solonis, Jacquez, Cunningham, Black July, Rupestris.
9. Light, pebbly soils, dry and barren: Rupestris, York, Madeira, Riparia (wild).
10. Deep soils, with a tufa base and salt lands: Salonis.
11. Soils formed of debris of tufa, but sufficiently deep: Taylor.
12. Ferruginous soils, containing red pebbles of silicia, deep and somewhat strong, well drained, but fresh in summer: All the varieties indicated, and in addition, Herbemont, Clinton, Cynthiana, Marion, Concord, Herman.

The accompanying table from the last report of the Superior Phylloxera Commission indicates, better than words can tell, the steady growth in the use of American vines:—

Years.	American vines covered.	Departments.
1881	22,000 acres	17
1882	42,700 ,, ...	22
1883	70,000 ,, ...	28
1884	131,909 ,, ...	34
1885	188,200 ,, ...	34
1886	276,900 ,, ...	37
1887	413,700 ,, ...	38
1888	536,900 ,, ...	43
1889	719,500 ,, ...	44

On the subject of direct remedies, the value of the kerosene emulsion for this purpose has not been properly realised in France, because of the relatively high price of petroleum, in her grape-growing departments. A series of experiments, which I made in 1883, showed conclusively its great value for this purpose, as it not only destroys the insect in all stages but also stimulates root growth.

In this connection I have recently had a series of experiments made, through Mr. Albert Koebele's agency, in the Sonoma Valley, California, to ascertain the effect upon the phylloxera of certain of the resin washes which proved so valuable when used against the fluted and other scale-insects. The results have been quite encouraging, and the experiments have already shown that in the use of these washes we have a valuable addition to the underground remedies. Soaps were made by the use of bicarbonate of soda, sal soda, and caustic soda, each mixed with resin. In the earlier experiments the earth was removed about the base of the vine to a depth of 6 inches and for a diameter of 4 feet. Ten gallons of the mixture were poured into each hole, and found to penetrate from 12 to 16 inches, or from 18 to 22 inches from the original surface of the ground. Most of the insects, as also the eggs, were destroyed to a depth of 16 inches. In the later experiments the holes were made only about 2 feet in diameter, and nearly, if not quite, the same results were obtained with half the amount, or 5 gallons of the mixture. The plan, which I have previously adopted for the application of insecticides to underground insects, of washing the mixture in with pure water, was tried with good success. Soon after the first application, 5 gallons of water were added, and 5 gallons more the following day.

This would indicate that in the spring, when rains are frequent (occurring almost every day), in the Sonoma Valley, only a small amount of the mixture need be applied, and the rains will do the rest, as examination has shown that up to a certain point each application of water intensifies and extends the action of the original insecticide. The best soap was made with bicarbonate of soda, but the results of that made with caustic soda are so little inferior, while the price is so much less, that the caustic soda and resin soap mixture is the one which I would recommend. The formula which was found preferable is as follows:—

Caustic soda (77 per cent.)	5 lb.
Resin	40 „
Water to make 50 gallons.	

The soda should be dissolved, over a fire, in 4 gallons of water, then the resin should be added and dissolved. After this the required water can be added slowly, while boiling, to make the 50 gallons of the compound. To this, water may be added at the rate of 9 gallons for 1, making 500 gallons of the dilute compound, sufficient for 100 large vines, at a cost of only 84 cents, or less than a cent a vine.

Considering the effective way in which the ravaged vineyards of France have been, and are being, redeemed by the use of resistant American stocks, and considering the efficacy of some of the direct remedies discovered, it is passing strange that no disposition has ever been made of the premium of 300,000 francs offered in the early history of the trouble by the French Government. It cannot be awarded to any one person, but should be distributed among those whose labours and discoveries resulted in the several feasible and satisfactory methods of coping with the insect.

The Pig.

Swine-breeding and Rearing.

The following article is taken from the Report of the Bureau of Animal Industry connected with the United States Department of Agriculture for the years 1887 and 1888:—

The United States stands easily first among nations in the number of its swine. There has been some decrease in the last few years, but the estimates of the Department of Agriculture gives the number, January 1, 1888, as 43,544,755, or nearly 75 for each 100 of human population. This estimate is made at the season of the year when the total number is nearly at its minimum, as a very large percentage of the pigs are produced in the spring months, and vast numbers of fattened hogs are sent to slaughter during the closing months of the year.

The abundant and cheap production of Indian corn is the controlling factor in pork-production in the United States. Thus, the seven great corn-producing states are estimated to have had, in round numbers, 20,800,000 hogs, or almost half the total number, and an average of nearly 3,000,000 for each state. Their respective rank was Iowa, Missouri, Illinois, Ohio, Kansas, Indiana, and Nebraska. No other state had 2,000,000 hogs, save Texas, and the poor quality of these largely offset the large numbers.

The rapidity with which swine increase, the early age at which they may be profitably sent to market, the ease with which the meat may be preserved for future use, and the large use made of the fat, as also the abundance of maize so well adapted as a fattening food, have made swine-breeding popular in all the great Indian corn-growing regions, while the readiness with which one or more pigs may be utilised as profitable means of consuming waste products from the table and the dairy have caused farmers and many village residents in almost every part of the country to annually fatten at least a few pigs.

Much attention has been given to the improvement of the hogs of the country, and it is believed those of no other country surpass the best in the United States.

There is a large number of distinct breeds, but several of these closely resemble each other, except in comparatively unimportant characteristics, and there is a noticeable tendency in the most popular breeds towards greater similarity. Early maturity, medium to large size, quiet disposition, and the ability to lay on flesh rapidly, even at an early age, are the qualities chiefly desired. No breed not above a fair medium size is in general favour in the great pork-producing regions, although several of the smaller breeds are highly prized for village pigs or on farms where but few swine are kept. It is also noticeable that swine of the dark-coloured breeds far outnumber those white in colour.

The breed most generally found on the farms in the great hog-rearing states is the Poland-China, a name somewhat inappropriately given to a breed originating in south-western Ohio, as the product of crossing hogs of various breeds, among which were hogs imported from China, and, in the opinion of a minority, some brought from Poland. The Berkshire was used at different times. Whatever its exact origin, the Poland-China has now marked uniformity. It is almost entirely black in colour, although there is little prejudice against white spots on any part of the body. The ear droops at the side of a moderately dished face. The body is deep, legs short. The disposition is noticeably quiet. While reaching great size at maturity—weights of 1,000 lb. not being unknown—the young pigs of this breed are readily made fit for market.

The Berkshire stands second in number and general popularity, and perhaps may be said to be a more fashionable breed than the Poland-China. As bred in the United States, it retains the characteristics which made it popular in England. It is usually uniform in colour and appearance, the white extremeties and black-haired body, erect ears, dishing face, somewhat prominent shoulders, well-rounded body, large hams, and appearance of vigour and vitality being readily recognised by any one who has seen even a few specimens. Of late years the average size has been increased without injury to the superior quality of the flesh.

The Chester White is the name of another breed of American development, the name being that of the county in Pennsylvania in which it first gained celebrity. Various crosses were used in producing the breed, and probably quite as much of its good reputation was due to skilful selection and good management on the part of breeders as to the merits of the foundation breeds. Except for its white colour, it is not unlike the Poland-China. The prejudice against white hogs on the part of so many farmers is a chief reason why it is not more widely bred, as no breed has more earnest friends among good swine-raisers.

Within the last ten years much favourable attention has been attracted by a breed known by different names, and the origin of which it is not easy to fully trace, but now most generally called the Duroc-Jersey, the first name having been arbitrarily given, the second referring to New Jersey, in which State these hogs were largely bred. Many are a dark red or "sandy" colour, of large size and, as bred a few years ago, somewhat coarse in bone. They are hardy, and when crossed in breeds which had become perhaps overly fine-boned, the results were often very satisfactory. The breed has a good standing in most of the pork-producing regions.

Of other breeds, of which there are large numbers, although small in comparison with the total number of swine in the country, may be mentioned the Essex, a pure black breed of small to medium size ; and the small Yorkshire, of similar size, but white in colour, both breeds being noted for early maturity and the ease with which they can be fattened, and both well adapted for crossing with the larger breeds. There are a number of other breeds of good repute in comparatively limited localities.

A much larger percentage of hogs than cattle are nearly or quite pure bred, or else are the product of intentional crossing of distinct breeds. Many good hog-raisers believe cross-bred animals are preferable to those nearly quite pure of one breed. In some parts of the country, especially in some of the more southern States, and in regions where the abundance of forest trees tempts the farmers to allow their hogs to get much of their living from the nuts and roots, the hogs are of inferier quality, often slow in

coming to maturity, and of small size, wild in disposition, active and muscular; but the animals of this description small but a form minority of the total.

As in the case of cattle, the methods of swine-rearing and feeding most approved in the United States, as shown by most general practice, are characterised by simplicity, the absence of complicated rations, and anything which tends to much increase the quantity of human labour necessary. There is much diversity in the methods pursued with village-kept pigs or those reared in sections were land and grains are high-priced; but these pigs are chiefly designed for home consumption, rarely reaching the public markets.

In striking contrast with modes of keeping in many countries, the traveller among the farms where hogs are chiefly grown in the central west will, during the summer, almost as certainly find the hogs grazing in the fields or in large grass or clover flats, especially reserved for them, as he will the cattle. This general recognition of the fact that the pig is a grazing animal has much to do with the cheapness with which pork is produced, and does much to secure healthfulness among the hogs, largely counteracting the ill-effects produced by another practice, concerning which there has been much adverse criticism of American farmers—that of using Indian corn too exclusively in fattening hogs as their food ration during the winter months.

The more common practice in the Western States among farmers who rear from a score to one or two hundred pigs each year, is to have the litters dropped in April or May; if early, in comfortable but often cheaply constructed shelters; if later, in the fields or grass yards prepared for them. As early as practicable the pigs are taught to eat grain, are fed on corn, oats, or rye, sometimes dry, but frequently soaked in water or in "slops," or ground and mixed with milk or water. Generally, large liberty is given. The practice of "ringing," or inserting a wire ring in the nose, thus preventing rooting, is very common, and allows the greater freedom on the grass and clover land, of which there are usually small fields especially fenced for the hogs. The pigs are weaned at from eight to ten weeks of age, after which the sows are frequently at once put on full grain feed, and sent to market in the early autumn, or are bred so as to produce a second litter in the autumn.

The practice of fattening the earlier litters of pigs so as to send them to market when from eight to ten months old, is growing in favour. The later litters, and those dropped in the autumn months, are kept over the winter and fattened either in the spring or next autumn. Except the brood sows, but a small proportion of the hogs in the best pork-growing regions are now kept until they are eighteen months old.

As has been stated, hundreds of thousands of cattle are annually fattened in the Western States by feeding them on Indian corn, either "in the ear" or shelled, but unground. A considerable percentage of the grain so fed passes through the animal undigested, and it is almost an essential to profit that this grain should be secured by hogs. While the practice is sometimes regarded as offensive by the fastidious, there are few methods of feeding by which hogs can be made to grow more rapidly or be kept in more vigorous health than when they have an abundance of such grain, and also good grass and clover.

When cattle are not so fattened, it is a common custom to feed the growing pigs about half as much grain as they would eat during the summer, letting them get the remainder of their food by grazing. As soon as the maize is in, or a little past what is known as "roasting-ear" stage, liberal feeding of

this is often commenced, in many cases the stalks being cut and fed with the ears. Of this green corn hogs are very fond, and gain in weight rapidly on it, especially if they have not been grain-fed during the summer. For finishing the fattening process, mature corn is preferred. The fattening period proper rarely continues over eight to ten weeks. During this time, especially as cold weather comes on, the hogs are most commonly kept in smaller enclosures, so as to keep them more quiet. Many farmers, but only a small percentage of the total, keep their hogs in small pens or houses almost continuously, either because, under some special circumstances, this is the more convenient method, or with a view to securing especially rapid developments. Large numbers are fattened at cheese factories or other factories at which there is a considerable by-product of vegetable or animal matter; but, relatively, these are exceptional methods. This may be said to be true, in a measure, of feeding ground grains or cooked foods to fatten hogs, although the use of meals, bran, and of oil-cake is practiced by thousands. It is certainly true that the great mass of the hogs which are slaughtered in the great markets of the country have been fattened almost exclusively on Indian corn, grass, and clover.

Two notable changes in the market demands in comparatively recent years have greatly influenced the practice of breeders. These changes are—a vast increase in the demand for hogs of comparatively light weight, and a fairly uniform demand throughout the year. Formerly the percentage of hogs slaughtered in the summer months was very small, and the largest demand was for heavy weights. Now, large numbers are slaughtered every week during the year, the highest prices often being paid during the spring or early autumn months, and there is a very large demand for hogs weighing 200 lb. or less. The average weight of all hogs received in Chicago in 1887 was 228 lb.; in 1888, 229 lb. The average weight of those received in December, 1888, was 262 lb., an unusually heavy weight, largely consequent on an abundant and rather low-priced crop of Indian corn.

The hogs exhibited year after year at the fat-stock show at Chicago may be taken as typical specimens of the best fat hogs of the country. While the weights are often great for age, considerable regard is paid by most exhibitors to quality of the carcass and symmetry of form. The average weight of the hogs of all breeds and crosses, over one year and under two years, exhibited at this show during eight consecutive years, was 436 lb.; of those under one year the average weight was 303 lb. The heaviest hogs over one and under two years at these shows averaged 591 lb., at an average of 428 days, or a gain of 1·15 lb. per day from birth. Of those under one year the average was 269 lb., at 207 days, or 1·30 lb. gain per day. The percentage of weight of dressed carcass, including head, to live weight of the hogs slaughtered at this show, during a series of years was 86.

Few classes of live-stock breeders in the United States have manifested more skill, energy, and perseverance than have the breeders of pure swine. Each breed is represented by National and State Associations, and each has one or more public records of pedigrees. Many of the animals that are recorded can be traced back for several generations. Remarkably high prices are often paid for choice animals for breeding purposes. There are some hundreds of intelligent farmers who make the breeding of pure-bred swine the chief or a leading portion of their work. From some of these breeding farms, there are annually sold from 500 to 1,000 well bred pigs to used as sires or dams by other farmers who rear hogs chiefly for the general pork markets. These breeders have done much to improve the hogs of the country, and to stimulate interest in swine husbandry. On the other hand,

the large number engaged in such breeding, and their general prosperity, is evidence of the adaptation of the soil, climate, and crops of the country to profitable swine rearing.

The chief obstacle to the further extension of the industry is the occasionally great loss caused by disease, popularly known as hog-cholera. In some years the losses from this cause have been enormously great. Fortunately, during the year 1888 there was comparatively little of disease, and pork-producers have received prices giving a fair profit. The unusually light crop of Indian corn in 1887 did much, however, to reduce the number reared in 1888, the total number slaughtered during that year being considerably less than the average for recent years.

Naturally, the centre of the pork-producing district is moving westward with the growing population of the great corn-producing States, west of the Mississippi River. Taking the chief hog-raising States as a whole, and the average value of Indian corn on the farms where produced is certainly not over ½ cent. per lb. Judiciously fed to good hogs, from 5 to 6 lb. of corn will produce 1 lb. of pork; under favourable conditions, 4 lb. will cause 1 lb. of increase. A good part of the weight of the fattened hog has been made at even less cost, from grass or clover, or from food that would otherwise have been wasted. One year with another, the producer has been able to get at least 4 cents. per lb. for his live hog. It is evident that, if there were no losses from disease or other unfavourable circumstances, the business would give a good profit, with a probability that the numbers reared would soon be so great as to materially lower prices. There have been marked fluctuations both in numbers and price in recent years, with some reduction of the total number. From various causes, the exports of pork to foreign countries have fallen off. Lower prices for beef, and a growing appreciation of mutton have tended to check the home demand; but there is every reason to believe that the United States will long remain the greatest swine-rearing nation, and that pork production will continue to be a profitable branch of American agriculture.

Pig Raising and Pork Making.*

By PROFESSOR E. M. SHELTON,
Queensland.

Since the time of my arrival in the Colony I have been impressed with the suitableness of the natural conditions here existing for pig-raising. We have over most of the Colony a temperate climate, and a soil which produces enormously of those fruits, vegetables, and grains, which experience has shown to be most useful in producing cheap and healthy pork. Comparing our own Colony with those countries in which pig-raising has a large and established place in the economy of every farm, we see at a glance how large and important these advantages are. In England, the United States, and Canada, for at least six months of every year, pigs must be fed wholly upon foods, mostly expensive grains, which have been grown during the preceding half year. During one half of every year the pig can get nothing directly from the ground. Moreover, during all this time he must be warmly housed and bedded in a necessarily expensive building. The pig loves a temperate climate, but where other conditions, as food, water, and shelter are suitable,

* Bulletin (No. 1), Department of Agriculture, Queensland.

he is not averse to a hot one. The success which has attended pig-raising in China, Siam, and Southern Europe is proof enough of this. In the tropical portions of Queensland, along the Herbert River, the Burdekin, the Pioneer, and elsewhere, the existence of great droves of wild hogs—the descendants of animals which escaped from the early settlers—was reported to me in the course of my recent visit to the North. These "wild hogs" not merely exist and multiply, but, according to all accounts, find in scrub and forest lands all that is needed for the attainment of great perfection in bone and flesh. Moreover, swine in Queensland, from all the evidence at hand, enjoy a remarkable immunity from diseases of all kinds. I have been unable to discover a single disease of swine, endemic or epidemic, although I have questioned scores of our farmers and others on this point. Contrast this condition of things with the fact that in the United States of America, the greatest of all pork-producing nations, swine plague alone, a disease which has never been stamped out or even held in check by man, costs the farmers of that country, in losses of swine, annually, from two to six millions of pounds.*

* * * * * * *

In 1888 there were marketed in the single city of Chicago 4,921,712 pigs, having an average weight of 242 $\frac{3}{10}$ lb., and an average value of £1 1s. 6d. The receipt of pigs in Chicago on one day amounted to 66,597. How the pig figures as a factor in the national wealth may be inferred from the fact that the exports of American pork products alone in 1888 aggregated the enormous total of £12,357,307. These facts are suggestive of great possibilities to Queensland farmers north and south.

A very large portion of the bacon and hams imported into Queensland come nominally from London. The truth is, however, that the "English" hams and bacon sold by our dealers comes from Kansas City or Chicago, *via* London or some other English port. England is not in any large commercial sense a pork-producing country. On the contrary, she is an enormous importer of pork in every form. The proprietor of one of the largest "packing houses" in Kansas City told the writer, about a year ago, that during the previous year his firm had worked up no fewer than 250,000 hogs for the English market exclusively. These "English" meats, then, after having been made by the American prairie farmer, under conditions not more favourable for pork making, I am convinced, than those prevailing in Queensland, pay a profit to the Kansas City or Chicago manufacturer, pay railway freights to the Atlantic seaboard, 1,500 miles distant, and charges for shipment across the Atlantic; give a profit to the London dealer, and pay for ocean carriage from London to Queensland, a distance of more than 14,000 miles. These facts raise a question in my mind of vast importance, not merely to farmers but to every class of citizen. We are just now moving heaven and earth to find a market for our great surplus of beef and mutton; expensive abattoirs are being erected, and cars and ships fitted up solely with the object of carrying dressed beef and mutton to England. Would it not be a shrewd, common-sense move on our part to save freights, at least one way, by growing our own pork? To aid in the accomplishment of this object is the purpose of this paper.

A Chance for the Bright Young Man.

I am told on excellent authority that many grand fortunes have been made in the Southern Colonies of Australia through attention to pig raising as a

* See p. 15, Report of United States Department of Agriculture for 1886.

branch of farming. The like opportunities for successful work exist in Queensland, I have every reason to know. Let the enterprising young man, who finds business in other directions failing or gone, start anew with a small farm, leased it may be, but farmed with the purpose of converting nearly everything grown into pork. The capital required to start such an enterprise is small, but he will be surprised at the large amount of work that can be done by one man in a system of farming which is complete in itself, involving both the growth of raw materials and their conversion into the manufactured article; and he will be astonished at the profits accruing. How all this may be done will be explained further on. For the present, I wish to call attention to certain matters of the nature of general information.

The Kind of Pig.

The pig best suited to the requirements of Queensland farming is a medium sized, early maturing, active animal—one which, in American parlance, is a good "rustler" and feeds readily without becoming "fat." He need not be purely bred; indeed, a high grade of a given breed will most likely prove a more profitable animal to the average farmer than one of pure blood. In the pig, as elsewhere, a high development of valuable qualities is likely to be associated with as great weaknesses. However, to get the high grade we must have the pure-bred on one branch of the ancestral tree or the other. Bacon is the end towards which all the operations of pig-farming must in Queensland be directed. Our colonists, in common with English people, generally prefer smoked meat to the "mess pork" so largely used in America, and elsewhere in cold climates. Our pig must, when fully developed, be an animal of medium size—one marketable at 160 lb. weight is large enough; but he ought to have long sides and well sprung ribs, and his flesh must show that admixture of lean and fat which is spoken of as marbled. The Berkshire will come nearer to filling these requirements than any other breed. Those breeds, or families, which ripen into mere cylinders of fat, are of little worth for use in the manufacture of bacon. No other breed is more active and hardy than the Berkshire. He is unsurpassed in the quality of his flesh, and the females of this race have no superiors as good mothers, and the producers of large litters. Next to the Berkshire, especially for grading up inferior herds, I should place the Essex, although as a pure bred he comes far short of our requirements. The Essex pig is an unequalled feeder, and the quality of his meat leaves little to be desired; but he is lazy and unenterprising, and in the course of a large experience with the breed they have shown themselves, in both sexes, to be often shy breeders.

The Small White Breeds.

Yorkshires, Lancashires, Suffolks, and Victorias are, for many reasons, worthless for Queensland agriculture; but the thin, papery skin, generally associated with the white colour, is alone a sufficient objection. American experiences give point to this statement. From the great pork-producing States, a region of great heat and cold, the white pig has practically been banished years ago. The tendency to mange, sun blistering, and an unthrifty condition of the hair and skin, have always been notable weaknesses in the white pig. Careful estimates show that not more than 3 or 4 per cent. of the swine kept in the prairie States now show white skins and hair. I have frequently noticed in watching the process of unloading hogs at the great markets at Chicago and Kansas City, that half-a-dozen car loads would be

discharged in succession, every animal of which was nearly or quite black. The black of the Berkshire and Essex breeds, it should be observed, is not even "skin deep." The process of "scalding," which removes the outer or scarf skin, leaves the carcase as perfect a pink white as any of the white breeds can show.

The Cost of a Pound of Pork.

Many experiments have been made in England and America with the object of showing the actual cost of producing a pound of gain by the different pig foods. The results of these feeding trials are instructive to us, even if the experiments have not a distinct application to our circumstances. Of all domestic animals, the pig utilises the largest amount of the food which he consumes. Messrs. Lawes and Gilbert found, as a result of their very elaborate experiments, that oxen used—that is, converted into flesh and bone—8 per cent. of the dry substance of food consumed; sheep, 12 per cent; and pigs, 20 per cent. Of course the pig food employed was more concentrated and digestible than those given to the sheep or cattle. The following data were wrought out in a long series of experiments made by myself at the Kansas State Agricultural College:—

On ½ acre of lucerne was depastured, by a variable number of hogs, six months, with a resultant gain in weight by the lot of 388 lb.

Ten full grown pigs were fattened on shelled maize; 5·8 lb. of maize gave 1 lb. of increase; 1 bushel of maize yielded 9·7 lb. of gain.

Ten weanling pigs were fed on new milk and pollard, and pollard alone, result 5·1 lb. of milk and 2·6 lb. of pollard, and 4·2 lb. of pollard alone gave 1 lb. of increase.

Fifteen full grown hogs were fattened on maize meal with the average result that 5·4 lb. of meal gave 1 lb. of gain, or one bushel of maize gave 10·3 lb. of pork.

Five hogs were fattened on cooked maize and five on raw; the cooked gave 1 lb. of increase for each 7·5 lb. of feed; the raw 1 lb. of gain for gain for each 6·3 lb. of feed.

Five hogs were fattened on pollard and bran, cooked, in the proportion of two of the former to one of the latter, and five at another season on the same materials in like proportions, with the result that the cooked gave 1 lb. of gain for each 4·66 lb. of the mixture fed, and of the raw 5·35 lb. of feed gave 1 lb. of increase in the weights of the pigs.

Five hogs fed on maize meal and English potatoes, cooked in equal parts, gave 1 lb. of gain for each 6 lb. of the mixed feed.

In presenting these experimental results, details have of necessity been omitted. Without doubt much better results would be given by like food and treatment in Queensland, because (1) the animals here referred to were in most cases very heavy hogs, which (2) were made very fat, and (3) the feeding was done in most cases in the midst of severe winter weather. In Queensland we shall almost certainly feed bacon pigs to a moderate fleshiness only, and always in mild weather. These facts do show plainly enough that at prevailing prices of maize and meat in Queensland, maize cannot be used in any considerable quantity as food for pigs. With the possible exception of a small amount of maize used for finishing off porkers, we must use for the most part in our pig-feeding operations, additional to milk, house slops, &c., such food as lucerne, sweet potatoes, peas, and like inexpensive green stuff. Fortunately, all experience shows that these foods make the most healthy pigs and a superior article of meat at the lowest cost.

The subjoined table will aid the farmer in forming a judgment as to the value of his maize crop when reduced to pork. I assume, in the first horizontal column on the left, that the poorest quality of stock fed in the crudest manner will give 9 lb. of gain to the bushel of maize. Younger stock of better quality may reasonably be expected, as experiments show to be the case, to give the larger returns of the second and third columns. The value of the manure on the one hand, and the cost of feeding, &c., on the other, are not considered in this statement. We can often feed maize profitably when the increase yielded is worth no more, or even less, than the market value of the corn consumed in making it. In "finishing off" a thin pig, we get not only the actual gain made in feeding the grain, but also added value to every pound of the original thin and comparatively worthless pig:—

	Pork lbs. per bushel of maize.	Value of pork, alive, 2d. to 8d. per lb.													
		2.		3.		4.		5.		6.		7.		8.	
		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Common stock, maize fed on cob	9	1	6	2	3	3	0	3	9	4	6	5	3	6	0
Better stock, fed shelled maize	12	2	0	3	0	4	0	5	0	6	0	7	0	8	0
Best young stock	13	2	2	3	3	4	4	5	5	6	6	7	7	8	8

Cooked and raw feed compared.

There has always been a considerable diversity of opinion among farmers as to the advantages of cooking feed for swine and other stock. While many feeders hold to the theoretical view that cooking pays, an influential minority asserts to the contrary, and nearly all, it may be said, do not cook feed for various reasons. The cost of fuel and cooking apparatus, and the labour involved in the process have, in the United States and in the Colonies, generally deterred even those who would give cooking a trial. Whatever our views may be on this question, the fact remains that the great bulk of the pork of commerce is made from materials fed in the raw state. The writer has had a very wide range of practical experience with cooked foods for cattle and pigs, and has no hesitation in saying that the practice is a losing one. All of the experiments made to test this point, without exception to my knowledge, show that without considering the cost of cooking, the difference was always in favour of the uncooked feed.

The following facts obtained from American sources refer to pig-feeding in every case. Experiments made at the Wisconsin Experiment Station with barley meal cooked and raw (four trials), and with maize cooked and raw (six trials), showed a loss for cooking in every case, the loss amounting from 4 to 19 per cent. Two trials of cooked and uncooked peas made at the Ontario Agricultural College (Canada), showed the loss by cooking to amount to 15 per cent. At the Maine Agricultural College nine trials were given cooked and uncooked maize, with a resultant loss for cooking averaging 17 per cent. My own experiments made to test this point show a loss for cooked maize of 16 per cent. These unquestioned facts, showing as they do such entire unanimity in results had with foods in considerable variety, must be accounted conclusive upon the matter under consideration. Cooking is to food a more or less destructive process. It adds to the flavour of food, but it does so at the expense of digestibility, as accurate experiments made to test this point show. Moreover, cooked food contains a much larger

proportion of water than uncooked, so that the daily consumption of food, aside from water, is considerably less than where raw food is used, a fact sufficient alone to explain to the minds of the most experienced feeders the losses resulting from cooking.

Quantity of meat influenced by feed.

While the quality of meat, the relative amount of lean and fat, the proportion of bone and offal, will depend greatly upon breed and habit—exercise—it is equally true that we may vary the proportion of these in *young pigs* through the agency of food alone. With hogs that have attained a full development of bone and muscle, no food seems to have much advantage over another in increasing the amount of lean meat or of bone. The general principal, as shown by the experiments of Professors Sandborn and Henry, of America, experiments which I have fully verified, seems to be this: that nitrogenous foods, like milk, peas, beans, clover, lucerne, pollard, and bran, give the strongest, densest bone, the largest development of lean meat, the greatest quantity of blood, and the best developed vital organs, *i.e.*, heart, stomach, liver, spleen, kidneys, &c. On the other hand, young pigs fed exclusively on carbonaceous food, like maize, potatoes and barley, develop a relatively larger amount of fat with a smaller amount of lean meat and blood, and weaker bones and vital organs. The practical lesson of all this plainly is that young pigs and, inferentially, young stock of every kind should be fed on a mixed diet, made up largely of foods rich in nitrogen. What those foods are will be easily seen by a glance at the table given further on. For young pigs, no single food equals milk, and nothing is better than milk for making superior pork from mature animals. The milk will, in nearly all cases, be fed to best advantage by mixing it with pollard when for young pigs, and with maize meal when fed to mature hogs. Maize, barley meal, and like starchy and sugary foods ought to be reserved for the process of finishing off mature animals, unless mixed largely with foods richer in nitrogen.

The table following is given with the view to aiding in forming judgment as to the feeding value of familiar agricultural products. While the column headed "Flesh formers" gives the actual amount of nitrogenous materials—albumen and protein—contained in each article, its value for this purpose depends not upon the actual amount of nitrogenous or plastic material contained in the food, but in the amount relative to the other materials:—

	Water.	Flesh Formers.	Heat and Fat Givers.	Mineral Matter.
Barley	15·1	8·0	76·0	0·9
Beans	12·0	26·0	59·0	3·0
Bran	12·28	15·07	66·75	5·70
Cotton-seed meal	8·52	42·39	42·03	7·26
Cow-pea vines (green)	84·07	3·12	10·98	1·83
Lucerne	69·95	3·83	14·44	3·64
Maize	12·0	12·0	75·5	1·5
Milk (new)	87·2	4·0	8·1	0·7
Milk (skimmed)	88·6	4·0	6·6	0·77
Oats	12·2	18·0	59·0	2·54
Peas	15·0	22·6	60·5	2·5
Pollard	12·0	15·17	69·57	3·26
Potatoes	75·0	1·4	22·6	1·0
Pumpkins	92·27	1·11	5·99	0·63

Aside from their chemical composition, foods differ greatly in their effect upon the character of meat, both fat and lean. Maize gives a much firmer, whiter pork, and one that boils away in the pot much less than that made from pollard. Peas, too, make a very firm, sweet pork, while oil-cake and oily foods in general produce a pork that is soft, flabby, and ill-flavoured.

Water and Condimentary Foods.

Pigs should be allowed constant access to fresh water. Even when their food is soft and sloppy, pigs will every day drink eagerly of pure water. Salt is as thoroughly relished by pigs as by any other class of stock, and a constant supply should be kept in every enclosure occupied by swine. My own practice has been to keep a strong box fastened securely to the ground in one corner of the pig yard or paddock, and to keep in this about equal parts of salt and wood ashes. Some add to this mixture a portion of sulphur and lime, and strong claims are put forth for the healthfulness of the pigs thus treated. But of all condiments and relishes, perhaps charcoal in some of its forms is the most craved by swine. Charcoal, while seemingly agreeable to the taste of pigs, is undoubtedly a great aid to digestion. Common coal will be found a useful substitute for wood charcoal where this is not available, but every owner should see that his pigs have ready access to carbon in some form, at all times. The charcoal made from ordinary corn cobs is exceptionally valuable for this purpose, on account of the large amount of potash which enters into their ash constituents. A conical pile of six or eight bushels of corn cobs covered lightly with straw, and then to the depth of an inch or two with earth will, after burning slowly for a day or two, give several bushels of superior cob charcoal.

The Pig for the Market.

In Queensland for the present, and almost certainly for many years to come, the markets will call for young porkers in moderate flesh only, and weighing not to exceed 160 lb. each. Such pigs need not be carried beyond the eighth month. Their growth and flesh can be made almost entirely from pasturage, and such foods as sweet potatoes, pumpkins, and lucerne, with a small amount of grain for finishing. Experienced feeders agree that young pork and pork only moderately fat is the cheapest meat that is made. Old pork is always expensive, as is that which has been thoroughly fattened. The experiments of Lawes and Gilbert, and the numerous American experiments agree with essential unanimity that in the course of the feeding process from the thin to "fat" condition, the cost in feed of making a pound of gain progressively increases week by week. In like manner there is a constant increase in the cost of gain coincident with the increase in age of the animal fed. In other words, the most expensive pork to the farmer is precisely that which is not required in Queensland—namely, the very fat meat of mature animals.

How to Breed the Pigs.

This paper is prepared for farmers rather than for the professional breeder of stud stock. Between the farmer and breeder, however, there are many things in common. The farmer must breed the stock that he feeds, and to get the largest returns from feeding he must use animals that are suited to his surroundings and the market which he supplies. Herein, at least, the

farmer and professional breeder, however much they may differ as to means and methods, are at one. Unquestionably the present stock of hogs in the Colony stands greatly in need of improvement. While Queensland cattle and sheep have been steadily gaining in quality, so that now they are quite equal to any like classes of stock found elsewhere in the world, comparatively little attention seems to have been given to the improvement of our swine. To keep up steadily the work of improvement in this common stock of the country is a necessary part of the work of the successful pork-maker. To accomplish this improvement, he must have clearly in mind a standard of porcine excellence. Improvement without an ideal is merely a matter of chance and accident. In the outset, Bakewell's celebrated aphorism comes to mind—"all is waste that is not meat." The feeder must regard his pigs as pork-making machines for the conversion of vegetable products into money. The farmer's interest in pure-bred stock will, as a rule, begin and end with the male, which practically is half of the herd. He will find in most cases that the better class of sows of the common stock of the country are good enough to begin with; but let him look to it that the male which he couples with these comes as nearly as possible to his ideal of perfection. While it is in most cases safe to use sows of the common breed, the use of a mongrel boar is wholly inadmissible. The temptation to use an impure sire, equal perhaps in appearance to one of pure lineage and costing considerably less, is often very great. The practice must be condemned as a "penny wise and pound foolish" expedient, which in this case but results in intensifying the inherited defects of both male and female. Having the best sows available for breeding purposes these, after their merits have been made apparent, should be reserved for use as brood sows. Such sows will usually reach the maturity of their powers at about the sixth or eighth litter; but until then, litters from such mature dams will be larger and better nourished, and the pigs will be stronger and better feeders than those from young and imperfectly developed females. The service boar must have a short snout and neatly dished face, with broad head, as indicated by width between eyes and ears. The neck should be short and deep, as well as broad, so that but little "shoulder" is perceptible. The ribs should be arched like hoops, extending well downwards, thus giving great depth to the sides, capacity for the vital organs, and a large development of the choicest meat. An arched back is always a strong one, and to a certain extent this form is desirable, but a long "sway-backed" animal of either sex or any breed ought not to be permitted to do duty as a breeder. The long, weak back—especially length between the last rib and hip bone—is a very common character with scrofulous and tuberculous subjects, and is an unfailing indication of defective nutrition. The hams should be well developed and especially deep, and the legs short and strong, and hung in lines at right angles with the body. The character of the feet is often overlooked, albeit one of very great importance, for the pig must travel and bear transportation, and his ability in this respect will depend upon the strength of his feet. The sound, strong foot supports the pig on its tips, with the "dew claws" well above the ground. In general, I should select a medium or under-sized boar for use with coarse, roomy, mongrel sows. The pigs resulting from a union of two such animals are sure to be well nourished, and most likely will show in large degree the best qualities of the improved size. I insist that the Queensland breeder of swine must rear his stock from well-developed brood sows, mongrel or otherwise, and a pure male, and not, as is often done, from yearling sows, which are fattened for the market as soon as they have raised their first litter. The offspring

of these mature sows, I have demonstrated by actual experiment, are stronger and more vigorous, making their gain at a less cost in food than those the offspring of half-developed animals.

How to manage the Herd.

While in cold countries there is some justification of the practice of keeping pigs in close quarters or styes, in which the animals keep warm by the contact of their bodies, in Queensland all the conditions favour an opposite system of management. Here, profit in pig raising will depend upon the facilities given the animal for making his living by foraging. To this end he must have ample range, with free access to water for baths as well as drinking, and as a rule he will be sufficiently protected when furnished shelter from the direct rays of the sun. My plan would be to fence in a considerable area, preferably of rough, broken, or even swampy land, more or less timbered; and if this could be made to include a spring or watercourse, so much the better. In the Western States of America the practice is to locate the "hog pasture" upon a river, where possible. Such a stream does double duty by furnishing drinking and bathing facilities to the animals, and taking the place of a fence on one side of the enclosure. Of course in those sections of the Colony in which alligators infest the streams, this plan is inadmissible. I have said nothing of the size of the pig-paddock, because this will depend upon the value of land, the number of pigs kept, the productiveness of the land in natural pasturage, and the amount of outside feed given the pigs. The rule observed in pasturing other classes of stock, however, applies in the case of pigs—do not overstock the pastures; let the range be ample. The advantages of the pasture system over the old method of stye feeding may be briefly summarised thus: the pastures, with attendant exercise, ensure *healthy* animals, and a large proportion of lean meat to fat in the pork, and pasturing is the open secret of cheap pork. Contiguous to the pasture, small fields proportionate to to the size of the herd to be fed from them should be planted to some pig food like sweet potatoes, lucerne, pumpkins, peas, oats, cow-peas (*Dolichos chinensis*), vetches, &c. Most of these may be harvested by the pigs themselues without cost of labour to the owner, except in surrounding the crop to be depastured by some temporary fence of hurdles, barbed wire, or wire netting. There are few better pig foods than growing oats, into which the pigs should be turned when the crop is about 8 inches tall. For fattening, sweet potatoes and peas are unexcelled, and in the case of both I should let the pigs do their own harvesting for the most part. The essential thing in pork-making, after having obtained the right pigs, is to furnish them with abundant food, with the least outlay of manual labour. Keep the herd "in clover," and make constant drafts from it of the best fed pigs for the market. The fencing of the pig-paddock will vary in different localities with the materials available and their cost. An excellent pig-proof fence may be made with barbed wire alone, placing the lowest wire 3 inches from the ground, and others above at intervals of 4, 5, 7, 9, and 10 inches respectively, securing these to posts 8 to 10 feet apart- Mr. J. L. Thompson, now Principal of the Hawkesbury Agricultural College, N.S.W., recommends a rail and wire fence made as follows:—First barb wire, 3 inches from the ground, top of first rail, 13½ inches from the ground; second barb wire, 17½ inches from the ground, top of second rail, 3 feet from the ground," all secured to posts 8 feet apart. It seems clear to me that for the top rail a barbed wire might be substituted in the interest of economy.

Many variations of the forms of the pig-fence will occur to farmers of different localities. The common rabbit netting, faced with a couple of barbed wires would, without doubt, make a "pig tight" fence. I have used for many years in America hurdles made of pieces of 6-inch fencing, 12 feet long and 4 feet high, which have proved very satisfactory for use in making temporary enclosures of all kinds.

The Piggery.

The elaborate piggery figured in all books on swine husbandry should be severely let alone by the farmer who raises pigs as a matter of profit simply. The writer has planned and constructed three of these elaborate structures, and has had them in use with pure-bred and experimental herds something over twenty years, and has no hesitation in saying that for the general farmer they are expensive and most disappointing luxuries. Even when very expensively constructed, and attended to afterwards, they are almost certain to become foul, noisome, and vermin infested. The careful managers of the largest herds of swine in America that I know of have no "piggery," and would have none, several have told me. To my mind, the best and cheapest piggery is a plain structure, 8 x 10 feet, with or without floor, boarded up 3 feet high on three sides—the second side may be hinged at the top, so that if needed it can be raised to give free circulation of air—and having a gable roof. Such a structure may easily be loaded upon a "sledge" and hauled from one paddock or portion thereof to another, as may be desired. It is never in the way, easily kept clean, and always useful, for when not in demand by the pigs it becomes a convenient place for the storage of implements. I remember some years ago seeing some three of these insignificant piggeries doing duty for one of the largest and most valuable herds of swine in the world.

Watering Facilities.

The importance of a constant supply of good water for the pigs has already been adverted upon. The pig is a steady drinker, and he must be provided with conveniences for bathing, especially in hot weather. In planning the pig-paddock, it will not do to count on a water supply for a considerable number of pigs, furnished by such adventitious means as the bucket or barrel in the hands of an ordinary farm help. I have known very serious losses to occur in herds which had been neglected during one or two hot days in the matter of water. The pig-paddock, then, ought to embrace a portion of a running stream or a pond, swamp, or spring which furnishes a never-failing supply of water. Failing in these, a stream may be diverted to the paddock, or a well dug, and from this a steady supply of water furnished by means of a windmill. The means of conserving the water thus artificially obtained, and making it constantly available to the pigs, is a matter that may safely be left to the ingenuity of the farmer. Frequently, a permanent supply of water may be obtained at slight cost by excavating and damming the lower part of a ravine or other temporary watercourse, thus creating room for storm waters that otherwise would be wasted.

The Factory System.

The Queensland pork-grower will, I am persuaded, follow the plan which long experience in the United States has shown to be the best—namely, market the pigs on foot for conversion into bacon, hams, &c., at some central

bacon or packing-house. All of the advantages possessed by the cotton mill over the hand loom, or the butter or cheese factory over the kitchen dairy, the bacon factory has, with important additions, as compared with the farm salting-bench and smoke-house. The bacon factory utilises every part of the animal; it dresses and cures the pork most economically, and by the best methods; it utilises machinery in working up the pigs, and buys its supplies at wholesale, hence securing the lowest figures; and the bacon factory makes a uniformly good article, which has at once a commercial standing. All these advantages are to the pork-grower as well as to the bacon-curer; but most important of all, the factory furnishes a steady, all-the-year-round market for every pork pig that the farmer can raise. That this American system is in a general way to be the Queensland practice, all the facts indicate. Already a very promising start has been made by a factory located near Brisbane, owned by J. C. Hutton & Co., which puts up 300 pigs per week. A bacon factory, backed by a strong company, is soon to commence operations at Warwick. The directors of the Fitzroy Meat Preserving Works, at Rockhampton, I am assured by their manager, have under advisement a plan for a curing house for bacon and hams, to be erected shortly in connection with their main establishment. All this shows unmistakably the general drift towards the factory system. It shows, too, how ready capital is in Queensland to join forces with the farmers in any sound business enterprise. The trouble now is with the farmers; there are too few pigs in the Colony to justify the erection of many new factories. In this respect, at least, pork-raising is on a par with every other branch of productive industry. We produce too little of fruit and of grain as of pork, to warrant capital in making large investments in works designed to transform them into articles of commercial value; too little of most things to even create a market for them. The farmer's work precedes that of the manufacturer. At the present time the prices of nearly all farm produce raised in Queensland, except sugar, beef, mutton, and wool, give our farmers a great advantage over producers in other parts of the world, so that there is little risk to the farmer in extending his operations even in new lines.

Transportation.

Of all farm stock, pigs are transported great distances with the least trouble and liability to losses. In America, almost every day in the year, great number of swine are moved by railway to New York, Philadelphia, and other seaboard towns, from the interior of the Continent, 1,500 miles distant. Compared with the distances American producers have to send their stock to market, our live stock routes are quite insignificant. Farmers living on railway lines ought, and ultimately will, singly or in combination, send their pigs to market by the truck load, and without the intervention of the factory buyer or other middleman. Both the factory owner and the farmer ought to insist that their dealings shall be upon the basis of so much per pound actual weight on foot after the pigs have been fasted twelve hours. Neither ought to tolerate the sharp practices that too often go with purchase and sale by the lump or guess weight. The weighbridge ought to be available at every railway station, and doubtless will be as soon as there is a demand for the services of the weighing machines. Where the weight of the pigs cannot be ascertained at the point of shipment, the agreement between buyer and seller ought to be based on the weight at the factory. The factory owner is quite as much interested as the farmer in square dealing all along the line. Along the coast, shipments of pigs may easily and safely be

made on the coasting steamers between all the points at which they do business. At all events, it is possible at present rates for farmers living on the seaboard in sections which now have not railway conveniences, to market their pigs alive in the neighbouring towns. These towns are at the present time large importers of pork in its various forms—bacon, hams, &c.—and so will take for years to come all pigs that the farmers can grow, whether factories are erected or not. Moreover, the demand is sure to grow with increased supply. Hams and bacon at present prices must be looked upon as luxuries to be used only occasionally by working people and men of small means. Learn to produce the best quality of pork cheaply, and thus increase the supply and lower prices. This will enable our people of all classes to get into the habit of breakfasting on ham and bacon, and ensure for the farmers a steady demand for their pig stock.

Rational Principles of Feeding.

II.

In the preceding article, I have tried to explain that nitrogen is the substance of the greatest nutritive value. It is also very expensive, being difficult to appropriate from the stores of nature. In order to feed an animal, according to strict economical principles, it is very important to ascertain how much of the nitrogenous matter contained in a certain quantity of food is being actually absorbed into the body, and how much of it is carried out again and lost. This may, to a considerable extent, depend upon the more or less digestible nature of the food itself—a matter to which more attention will be paid on a later occasion. We have now to consider the question:—Is it possible so to surfeit the animal body with nitrogenous matter, that it cannot take up any more? or does the accumulation of nitrogenous matter in the body go on at the same rate, or to the same extent, as fat does?

If the animal body can be surfeited with nitrogenous matter, there can be reached, sooner or later, a certain stage in the process of assimilating nourishment in the body, when a considerable portion of nitrogen, offered in the food (if not all of it), will be refused by the system, and be lost, so far as the animal body is concerned. Such a case would be anolagous to the phenomenon of saturation observed in chemistry. Of common salt, for instance, a limited portion only can be dissolved in water; a surplus quantity being a added, will settle as a sediment at the bottom of the vessel. It is different with other soluble substances, such as sugar, which may be dissolved in water to any extent.

Now, it has been proved that the body may be surfeited with nitrogenous food, in a manner similar to water being saturated with salt, whilst hydrocarbons may be assimilated to an extent very much beyond the natural requirements of the body. Superfluous quantities of hydrocarbons are changed into fat, and are stored up in different parts of the body. We shall see later on whether it is not quite as irrational to invest large quantities of valuable food for the purpose of producing fat, as it is to attempt to store up nitrogenous matter, when the tissues of the body have been already surfeited with it.

It is highly important for the producer to be able to tell the moment when the body has arrived at that condition of surfeit with nitrogenous matter when it cannot take up any more of it. From that moment, highly nutritious, *i.e.*, expensive, food will go to waste, and though there would be still every chance of accumulating fat out of the nitrogenous food consumed, the animal would not become more valuable as human food. People do not buy beef for the sake of its fat; they want to eat flesh. Even if we were to get nothing but lean meat, we could make up for the want of fat in it by eating starchy, saccharine, or vegetable fatty matter. It being possible to surfeit the animal

body with nitrogenous matter, it will be more rational, on economic grounds, to dispose of an animal as soon as that stage has been arrived at, whether the animal is fat or not. Can we, on the contrary, increase the quantities of nitrogenous matter, or, in other words, the flesh substance in the body, at the same rate as that of fat, then it may be rational to feed animals until they have arrived at the highest possible living weight which they can possibly attain according to the peculiarity of race, their age, &c. When that stage has been arrived at (it may be ascertained by repeated weighing, carried on for a certain period) when no appreciable increase of weight is noticed, the animals should be disposed of: First, as being in the best condition for human food; second, because any more valuable food given to them would leave the surfeited tissues and be wasted. Before dealing with the purely chemical aspect of this question, we must bear in mind that it is the red muscle flesh principally which forms the valuable part of the carcass.

Muscles greatly differ in size and texture, according to the species to which the animal belongs and the life it leads. On purely theoretical grounds, we should presume that the most active animals possess the strongest muscles. We know that athletic exercise tends to enlarge and to strengthen them. Darwin has shown us some instances how, in some species, certain muscles have been gradually developed from generation to generation until they have reached an unusual degree of perfection.

The powerful forequarters of the mole, and the strong wings of the wild duck, in comparison to his domesticated cousin are instances.

Whilst zoology thus teaches us that muscle flesh can be increased by physical exercise, the history of breeding proves that the growth of muscular flesh can be promoted by systematic selection from generation to generation without the aid of physical exertion. Our best shorthorns or Durhams are not allowed to tire themselves before the plough. One would feel inclined to think that some animals, or some races of them, have a peculiar innate tendency to muscular development. Whether the muscles so produced have much value for the purpose of producing physical labour may be an open question. At the present time we know very little about the physiology of muscle fibres, the laws of their growth, &c., and until we know something more about this most interesting matter, we must confine ourselves to the question—How can we, by a judicious system of feeding, accumulate nitrogenous matter, *i.e.*, muscle-flesh, in the animal body, and which is the most economic way of doing it?

The several "entrances" of nitrogenous matter into the animal body, as well as their "exits," have been the subject of numerous investigations on the part of agricultural chemists. The results, however, have been more or less unsatisfactory. There has always been the difficulty of correctly estimating the quantities of invisible exits of nitrogenous matter from the skin, and of carbon from the lungs. Professor Pettenkofer, of Munich, at last succeeded in "catching," and thus estimating them to a high degree of accuracy. He constructed a box (salon), in which the animal to be experimented upon could conveniently be kept for weeks. By means of an ingenious and complicated apparatus, a current of air was produced, which carried the air, impregnated with the exhalations of the animal's skin and lungs, over a set of vessels filled with fluids, calculated to absorb the animal-matter present in the atmosphere. Provision had also been made for collecting excrement and urine for analysis, so that next to nothing could escape without being weighed. Having analysed samples of the food which the animal was going to consume, and having weighed the quantities to be given, a correct estimate of the entrances and exits could now be arrived at.

In this way Professor Pettenkofer obtained very valuable results. He found that the quantities of nitrogenous matter digested and absorbed from the food, can be computed to a nicety, because the quantities of urea present in the urine are reliable indications of the extent to which albumen is either being absorbed and stored up in the body, or, being reduced into its elements, and its nitrogen evacuated in the form of urea present in the urine, or in almost imperceptible, and, therefore, unimportant quantities in the form of exhalation and perspiration. This important discovery has been the means of finding the laws by which the absorption and the storing up of nitrogenous matter in the body, or its departure, are regulated, a matter to which more special reference will be made later on.

J.H.H.S.

Apples and Pears recommended to be grown for Export.

An inquiry having been addressed to the Department as to the best kinds of apples to grow for the export trade to England—viz., which would bear the voyage and suit the market—the accompanying list has been prepared by the orchard manager at the Hawkesbury Agricultural College, and is here reproduced for the benefit of fruit growers throughout the Colony.—

Adams' Pearmain.
Red Baldwin.
Golden Reinette.
Bedfordshire Foundling.
Blenheim Orange.
Reinette de Canada.
Triomphe de Luxemburg.
Winter Pearmain.
Five Crown Pippin.
Ward's Seedling.
Red Warrior.
Mère de Menage.
Kentish Pippin.
Boston Russet.
Claygate Pearmain.
Gloria Mundi.
Newtown Pippin.
Stone Pippin.
Red Streak.
Royal Russet.
Striped Beefing.

The following article, giving the opinion on this subject of Dr. Benjafield, of Hobart, Tasmania, an enthusiastic horticulturalist, is of interest to fruit growers, more particularly in regard to pears, upon which he is an acknowledged authority:—

"To find out what fruit trees are best to plant, we must first know what markets we have to supply with the fruit when grown. And we may speak of them as four markets—(1) The home markets in Hobart and Launceston; (2) New Zealand with its seasons even later; (3) the Melbourne, Sydney, and other colonial markets, which require late keeping fruits chiefly, and (4) the London market, requiring good keeping and carrying fruits, but sorts that will gather early. The character and appearance of the fruit, too, must be taken into account. Salesmen all the world over tell us they must have large fruit and well colored. If with this we can obtain quality as well, we have then reached what the markets require. But the grower must consider the character of the tree he is planting—is it a strong grower, will it bear well, is it a good bearer every year, or only alternate years?—and so on. I shall try to remember all these points in the sorts now to be given.

"*Apples.*

"Best six dessert and three kitchen apples, and proportion of each in the 1,000.

"Dessert.—Emperor Alexander, 10; Adams' Pearmain, or more properly King of the Pippins, 100; Ribstone Pippin, 50; Scarlet Pearmain, which I consider Cox's Orange Pippin, 400; Sturmer Pippin, 140; New York, 50.

Cooking.—French Crab, 100; Wellington, 100; Prince Bismarck, 50.

My reasons for advising each :—

Alexander—Is a large, showy, handsome apple, which crops well and comes off early, and will sell for dessert or cooking, and thus do well for Home and New Zealand markets. I advise a few of these, although I am doubtful whether Maiden's Blush will not be the coming apple for this purpose, or perhaps Worcester Pearmain.

Adam's Pearmain (called in England King of the Pippins) is an excellent dessert apple, handsome and very productive, but I advise so many of these because the fruit comes off early and sells so well in the London market. In the latest published English book on fruit culture, Mr. Wright places it in the very first position as the dessert apple to plant.

Ribstone Pippin—In spite of the tender tree and doubtful bearer, both the Colonies and London tell us we must continue to grow this magnificent apple, and it is especially useful for early London shipments.

Scarlet Pearmain (so called here, but Dr. Hogg declares it to be Cox's Orange Pippin)—As an early bearer, regular cropper, handsome fruit, which in quality has no equal, we must give this premier position. Both the Colonies and England want our Scarlet Pearmains, and being such good keepers, we can hold them till there is a market.

Sturmer Pippin is a handsome apple, either kitchen or dessert, which keeps till very late in the season, and is then of excellent quality. The tree is a good bearer, especially in suitable localities, and last year the price in London averaged higher than even so-called Scarlet Pearmains, showing that it is an excellent traveller.

New York.—This is a beautiful apple, which sells well anywhere, and has done well in London. The tree is a good cropper, and the fruit comes off fairly early for Colonial or London market.

French Crab is now so well known in Colonial markets, and carries so well to England, besides being such an excellent keeper and cooker, that we must have 100 of these. Tree a strong grower, but a very late cropper.

Wellington.—I do not consider Tasmanians have ever done justice to this splendid culinary apple. As handsome as a picture (far more so than the crab), and considered everywhere to be the very first kitchen apple. I would plant as many of these as crabs.

Prince Bismarck is a magnificent large fruit, highly coloured, comes into bearing very early, and comes off very early. Is rapidly rising in favour wherever known, and likely to be very popular in a few years. As we must have a greater variety of kitchen apples, I would, so far as tested, recommend this before Prince Alfred, Lane's Prince Alfred, or Warner's King, the three kinds new to us, but just fruiting, and under observation.

N.B.—I am just fruiting Ben Davis, King of Tomkins County, Annie Elizabeth, Five Crown Pippin, Jonathan, Northern Spy, Golden Russet, Calville Blanche, and hope great things from some of them.

Pears.

In quoting the best nine pears to plant we must follow the same reasoning as we did for the apples, viz., markets to be supplied, character and appearance of the fruit, and bearing qualities of the tree. As pear-growing has been carried on to a very small extent, it will be more difficult to give these.

Dessert.—Williams' Bon Chrêtien, 50 ; Beurré Bosc, 100 ; Glou Morceau, 50 ; Beurré Rance, 50 ; Winter Nelis, 300 ; Josephine, 200.

Cooking.—Vicar, 150 ; Achan, 50 ; Uvedale's St. Germain, 50.

Williams' Bon Chrêtien, or, as the Americans call it, Bartlett, is, according to them, pretty well the only pear worth planting, but I do not go so far as

that. Still, being a very fine, early, showy pear, I think for early home and New Zealand markets it is the best pear to plant.

Beurré Bosc will come next in order, and for place has formidable competitors in Beurré de Capiamont and Gansel's Bergamot; but I prefer it to either of them, being a much better pear altogether than Beurré de Capiamont, and better carrier, and nearly as good a bearer. I consider it as good in quality as Gansel's; whilst the latter is such an uncertain bearer that I reject it in favour of Beurré Bosc. As these will travel to any Colonial market, and keep a fair time, I would plant a fair percentage of them.

Glou Morceau comes next, and is but little known, since the trees which have been planted are only just bearing their first fruits; but with such commendations as it brings with it, and after seeing the fruits brought out by Mr. Butler from France, we must grow it, especially as the London market calls for it more than for any other. It is placed first as a keeping dessert pear for planting by Wright, and Hogg speaks of it as a first-rate dessert, the tree being hardy and an excellent bearer.

Beurré Rance—And by this I do not mean the worthless thing that goes by that name in Hobart, but a freely-growing very productive tree, whose fruit is very like a Vicar, but ripens green, and is "a very valuable dessert pear, keeping five to six months" (Hogg). I have an old tree near my house, and its fruit fulfils all these conditions, and I think it about the surest dessert pear we can send to London. In this opinion Mr. Butler, when here, concurred.

Winter Nelis.—In spite of its tender habits as a tree, and capricious habits in bearing, there is such a demand for this prince of pears in all markets that every large pear-grower must plant this freely. In all the colonial markets it fetches very high prices, and as it has carried to England, and there is esteemed "one of the richest flavoured pears" (Hogg), the future of our Winter Nelis cannot well be over-estimated.

Josephine de Malines—Is a good bearer, although of rather straggling growth, will keep several months, is of excellent quality; indeed, the great English authority, Mr. Blackmore, calls it "grand quality for a late pear"; has carried to London, and in my garden has resisted the moth better than any other. It is, perhaps, the best late pear we can plant.

Napoleon (or Vicar)—I, in accordance with the books, class with the cooking pears, although when taken care of, it makes very fair dessert. Its bearing qualities are enormous, and although it only realises low prices, it is one of the most profitable pears to grow, especially as it has carried to England.

Achan—This, when carefully gathered and handled, is a very fine pear which will sometimes ripen into good dessert; but for cooking I have never seen its equal either in colour or flavour. It is an enormous cropper and strong grower.

Uvedale's St. Germain—For bearing, keeping, size, and all that pertains to a profitable cooking pear, cannot, perhaps, be excelled. We must have a few of these.

N.B.—We have selected these because they are proved; but I have forty more varieties growing, many of which I hope to find more profitable than some of the above. Thus in Beurré Clairgeau, we have a magnificent fruit. In Doyenné du Comice we have beauty and quality, even beyond a Winter Nelis. In Louise Bonne of Jersey, we have the favourite cropper and market pear in England, and in Winter Cole we hope to have keeping qualities, combined with quality and quantity.

Notes on Diseases of Plants, &c.

By N. A. COBB.

Diseased Horse radish Plants.

Some specimens of diseased horse-radish plants forwarded to the Department by Mr. J. J. Fletcher, M.A., of the Linnean Society, Elizabeth Bay, have been submitted to Dr. Cobb, who has made the following report:—

"I find on examination that the horse-radish plants are attacked by *Cystopus candidus*, Lev., sometimes called "white rust." This fungus is sometimes common in moist situations on various cultivated and wild cruciferæ.

Remedies:—

(1.) Rotation of crops.
(2.) Clean cultivation.

Under this latter head, which is doubtless strongly advisable in cold countries, I must add that I think it uncertain whether the fungus in this climate would require to pass the winter in its resting-spore state; hence it is also uncertain whether the careful destruction of all overground parts would be as effective here as in colder climates.

(3.) Destruction of cruciferous weeds, such as mustard, shepherd's purse, &c., which also harbour this fungus.
(4.) It would be interesting to try the effect of some sprays and powders. I would recommend a trial of (*a*) pulverised lime; (*b*) sulphur flowers; (*c*) spray of *eau celeste*, made as follows:—

Copper sulphate (bluestone)	1 lb.
Ammonia	1½ pints.
Water	22 gals.

Dissolve the bluestone, and add the ammonia.

This fungus in certain stages is deceptive, giving rise to the opinion that the affected plant is suffering from the encroachment of some insect or mite. The white blister-like pustules resemble the galleries of some mites, and when the blisters break their white colour changes often to a dirty yellow, and this heightens the deception. Microscopic examination, however, at once dispels the illusion.

Diseased Maize Plants.

Three specimens of diseased maize plants have been received by the Department from Richmond, and after examination, Dr. Cobb (the Pathologist), made the following report:—

No. 1.—I see no specific disease on the two cobs sent. They are mouldy on the outer husks, a fact probably due to dampness in the situation.

No. 2—Is affected with *Ustilago maydis*, commonly known as "maize-smut."
No. 3—Is affected with *Puccinia maydis*, commonly called "maize rust."
As regards 2 and 3, the best preventive measures are,—rotation of crops, clean cultivation and destruction of diseased plants. In fifteen years' experience in a maize-growing district, where the rotation was maize, potatoes, and grass, I never saw either "smut" or "rust" do any damage worth mentioning.

I would like much to have further specimens of the maize sent to me in as fresh a condition as possible; also a few plants left standing, so that I can send for more in the course of the autumn and winter.

Diseased Lucerne.

A sample of soil, and of the roots, &c., of lucerne, grown in it have been forwarded to the Department for examination from Tooloom, with the information that the disease which had attached the plant had destroyed 4 acres of a crop, and was also doing damage amongst garden produce and other plants. Dr. Cobb, Pathologist to the Department, says in his report:—"I have examined this soil, and find many nematodes in it. It may be that they cause the trouble. Clover is sometimes attacked by nematodes. A dressing of gas-lime is what is usually recommended for this state of things. I have given this specimen a good deal of attention, and think that if further fresh specimens were forwarded in a large tin, so as to reach me in a fresh state, I might be able to determine more definitely what is the matter. All the sorts of soil, and all the sorts of roots attacked should be sent."

From specimens of blighted lucerne forwarded subsequently, it was ascertained that the disease affecting them was sphærella destruction, B. and Br., a full description of which, together with remedies, will be found at p. 107 of vol. 2, part 2, of the *Agricultural Gazette*.

Water Core in Apples.

Specimens of apples having been forwarded to the Department of Agriculture from various parts of the Colony (all of which were similarly affected) for investigation, the Departmental Pathologist, Dr. Cobb, reports as follows:—

"The transparent appearance exhibited in the specimen I believe to be due to what is known as water-core. Water-core is easily known by the watery or waxy appearance it gives either the whole or part of an apple. If the affected apple is cut through the watery part, the tissue is at once recognised as being different from ordinary apple tissue. It looks transparent and watery, and that look has given rise to the name "water-core," which is a very descriptive one. This water-core starts, apparently, from the surface in some cases, but probably in the great majority of cases it starts from the core; and very often when the apple to outward appearance is quite sound, on being cut open it is found to be watery at the core. The cause of the watery appearance is very easily made out, for if a very thin slice of apple be examined under the microscope it will be seen that among the cells of the tissue there is no air. Under ordinary circumstances the tissue contains a great deal of air; and if this air is replaced by water, which can easily be done artificially, the tissue at once becomes transparent. It is generally noticed that this disease (if it can be called a disease) is more abundant in moist seasons, and it is especially likely to appear after a long rain, if this rain occurs about the time that the fruit begins to ripen. The time at

which the fruit begins to ripen is a period of rapid growth, and if the air is very moist, or if rain collects in the cavity at the stem end of the apple, apparently the water is absorbed either through the stem, or perhaps through the pip. There has been no fungus discovered in this transparent tissue, and the disease must be regarded as of a mechanical nature rather than due to the effects of any organism. It is quite noticeable that early varieties are more subject to it than late varieties. So called "winter varieties" are comparatively free from it; but the varieties which ripen in the autumn, especially acid and sub-acid varieties, suffer from it to a greater extent than any others.

As to remedies, I do not know of any. The only precautions that can be taken, as far as is known, is to avoid the sorts that are affected by it. The Department would like to ascertain from fruit growers what sorts they find to be very subject to this water-core. A list could then be prepared of such sorts, which, of course, would become "tabooed" apples, as growers would not buy them. It is not only confined to particular varieties, but, in some cases, is confined to certain strains of a variety. It has been suggested that this transparent appearance might be due to sunburn. I do not mean to deny that in certain cases a transparency may arise from sunburn; but I believe that in the majority of cases where this transparency has been noticed, it is by no means due to that cause. Any person familiar with fruit would be able to tell whether a transparency was due to sunburn or not.

Notes on Weeds, &c.

Verbena bonariensis (*Linn.*), "Vervain."

A specimen of a weed, which is very abundant in the Mudgee district, having been forwarded to the Department of Agriculture for classification, has been identified by Mr. F. Turner, the Botanist of that Department, as *Verbena bonariensis* Linn., commonly known as "Vervain," and locally as "Mrs. Günther." It is a plant of South American origin, and has become naturalised in most of the warmer parts of the earth, particularly in the warmer parts of Australia. In many parts of this Colony it has proved a great pest in cultivated land, and pastures are often rendered useless for grazing purposes where the plant has become established. It is a very difficult plant to get rid of, for if left undisturbed for a short time, it produces a great amount of seed, which germinates readily after showers during the summer weather. The plant had previously been sent to the Department for identification, with a note to the effect that "it caused red water in cows"; but experience tends to show that, unless cattle are starving, they will not eat it. The only way this plant can be exterminated is to keep it well cut down with a scythe or reaper to prevent it seeding, and then burn it. This operation is, of course a tedious and expensive one, but unless some vigorous measures are taken against the plant, the area of its occupation will gradually widen from year to year.

Phyllanthus gasstrœmii, M. Arg.

The receipt of a specimen of a supposed poisonous plant from the Stock Inspector at Hillston, resulted in the following information, given by the Botanist, being forwarded to the Chief Inspector of Stock:—The specimen is known to botanists as *Phyllanthus gasstrœmii*, M. Arg. This plant sometimes grows to a height of 2 feet, and is found in several parts of the Colony. Although it has never been sent to the Department as a suspected poisonous plant before, still it belongs to a notoriously poisonous order (*Euphorbiaceæ*) of plants, many of which abound in an acrid milky juice, and are suspected of poisoning sheep. What I would suggest, therefore, is that sheep should not be allowed in the paddock where the phyllanthus is growing plentifully, for nearly all Euphorbiaceous plants are beautifully green when the surrounding vegetation is dried up during the summer months; consequently they offer a tempting bait to herbivora of all kinds, which, if partaken of, when the animals are not strong, often cause serious consequences.

Lantana camara, Linn. "Lantana."

A somewhat curious discovery has been made accidentally, in the Upper Richmond River district, of a means ef destroying the weed known as Lantana, and in that locality as "Wilson's Weed." It appears that the

land round Lismore is very much infested, there being hundreds of acres on which nothing is to be found but Lantana. Two years ago a resident of Lismore had a plot brushed down, and waited for dry weather to burn it; but no dry weather came, so he had to let it lie till the next year. He found then, after burning, that he had only to deal with some seedlings, as the most difficult part to exterminate, the roots, had been completely smothered by the overlying brush. These facts having come to the knowledge of an officer of the Department of Agriculture while on a visit to the district referred to, are reproduced for the benefit of all whose land may be similarly infested.

Cuscuta tasmanica—A Parasitical Plant new to the Colony.

The Rev. W. F. Frazer, of Murrurundi, has been kind enough to forward to the Department a specimen of what he thought to be *Cuscuta australis*, R. Br., which was found growing on horehound. On examination, however, the botanist identified the specimen as *Cuscuta tasmanica*, Engl. This is the first occasion which is recorded of *Cuscuta tasmanica* being found in the Colony. Moreover, it is the first time this particular parasitical plant is recorded as having been found growing on horehound in the southern Colonies, where, however, it has been found growing on Sonchus and Goodenia. The principal difference between these two species, *C. australis* and *C. tasmanica*, is that whilst the flowers of the former are nearly sessile, those of the latter are arranged on pedicels four or five lines long, with minute tracts at their base. Moreover, the scales of the tube are large and deeply fringed.

A Peculiar Fungus.

The Hon. Dr. Creed, M.L.C., brought recently to the Department a very peculiar and somewhat rare species of fungus, which was recognised by Mr. Turner (the Departmental Botanist) as *Aserŏe rubra*, Labill. This phalloid fungus may be distinguished by the bifid rays of the receptacle and its prevailing vermillion-red colour. Like many allied species, this fungus is very fœtid when fresh.

Analyses of Soils.

Table of Soils analysed by the Analytical Chemist of the Department.

(*Continued from vol. 2, page 222, of the Agricultural Gazette.*)

By A. HELMS, M.A., Ph. D.

Locality and geological formation of surrounding country.	Nature of Soil.	Mechanical Analysis.				Analysis of fine soil.				Determination of substances soluble in hot hydrochloric acid of 1·10 specific gravity.										
		Stones of more than ¼ in. diameter.	Coarse sand of more than ¼ in. diameter.	Root fibres.	Fine soil.	Moisture.	Sand.	Impalpable matter, chiefly clay.	Organic substances, and water of combination.	Lime.	Equivalent to, in an acre of soil 6 inches deep.	Potash.	Equivalent to, in an acre of soil 6 inches deep.	Phosphoric acid.	Equivalent to, in an acre of soil 6 inches deep.	Nitrogen.	Equivalent to, in an acre of soil 6 inches deep.	Equal to ammonia.	Magnesia.	Ferric oxide.
Durandah, Tweed River	Heavy clay	4·67	2·91	0·43	91·99	9·3	2·6	70·8	17·3	0·1996	3,992	0·0542	1,084	0·0379	758	0·3332	6,664	0·4046	0·1580	11·6176
Wentworth irrigation area	Light sandy loam	0·11	0·17	0·09	99·63	0·80	80·80	15·95	2·45	0·5600	11,200	0·2761	5,522	0·0594	1,188	0·0742	1,484	0·0901	0·2347	2·9044
Cane-fields, Alstonville	Heavy clay	1·49	2·26	0·02	96·23	5·3	1·0	75·7	18·0	0·4076	8,152	0·0646	1,292	0·4152	8,304	0·3304	6,608	0·4072	0·1195	20·0020
Ellerslea, Candelo	Loam	1·81	24·75	0·10	73·34	4·55	56·10	34·98	4·37	0·5520	11,040	0·0768	1,536	0·0813	1,626	0·1638	3,276	0·1989	0·0358	1·2604
Port Macquarie	Heavy clay	1·47	5·21	None.	93·32	3·90	16·30	68·31	11·49	0·3280	6,560	0·0358	716	0·1244	2,488	0·2240	4,480	0·272	0·1880	6·5760
Casino, Richmond River	Sandy loam	None.	3·87	2·32	93·81	3·55	66·57	26·64	3·24	0·1008	2,016	0·0506	1,012	0·0215	430	0·1218	2,436	0·1479	0.0418	1·5344
Gosford	Loam	0·08	1·53	0·20	98·19	2·20	45·75	45·90	6·15	0·1956	3,912	0·0619	1,238	0·0750	1,500	0·1330	2,660	0·1615	0·0480	1·4248
Bijiji, Corowa	Clay loam	None.	0·84	None.	99·16	1·65	26·05	69·15	3·15	0·0688	13,376	0·0650	1,300	0·0890	1,780	0·0658	1,316	0·0799	0·0938	2·2468
Blayney	Heavy clay	None.	2·24	0·31	97·45	1·08	3·45	92·29	3·18	0·1672	3,344	0·0355	710	0·0435	870	0·0364	728	0·0442	0·1225	2·1372
Jamberoo	Clay loam	1·91	5·38	0·01	92·70	5·18	22·82	57·55	14·45	0·3865	7,730	0·0534	1,068	0·0854	1,708	0·2744	5,488	0·3332	0·0796	4·5484

Dried Bananas.

An experiment in shipping dried bananas to London has been tried with fair success by a Mr. W. Reynolds, of Daintree River (Q.), who gives some interesting information on the subject in a letter which appears in the *Queenslander*, of April 25th, 1891. Mr. Reynolds explains that his object in writing is to induce other settlers to go into the business, as he feels certain that once the fruit was known there would be a large demand, as it could be used in so many ways. If 1 lb. of the dried fruit is soaked in water and stewed for half-an-hour, it swells, says Mr. Reynolds, up to 5 lb. weight; besides, the water is a sweet syrup without putting any sugar whatever with it. The shipment sold in London at 6d. per lb., and when the returns come in, if the net profit shows 3d. per lb., Mr. Reynolds says it will pay very well. He is of opinion that a company on a large scale could make banana-drying pay at 2d. per lb., and give a good return on the outlay. His evaporator is his own make, and capable of drying 2,000 lb. of fruit per month.

Dealing more in detail with this new outlet for the banana crop, Mr. Reynolds goes on to say:—

"I may state that the quantity sent was 1,600 lb., or about one ton measurement. It was put up in 40 lb. boxes, not in small boxes of about one dozen each. I do them up in small 1 lb. boxes, with a label on, for sale in the colonies. My experience of trying to sell dried bananas in the colonies is a failure; the duty of 2d. per lb. in the southern colonies kills it for a start, and it is not to be expected they will sell in Queensland where the fresh banana is so plentiful. I believe the dried bananas would sell in the interior if the storekeepers would sell them reasonably. Just an instance: I supplied one storekeeper, about 100 miles from the coast. The fruit was delivered at his door at 6½d. per lb.; he retailed it out for 1s. 6d. per lb., the result being that people would not buy. Everybody that tastes the dried bananas likes them, but don't care to buy; but, if they came from London or New York, then they would buy them. Speaking of New York reminds me of two years ago; it was Christmas time. I was in Cooktown, trying to put a few cases on the Cooktown market. The first shop I tried was a confectioner's, and the owner says, 'Dried bananas; oh, I get mine from America; that's the place where they know how to dry fruit,' and there was no mistake about it, he showed me dried bananas from New York. It was awful rubbish; he said so himself when he saw the Queensland dried bananas, and he took a few dozen boxes. When I started drying bananas it was for the Home market. I knew they would not sell in the colonies to any extent, but the trouble was in drying them so that they would keep for twelve months. The banana, with so much moisture in it, is very difficult to evaporate, so that it will keep and still be soft. Of course there is no trouble in keeping the banana if it is dried as hard as a brick; then it will keep, but then it is very hard on the teeth. After two years,

experimenting and spoiling a great quantity of fruit, I have got it so that it will keep for over twelve months in this moist climate. I am also able to dry the fruit whole instead of in halves. The fruit can be dried by small settlers and put f.o.b. mail steamers for 3d. per lb."

"I think it would be a good thing for the colony if the Department of Agriculture would place any new industry which any settler should start on the London market—put it in the hands of some reliable man at Home, for, it I had not dropped across Mr. Lamb, the tobacco expert, it might have been a long time before these dried bananas would have formed a Queensland industry which, I feel sure, will be a big thing in the near future. Let me give an instance of having reliable men to send goods to. Two years ago I sent 100 lb. dried bananas Home and paid the freight on them; result—heard no more about them, only a friend of mine came out to this country who had bought the bananas at Home, and paid 1s. a pound for them. Small settlers ought to have someone to look to whom they could rely on for getting anything new put to the front."

"I sent last September 1,200 1-lb. boxes to Germany, but have heard nothing of them yet. Messrs. Hoyer, Tieggs, & Co., of Brisbane, shipped them. At the present time I have 9 acres of bananas rotting—hundreds of bunches weekly. It doesn't pay to ship, as the Chinamen in the north are too much for the white settlers. I sold 6,000 bunches in 1889, and the year before I sold 3,000 bunches; but in 1890 and 1891 they have been a dead loss, with the exception of a few cases of dried, which I have sold in different parts of Queensland. There is a good opening for a company to start and do nothing but dry the banana."

It would appear that the banana-growers on our northern rivers are in the same position with regard to disposing of their produce as the Queenslanders, and, therefore, the question of drying bananas for shipment to Europe is one well worth consideration.

General Notes.

The Travelling Dairy.

The Minister for Mines and Agriculture (the Hon. Sydney Smith), has appointed Mr. Niel Harper, formerly a dairy farmer of excellent repute in the South Coast District, to take charge of the Travelling Dairy, which is to be sent to the different districts of the Colony under the control of the Department of Agriculture. It will be necessary for the Agricultural Society, or a local committee, to provide the requirements of the dairy, such as a building suitable for its operations, and giving accommodation sufficient for ten pupils, who will be thoroughly instructed in all dairying operations. Also, for the carriage of the plant to and from the nearest railway station or wharf to the scene of operations, together with the necessary labour to assist in the rough work of cleaning up, &c. The society, or committee, will need to provide also a sufficient supply of milk, say about 50 gallons daily, for the operations of the dairy, and plenty of clean water for washing butter and cleaning up. Each society, or committee, undertaking to furnish these requirements will be entitled to nominate at least ten pupils (either male or female) for the full course of instruction in dairy operations, who will afterwards be examined with a view to receiving a dairy certificate in the event of their showing a satisfactory knowledge of the course of instruction. Of course the general public will be admitted to see all the operations of the dairy which will work for ten days at each place where set up. All district societies and committees desiring to have the benefit of this course of instruction for their localities should make early application to the Director of Agriculture, from whom regulations and instructions can be obtained.

Hawkesbury Agricultural College.

For the encouragement of students of the Hawkesbury Agricultural College, Mr. Sydney Burdekin, M.P., has intimated his intention of presenting gold medals to the most successful students in the following subjects :—

1. Proficiency in dairy farming in all its branches.
2. Veterinary science and practice, including horse-shoeing on newest and best principles.
3. Proficiency in garden and orchard work generally.

National Prizes for District Agricultural Shows.

The Minister for Mines and Agriculture (the Hon. Sydney Smith), has under his consideration a comprehensive scheme for alloting the £5,000 voted for national prizes for this year. He has approved of a number of prizes for the best managed farms, orchards, vineyards, dairies, &c., which

will absorb half the amount; and with the idea of encouraging the holding of large annual district shows he has divided the Colony into ten districts distinct from one another by their climatic conditions, to each of which he will offer a sum of money to be awarded for the objects specified by the Department—the money to be given to each of the leading societies in the district in successive years. The coast has been divided into four districts, tableland into four, and western plains into two. In each of these districts there are a number of agricultural societies, varying from five to twenty. The Minister wishes to encourage the holding of a large district show in each of the most important centres of these districts, and in order to make them as representative and productive as possible, he will offer sums ranging from £100 to £350, according to the importance of the district, to be given in prizes, as indicated by the Department. He hopes thus to make large prizes that will draw the very best possible exhibits to the different centres year by year from the whole district; and as each society will get its turn in being chosen to represent the district, there should be a general improvement throughout the Colony in the character and aims of the shows. The Minister is now choosing the centres for the first of these district shows, and is allotting the money according to the importance of the different districts.

Swamp Rice.

A splendid sample of swamp rice has been forwarded to the Department by Mr. Henry Juhl, of Coopernook, Manning River, which is stated to go 80 bushels to the acre. This proves conclusively the suitability of the North Coast District for rice cultivation. An exhaustive description of the mode of preparing rice for the market appeared in Vol. I, part 3 of the *Agricultural Gazette.*

Horses and Sour Ensilage.

The danger of allowing horses to eat sour or pit ensilage forms the theme of an interesting letter published in the *Maitland Mercury* of 14th April last, and written by Alfred Bickford, M.R.C.V.S., Government Veterinary Surgeon for South Australia. It is practically the report of a case to which he was called in Adelaide, where four horses which had been allowed to eat ensilage from a pit. Mr. Bickford states that, from his experience, while sweet or stacked ensilage may be fed to horses with little or no danger, there is the greatest risk in allowing them to eat sour or pit ensilage, which becomes more poisonous to them the nearer it reaches the bottom. The toxic effects of pit or sour ensilage upon the system of the horse are set forth as follows:—

First.—It affects the brain in such a way as to produce paralysis of the tongue and muscles of the throat, and an inability to swallow.

Secondly.—It alters the character of the blood, and causes yellow clots to form in the cavities of the heart, most often in those of the left side, thereby rendering the circulation throughout the body so imperfect that a clamminess of the skin and a quivering of the voluntary muscles is very perceptible, almost at the outset of the attack.

Thirdly.—It produces a disease that is very rapidly fatal after the first symptons are observed.

Fourthly.—Although pit ensilage can be given to the ruminating animal with advantage, it can be given to the horse only with the certainty that it will cause speedy death.

Specimen Fruits.

Amongst the many gentlemen to whom the Department is greatly indebted for specimen fruits, of which models are made, to form a complete collection, Dr. Benjafield, of Hobart (Tas.), deserves special recognition. He has already sent a large number and promises in due season to considerably add to his already magnificent contribution.

Fruit Evaporation.

In reference to the exportation of fruit from New South Wales to England, the following extract from a pamphlet issued by the British Board of Agriculture on the subject of fruit evaporation, contains a valuable suggestion to fruit-growers :—"Experience in Canada has shown that it is far better for fruit-growers to send their apples to evaporating factories than to have small machines of their own for this purpose, as considerable skill is required to conduct the process properly. The apples usually evaporated are those not suited for exporting—windfalls, culls, and those that will not keep. At the factory apples are divided into two grades; first, those of good flavour, size, and shape, and suited for peeling by machinery; second, all inferior badly-buised, small fruit. The first-grade apples are peeled, cored, and sliced by machinery, often in one operation. The sliced fruit is at once exposed for a few minutes to the gas produced by burning sulphur. This prevents discoloration, and in no way injures the fruit. After this the slices are spread on trays of galvanised netting or cloth, and heated air passes over them to withdraw the water. At the same time certain chemical changes, akin to further ripening, are produced in the fruit, resulting in an increased percentage of sugar and diminished acidity. The apples are then allowed to lie in a heap for several days, and are finally packed in boxes containing 50 lb. Cores and peelings are all utilised, being used as a source of cider, or evaporated, and shipped to jelly-makers or to makers of wines. This system of evaporating fruit offers many advantages to fruit-growers, and should be adopted in this country. It affords means of making fruit saleable that is not fit to send to market, and ought to be an adjunct to jam manufactories, and to large fruit farms, upon which sufficient intelligence would be found to carry it out in a proper manner.

Cream.

A number of inquiries having been made as to the best method of cooling cream to the proper degree necessary for churning during the hot months of the year, the following will be of interest:—

A mixture consisting of two parts of nitrate of ammonia with one part of chloride of ammonia, when dissolved in water to the extent of 5lb. to 1 gallon, makes a most valuable freezing mixture, and will reduce the temperature of cream or milk which has been placed in the mixture to a suitable temperature for dairy operations (60° F.) even in the hottest climate.

When the mixture has been evaporated the salt is available for further use as often as necessary, so that, although the first cost (about 8d. per lb.) for these chemicals is rather heavy, there is very little waste, and therefore little further expense.

It need hardly be added that the very best way to provide for an equable temperature is to make the dairy underground and on the most approved principles, and fitted with the best possible appliances for causing evaporation and consequent cooling.

Its carriage.—Answering an inquiry as to the carriage of cream from a farm to a butter factory, the following information was given:—Cream requires very careful management in transit, especially over rough roads, where, unless due precautions are taken, the motion is likely to turn it into butter. The most likely method of carrying it under such circumstances would be to keep the cream at a very cool temperature by wrapping a cloth well saturated with cold water round the vessel, which should be suspended in the vehicle to prevent the shaking of the cream by jolting. The principle would be the same as that of keeping drinking-water cool in a swinging water-bag. There is reason to believe that cream could be thus conveyed without injury for 15 or 20 miles.

Rennet.

It appears from a bulletin published by the Hatch Experimental Station of the Massachusetts Agricultural College that the average curdling power of rennet, taken from calves that have fasted one hour, is 22,091 parts of milk for one part of water free rennet; five hours fasting, 23,315 to one; eighteen hours fasting, 25,338 to one. The age of calves also makes a material difference in the coagulating power; thus the parts of milk coagulated by one part of water, free rennet, are as follows for the different ages:—5 days old, 28,597; 28 to 30, 19,057; 35, 19,054; 42, 20,558.

Budding the Mango.

An article on the mango, by the Botanist, published in Vol. 1, Part 1, of the *Gazette*, has called forth the following interesting letter from Mr. H. E. Van Deman, Pomologist to the United States Department of Agriculture:—

"In reading the July number of last year, I notice an article from you on the mango. Having had some experience, and much more study, concerning this fruit, I think it might be to your benefit to learn of some of the facts regarding its growth and propagation in Southern Florida. I imported for this Department a number of grafted plants of the choicest varieties from India within the last two years, and they are now growing nicely in Florida. Some of our careful experimenters there have found that the mango can be budded, and this is a great step in advance of the slow method of propagating by inarching. I think it might be well for your people to try propagating the mango in this way. The secret seems to lie in selecting a time just before a rapid state of growth, and of course when the bark will readily peel, and taking buds from that part of the young branch or scion which lies between the very tender growth near the tip, and the older portion of the scion, where the purple colour of the bark has begun to turn to brown. Some have succeeded in budding just at the close of the growing season, but before the bark on the stock has begun to adhere. The budding is done in the usual way, and thus the life of the stock is preserved in case the bud does not take. And there is a great economy of scions of the choice kind to be propagated. In case you should try this method, I hope you will let me know the result.

"With good wishes for the fruit-growers of your country . . ."

The Director will be glad to receive reports from any fruit-grower who acts on the information contained in the above interesting letter.

[Five plates.]

Sydney: George Stephen Chapman, Acting Government Printer. —1891.