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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Organised Agriculture.

THE basis of any activity is intelligence. A survey of every problem and need is the first step in agricultural organisation. Formulation of a course of procedure based upon facts, experience, and sound reason follows. With these fundamentals recognised and given a place, initiative and freedom of action in the interests of those to be served are certain to yield results. The Department of Agriculture and Stock and our educational institutions, such as the Queensland University and the Queensland Agricultural High School and College, can and do render highly valuable assistance to the agricultural industry. They are very necessary agencies in the attainment of the objective of organised agriculture in Queensland. They are, moreover, the creation of all the people representing the common interests of all the people. To make our intelligence available, to free it from prejudice and petty and selfish considerations, and give it the impetus necessary for its practical application is one of the most important services we could render to the farming industry in any considered policy for its benefit. Forms and types of service will necessarily vary, but armed with intelligence based on careful survey and analyses and a well-planned programme, organised agriculture will no longer remain a voice crying in the night, with no other language than a cry. Loyal, well-informed leaders whose dominating ambition is to serve their fellow farmers are needed in all our organisations. Then must come co-ordination of farmers' groups whose interests may diverge to some extent, or otherwise become isolated. Those seeking to serve organised agriculture in a big and practical way have in the co-ordination of activities a very high service and a most important job.

Higher Agricultural Education.

THE whole available forces of modern science and invention are also being brought into focus by the Department of Agriculture and Stock on field work and farming problems. Agricultural science has more than vindicated itself as directed by the Department in the results of experimental and demonstration work. All this work is continually producing valuable data for the practical farmer. Under its stimulation soil technicians are enabled to suggest improvement in cultivation methods and innovations in cropping systems; plant breeders are busy in plant study with the purpose of improving yield and disease and drought resistance; while pathologists and entomologists are working hard continuously on the eradication of diseases and pests.

In the Queensland Agricultural High School and College at Gatton we have also an institution that offers to farmers, sons of farmers, and those other young Queenslanders who look to the land for a useful career, specialised instruction of the highest standard and comparable with similar institutions established in the other States of the Commonwealth. The college is strongly and efficiently staffed, and the principal branches of practical agriculture are covered by a modern curriculum. It is believed that the function of higher agricultural education is not only to train students who will ultimately farm their own holdings, but also instructors, research workers, and the moulders of our agricultural future. With this object in view the courses at Gatton should develop still further the scientific side of agriculture, for the college has definitely taken its place as an auxiliary to the Queensland University.

Economic Research.

QUEENSLAND with its vast area, its wide range of soils and climates, and its very small population, must for many years to come remain mainly a primary producing State. That being so, a sound agricultural developmental policy is absolutely essential if we are to secure economic stability. To that end, Departmental policy is being shaped—a policy advancing from stage to stage as the peculiar needs of any or every section of such a complex industry as agriculture become apparent. One of the most clamant needs of the day is scientific and economic research as applied to rural industry generally. The Commonwealth Statistician estimates the public and private wealth of Australia as approximately £3,000,000,000 sterling. The accumulation of such wealth by comparatively a handful of people in so brief a period of time constitutes an unparalleled achievement in the world's history. Most of this wealth has been derived from rural production; nor could it be otherwise in a vast virgin continent that was lying economically idle when first occupied by white people a little more than a century ago. The extent of the contribution of rural industries to the national wealth may be measured by the present yearly rate of rural production, which is approximately £280,000,000 sterling, or about £47 per head of population, or about £125 per head of rural population. The rural population represents 37 per cent. of the population of the Commonwealth, yet on recent figures it is responsible for about 61 per cent. of our total wealth production. Our city population represents 62 per cent. of the total population, but according to the same figures (Commonwealth Year Book) it is responsible for only 31 per cent. of our total production. Mining, forestry, and fisheries make up the balance. (Note.—These percentages are subject to modification, for it is recognised that manufactures, especially in Victoria and New South Wales, have increased remarkably both in output and value in the last couple of years, for which precise figures are unavailable.) The city population, of course, serves the community in other ways as well as in the production of manufactured goods: nor must the fact be lost sight of that the cities as industrial centres, constitute the farmers' best market—the home market. From the foregoing it may be deduced that of the two sections of the Australian population the rural is the richer, but is it? Exactly the opposite is the case. Therefore the need of effective and continuous research at once becomes evident if we are to find the depreciating factors or discover means by which we may improve our methods and the general economy of agriculture.

It should be one of the chief functions of any research bureau to lay bare the governing facts and factors in regard to the present position of agriculture in this State; to determine, for instance, the extent to which the primary producer can command a fair share of the wealth he produces, or the extent to which production costs and artificial economic conditions cut into his legitimate profits. In Australia we stand irrevocably for the maintenance of a living wage, and as a moral principle no one will dispute its justice. But to what extent does that principle hold good for the farmer, who not only puts into his business thought, time, and energy, but also much capital, generally every shilling he possesses? When we

talk of the market realisation of primary commodities not covering costs of production, we say, in effect, that had the producer of those commodities no other sources of livelihood or other resources on which he could draw, he would actually starve. How many farmers, it is fair to ask, collect less than the basic wage? That is what economic research must tell us, and how to remedy the well-known anomalies that exist on the economic side of agriculture.

The Work of a Research Bureau.

SPEAKING on the importance of agricultural research at the opening of the Rockhampton Show last month, the Home Secretary (Mr. J. C. Peterson) surveyed the probable work of such a bureau, and the points he made may be summarised thusly:—

(1) To throw a spotlight on the Commonwealth Customs Tariff, examine it closely and suggest remedial measures, if advisable, for new and struggling rural industries.

(2) World's prices are, of course, beyond our control, but costs of production may not be. That is what we have got to find out.

(3) Like those engaged in other businesses, the farmer takes his produce to market, but, unlike them, he cannot balance costs of production by fixing his own prices, and must take what other business men offer him for his produce. He deals, too, in perishable and bulky goods. In the former case he must realise immediately or lose the lot; in the latter, he must pay for storage and costly handling. Then, again, the farmer is not usually a financier, and cannot afford to hold his produce for long. Economic research would show him the lowest price he could afford to accept for his produce; it would also help him by keeping him or his organisations well informed of market movements, of crop estimates, local and general, and in other similar ways.

(4) How often are costs of production in excess of the value of the produce raised and marketed? Is the farmer, who is not allowed to sweat his paid labour, often compelled to sweat his own family? Economic research would supply the answers and suggest the remedy.

(5) In secondary industry rising costs and every other conceivable charge are passed on. The farmer remains the economic shock absorber for the whole community. How we can lessen that economic shock is what we have got to find out.

(6) Ill-digestion of conflicting facts and half truths, when dealing with a sudden crisis in primary industry, is often followed by a temporary palliative which is often unfair to those immediately concerned as well as to the general taxpayer. Economic research, completely impartial and judicial in its outlook, would give timely warning of approaching or threatened crises and suggest means of preventing or avoiding them.

(7) Success of a crop or a section of primary industry in one district does not necessarily imply an equal success in other districts. Economic research would call attention to weaknesses of industries carried on in an unsuitable environment, and add strength to those more satisfactorily circumstanced, with the result that much wasted effort would be avoided and misdirected energy would, in the long run, give way to an all-round improved efficiency.

(8) Agriculture may be an art, but it is also a business in respect to which technical research cannot be separated from economic research.

(9) Many of our farms are over-capitalised, particularly in respect to modern machinery and plant which are often not fully and profitably employed. Economic research would keep the farmer informed on this phase of the industry.

(10) What are the prospects of success before the industrious farmer in regard to actual farming, and apart from a rise in land values or profits from speculative stock dealing? Economic research would give us some idea of the profits from actual production.

(11) To what extent can we absorb new settlers, migrants as well as native born, on our agricultural lands without disturbance of economic conditions, market, and otherwise? Continuous economic research would provide means of careful and accurate computation on this score.

How economic research should be conducted is, of course, a matter of determination by economists. The activities of a research bureau would extend to every section of primary industry, and it would materially add to the wealth of the State by indicating how methods and practices could be improved, how economic crises could be avoided, and how markets could be extended and stabilised.

Bureau of Sugar Experiment Stations.

The Bureau of Sugar Experiment Stations has received the following report (2nd May, 1929) from the Pathological Division of the Bureau:—

DOWNY MILDEW OR "LEAF STRIPE" DISEASE OF SUGARCANE.

Downy mildew or leaf stripe disease of sugar-cane is to be found in most parts of North Queensland wherever susceptible varieties are grown. The country in which the disease originated is not known with certainty, but it has been present in Queensland and Fiji for many years, and in the early days was called "Jump Up" by the kanakas. In 1909 it was found in Formosa, Japan, where it rapidly spread and caused a great deal of damage; and in 1920 it was introduced into the Philippines from Formosa, but prompt measures were taken and the disease was quickly eradicated. It is particularly destructive to the variety B. 208 in the Lower Burdekin, and B. 147 and Pompey in the Mossman district. In the Burdekin the disease has been responsible for the gradual disappearance of B. 208, but we think that with care this fine variety can be brought back again; certainly every effort should be made to accomplish this. The effects of the disease are a marked stunting of the cane and a low sugar content. On the Herbert River in 1910 diseased crops gave a p.o.c.s. of 10.7, as against the mill average of 13.8 for the same period.

Appearance of the Disease.

The first sign of the disease in the young plant or ratoon crop is the appearance of yellowish-white stripes running lengthwise along the newly opened leaves. As the young leaf becomes older the stripes become yellow, then a mottled reddish-brown, and in the older leaves may be a uniform dark-red colour. The stripes are straight and regular and generally run the whole length of the leaf; they run parallel to the large veins of the leaf and remain the same width throughout the whole length. Typical stripes are about one-eighth of an inch wide and alternate with stripes of normal green leaf of about the same width. In many cases, however, the stripes are wider, and in some cases they run together, so that the whole leaf becomes yellow, and later a rusty red.

On the under surface of these yellowish stripes may be found a white, fluffy, "downy mildew." This is most abundant on the younger leaves and is best seen in the early morning, as it may be dried up by the hot midday sun. If a young diseased leaf is sprinkled with water and placed in a closed tin overnight a strong growth of the downy mildew will be found next morning. The leaf should not be kept more than one night, as after that time all sorts of unimportant molds begin to grow.

This stage of the disease may be found all through the year, but is most common in the warm, wet summer months.

In the winter months, especially in old ratoons and abandoned fields, a number of the diseased canes develop into freaks and grow abnormally long and thin. Some of these may be as much as two and a-half times the height of the surrounding cane, and they stand out like flags to indicate the presence of the disease. It was the presence of these very long canes which led the kanakas to apply the name of "Jump Up" to the disease. The leaves on these long canes are short and few in number, and later become shredded and twisted. The sticks are brittle and watery and low in sugar content. This stage is found only in old cane.

The Cause of the Disease.

The disease is caused by a fungus known scientifically as *Sclerospora sacchari* T. Miy., which belongs to the class of fungi called the downy mildews. This fungus grows mainly inside the leaves and the yellowish stripes are formed as a result of its attack on the cells of the leaf. At night the fungus sends little stalks out through the breathing spores of the leaf, and on the ends of these are borne the spores or "seeds" of the fungus. A fresh crop of spores is produced every night and sometimes two or three crops. The spores are very delicate and tiny, being only about one-thousandth of an inch long, and dry up and die as soon as they are exposed to the sun. They are produced in extraordinarily large numbers and form the white downy mildew which is seen on the under surface of the leaves. A scientist, working with a very similar downy mildew disease of maize, estimated that on one diseased maize plant there were produced up to 4,000,000,000 spores in a single night. Since these spores are produced night after night, month after month, it will be understood that one diseased plant could provide enough spores to infect all the cane in the State.

How the Disease is Spread.

As the spores of the fungus are so small and light, they are easily carried from diseased to healthy cane by the lightest of winds and air currents. The spores will only germinate in the presence of moisture, and so the disease spreads mainly during the wet season, when the cane is almost continuously wet. When a freshly-produced spore falls on to a moist surface it will germinate immediately, and if it happens to be lying on a suitable part of a cane plant it will penetrate the tissue, and the plant becomes infected with the disease. The spores may be carried great distances, but they quickly lose their power to germinate, and our experience is that they do not usually infect plants which are more than ten chains away from the diseased stool on which they were produced. (The Bureau is now carrying out experiments to determine exactly the distance over which infection takes place.) It has been found that the plant becomes infected mainly through the tender eyes. The younger eyes towards the top of the stalk are more susceptible than the older eyes toward the butt.

An experiment may be performed by taking some top cuttings of B. 208, or other susceptible varieties, stripping off the trash so as to expose the eyes, and laying them overnight beneath the leaves of a diseased stool. The sets are then planted, and it will be found that a large proportion will give rise to diseased plants as a result of the eyes having been infected by the falling spores.

Standing cane may become infected through the eyes, and yet the fungus may not travel up into the leaves, and thus the cane will appear quite healthy, but on being planted the infected eyes will give rise to diseased plants. It is therefore evident that a cane may appear quite healthy and yet have diseased eyes which will give rise to diseased plants. It is for this reason that cane within ten chains of a single diseased plant is not safe for seed.

Methods of Control.

1. The first line of attack in this, as in most other diseases, is to plant healthy seed when planting susceptible varieties such as B. 208, B. 147, B. 156, and Pompey. It must be remembered that no cane within ten chains of even a single diseased stool can be considered healthy.

2. The young plant cane should be inspected frequently and any diseased stools pulled out and destroyed as soon as they are seen. This should be done during the dry winter months, when the spread of the disease is at a minimum—it is too late when rainy weather starts. It is very easy during the early cultivation to pick out the diseased plants and destroy them.

3. Burn trash immediately after cutting a field which contains some diseased cane.

4. Badly diseased cane should not be ratooned, but should be ploughed out immediately after cutting.

5. Do not have any volunteer ratoons or small patches of abandoned cane.

6. Plant resistant varieties if these precautions cannot be strictly observed.

Mr. George Wilson is at present in the Lower Burdekin district, and any farmer who wishes to plant B. 208 should get in touch with him. Mr. Wilson will give information as to the safest sources of seed, and if necessary will explain in detail the symptoms of the disease and its control. Mr. Wilson's address is Box 93, Post Office, Ayr.

DISEASE SURVEY OF THE GIRU DISTRICT.

A sugar-cane disease survey of the Giru district was carried out during the month of April, and revealed a very satisfactory state of affairs. Seventy-one farms were surveyed, and on fifty-nine of these no major diseases were found; downy mildew (leaf stripe) was found on five farms, and mosaic disease on seven farms. In each case the variety affected was B. 208, this variety being rather susceptible to both diseases. B. 208 is grown on some thirty-five farms. In order to protect the interests of the remaining farmers, orders to eradicate diseased plants were issued to the five farmers who had cane affected with downy mildew. The Bureau intends to see that these orders are carried out, and in this way it is hoped to make the district practically free from all major diseases. It must be emphasised that this very desirable freedom from disease can only be maintained if farmers continue to refrain from bringing in cane from other districts. It is by this means that all sugar-cane diseases are spread, and to introduce varieties from other parts of Queensland is taking a very grave risk. Farmers who desire any varieties which are not growing in their own district are requested to communicate with the Bureau of Sugar Experiment Stations for information as to the best source of that variety.

Any Giru farmer desiring information on downy mildew disease is referred to a circular which was recently issued from the Bureau and published in the Press. In this circular the appearance of the disease and the methods of spread and control were fully described, and it was particularly stated that no B. 208 taken from within a radius of ten chains of even a single diseased stool could be considered as safe seed. Any B. 208 block therefore should be carefully inspected for downy mildew before it can be considered as a source of seed.

The attention of farmers is directed to the fact that the small plantings of the variety P.O.J. 2714 have shown a very marked susceptibility to top rot, and therefore any plantings of this variety should be made with great caution in localities where top rot is prevalent.

GUMMING-FREE FARMS IN THE BUNDABERG DISTRICT.

The farms mentioned in the following list have been periodically inspected during the past year, and no trace of gumming disease has been found on any of the inspections:—

B. O. Smith, North Gooburrum (D. 1135).
W. J. Ferris, Ten-mile Road, Bingera (D. 1135, M. 189).
S. Nicolson, Maryborough Road (1900 S.).
F. G. Petterson, Pine Creek (D. 1135, 1900 S.).
O. Petterson, Pine Creek (1900 S.).
W. McGarry, Pine Creek (1900 S., D. 1135).
H. McGarry, Pine Creek (1900 S., D. 1135).
P. J. McGarry, Pine Creek (1900 S.).
E. J. Gaylard, Electra (H.Q. 285, D. 1135, 1900 S.).
H. Marles, Electra (H.Q. 285).
W. Hull, Yandaran (1900 S., D. 1135).
J. A. Knight, Yandaran (H.Q. 285, D. 1135, 1900 S.).
H. Buchback, Yandaran (H.Q. 285, D. 1135, 1900 S.).
J. Schmidt, Yandaran (D. 1135).
P. G. Maisey, Yandaran (H.Q. 285).
Batt and Dickson, Takoko (H.Q. 285, D. 1135, M. 189).
H. Neubecker, Waterloo, via Yandaran (H.Q. 285, D. 1135, 1900 S.).
R. Williamson, senr., Mullet Creek (1900 S., M. 189).
F. C. Bugden, Mullet Creek (D. 1135).
G. Visona, Mullet Creek (H.Q. 285, D. 1135).
A. Hyland, Mullet Creek (Q. 855, 1900 S.).
H. Bugden, Mullet Creek (D. 1135).
R. Williamson, junr., Watalgan (H.Q. 285, H. 227, M. 189).
E. J. Grills, Watalgan (D. 1135, 1900 S.).
J. Grills, senr., Watalgan (H.Q. 285).
H. Richter, Watalgan (H.Q. 285, 1900 S.).
Bailey Bros., Miara, via Yandaran (H.Q. 285).

These farms are recommended as suitable sources of seed for the spring planting in so far as freedom from gumming disease is concerned. On some of the farms there is a small percentage of Mosaic, and care should be taken to prevent the cutting of stools affected with this disease. Naturally not every field of cane on these farms is suitable for seed purposes, on account of lack of vigour, &c., and purchasers should select their own seed as far as possible. It is, of course, possible that gumming disease may have been introduced into some of these farms since the last inspection, but this is not considered likely.

Some fifteen additional farms were found to be free from gumming disease, but have had to be abandoned for seed purposes on account of Mosaic disease, or the crops being badly grown.

Suggestions for Owners of Farms Free from Gumming Disease.

The owner of a farm which is free from the destructive gumming disease will naturally desire to maintain this condition, and a study of the following points will assist him in this endeavour:—

1. Make yourself thoroughly acquainted with all the symptoms of gumming disease, particularly the early leaf streak symptoms. The field staff of this Bureau, or the officers at the Experiment Stations, will explain these symptoms, if desired.

2. Gumming is a highly infectious disease, caused by bacteria; the gum which oozes out from the cut ends of badly diseased canes consists of countless numbers of these extremely small germs.

3. The oozing of gum is almost the last stage of the disease. Every stick of cane in a field could be infected with gumming, and yet none of the sticks may have reached the oozing stage.

4. Cane must not be planted merely because it looks healthy; the selection of clean seed in a gumming area is very difficult and should be left to experts.

5. If your farm is clean, plant your own seed. If you desire to try out a new variety, write to the Director, Bureau of Sugar Experiment Stations, Brisbane, and find out if there is any guaranteed clean seed to be had. On no account plant cane from outside, no matter how healthy it looks, unless it has been O.K.'ed by the Director.

6. Gumming is spread from plant to plant in the field through the leaves, during wet, windy weather. The bacteria swim out through scratches in a diseased leaf, are brushed on to a healthy leaf, and enter through scratches in the healthy leaf. A single diseased plant will gradually infect the whole field.

7. Gumming may also be spread from plant to plant, and from field to field, by means of infected cane knives. A clot of gum was placed on a cane knife which was then thrown in a corner—six months later some of the bacteria were still alive and able to infect cane.

8. When selling plants, do not allow the purchaser to use his own cane knife, but see that he uses one of yours.

9. Do not allow men, animals, or implements from another farm to go into your cane during wet weather.

10. Do not allow chop chop from another farm to pass along your headlands, so that the leaves of the chop chop brush against your cane.

INSURANCE FOR THE MAN ON THE LAND.

ESSENTIAL PROTECTIVE SERVICE.

The time has fortunately long since passed when it was necessary for the representative of the insurance office to first persuade his prospective client that insurance was sound business and not a form of gambling. There may be a few remaining still holding this latter erroneous view, but the man on the land of to-day as a rule is keen, businesslike, and fully seized with the necessity for the protection of his assets against loss through one of the many risks incidental to his calling, the happening of any of which might seriously cripple him financially. Insurance spreading among many the losses which otherwise would fall heavily on the few is scientific and prudent, and in affording relief against misfortune achieves the object for which it was brought into being.

The present is a progressively mechanical age, and the advent of the numerous modern machines, which tend to greatly lighten the labour of the primary producer also tend to increase in many ways the risk of fire and accident. The forms of insurance protection available at the present time as a result of this progress are much more numerous than was the case twenty years ago, and the necessity for insurance cover more urgent. While almost every farmer has for years past insured against fire his buildings he may now secure policies which will cover him against many other forms of loss. For example, wool is covered from the sheep's back until sold locally or overseas.

In respect of his legal liability for workers' compensation for accidents to his workmen arising out of or in the course of their employment full protection may be obtained, while for damage to persons or property as the result of the negligent driving of his motor-car, his tractor, or his other vehicles he may secure indemnity, including also the refund of his legal expenses in connection with the defence of any claims made on him in this connection. The insurance office of to-day is an economic necessity, and the prudent man on the land needs no convincing that the cost of his insurance premiums is a necessary working expense which secures for him essential protective service.

FEEDING HABITS OF SOME QUEENSLAND BIRDS.

By HUBERT JARVIS, Entomological Branch.

The value of Queensland native birds and the importance of their protection have long been realised by many agriculturists and by those interested in ornithology. Many other members of the community, however, are less appreciative of the value of bird life, and it frequently becomes necessary to demonstrate to them the grounds on which the protection of birds is based. The decision to protect a species of bird on account of its economic status must be based upon an accurate knowledge of its feeding habits, and a valuable contribution to such knowledge can be obtained by an examination of its stomach contents. As a contribution to such a fund of knowledge, a number of the commoner Queensland birds were shot some years ago, and an examination was made of their stomach contents in the Department of Agriculture and Stock.

This work was initiated by the late Government Entomologist and Vegetable Pathologist (Mr. Henry Tryon), who identified the fifty-eight birds herein dealt with. The stomach contents in each case were determined by the writer during the years 1919 and 1920.

The birds were all collected in the Mount Gravatt area, near Brisbane, by Mr. Thomas Batchelor, whose skill as a taxidermist enabled him to mount for exhibition every bird shot, and the interesting collection thus made was acquired by the Department of Agriculture and Stock as a permanent exhibit.

After their determination the stomach contents were mounted on cards of uniform size, the fragments representing each group of insect being kept in separate areas. (Plate 1.) In many cases where an insect was found more or less complete it was possible to determine the family to which it belonged; but this was not always the case, as frequently, the insect remains were broken into small fragments, making the identification of its systematic position impossible.

Each card was labelled with the name of the bird and a general description of the stomach contents, and the cards were arranged in exhibition cases, where they are now permanently on view in the Entomological Museum of the Department of Agriculture and Stock, Brisbane.

The information obtained as a result of these examinations has hitherto been available only to visitors to the Entomological Museum, and it has now been thought desirable to place it on record in the "Agricultural Journal," thus making it available to the agricultural community and to such sections of the scientific world as are interested in ornithological matters.

The nomenclature used in these notes is the one adopted in "The Official Check List of the Birds of Australia," and the numbers in brackets in this article refer to the consecutive numbers of the species in the check list mentioned.

It is now being realised by most orchardists that birds, destructive to the fruit crops during six or eight weeks in summer, may yet be doing useful work during the remainder of the year; and if this is the case even they are, therefore, worth protecting.

Few if any of Queensland's native birds are entirely destructive, and the value of by far the greater number to the agriculturist is now generally conceded.

Although it was found possible to examine comparatively few of the common birds, and in some cases only one of a species was procurable, the information obtained is, nevertheless, interesting, showing as it does how large a part of the dietary of nearly every bird examined was composed of insects.

1. (447) Australian Ground-Thrush (*Oreocincla lunulata* Latham)—Coleoptera, 1 Scarabæid, 1 Carab, 1 specimen undetermined; Hymenoptera, 1 ant; Hemiptera, 1 Asopid, 2 other specimens; Larvæ, 2 dipterous; fragments of vegetable matter.

2. (447) Australian Ground-Thrush (*Oreocincla lunulata* Latham)—Coleoptera, 2 Tenebrionids; Coleopterous larvæ, 3 wireworms; no seeds, fruit, &c.

3. (647) Australian Pipit (Ground Lark) (*Anthus* (*Austranthus*) *australis* Viellot)—Sow bug, cicadas, leaf hoppers; 6 small seeds.

4. (524) Australian Reed-Warbler (*Acrocephalus* (*Conopoderas*) *australis* Gould)—Cicadas, 3 beetles; no seeds, fruit, &c.

5. (179) Australian White Ibis (*Threskiornis mollucca* Cuvier)—Dragon fly larvæ, water bugs; no seeds, fruit, &c.

6. (428) Barred Cuckoo-Shrike (*Coracina* (*Paragraucalus*) *lineata* Swainson)—Beetles, dragon flies; small seeds.

7. (705) Black-backed Magpie (*Gymnorhina tibicen* Latham)—2 crickets, 5 small Phasmids (stick insects), 3 spiders, 4 Coprid bettles, 1 small lizard; no seeds, fruit, &c.

8. (705) Black-backed Magpie (*Gymnorhina tibicen* Latham)—1 cricket, 4 spiders, 1 Ichneumon, 1 Carabid beetle, 5 Coprid beetles, miscellaneous beetle fragments; no seeds, fruit, &c.

9. (705) Black-backed Magpie (*Gymnorhina tibicen* Latham)—Grasshoppers, beetles; lantana seeds.

10. (705) Black-backed Magpie (*Gymnorhina tibicen* Latham)—Grasshopper, cicada, beetle fragments; no seeds, fruit, &c.

11. (373) Black-faced Flycatcher (*Monarcha melanopsis* Vieillot)—Coleoptera, 1 Clerid; Hymenoptera, large quantity of fragments; Diptera, fragments; Homoptera, 1 or more cicadas (small species); no seeds, fruit, &c.

12. (56) Dusky Moorhen (*Gallinula tenebrosa* Gould)—No insects; stones, vegetable matter.

13. (547) Dusky Wood-Swallow (*Artamus* (*Angroyan*) *cyanopterus* Latham)—5 beetles, 30 flies (miscellaneous); no seeds, fruit, &c.

14. (547) Dusky Wood-Swallow (*Artamus* (*Angroyan*) *cyanopterus* Latham)—20 caterpillars; no seeds, fruit, &c.

15. (318) Eastern Broad-billed Roller (Dollar-bird) (*Eurystomus orientalis* Linné)—3 cicadas, several beetles; no seeds, fruit, &c.

16. (318) Eastern Broad-billed Roller (Dollar-bird)—(*Eurystomus orientalis* Linné)—6 large cicadas; no seeds, fruit, &c.

17. (318) Eastern Broad-billed Roller (Dollar-bird) (*Eurystomus orientalis* Linné)—Large number of small beetles; no seeds, fruit, &c.

18. (318) Eastern Broad-billed Roller (Dollar-bird) (*Eurystomus orientalis* Linné)—40 small cicadas, 1 large bee, 12 beetles; no seeds, fruit, &c.

19. (421) Eastern Whipbird (*Psophodes olivaceus* Latham)—Cicadas, large number of fragments, 1 small lizard; no seeds, fruit, &c.

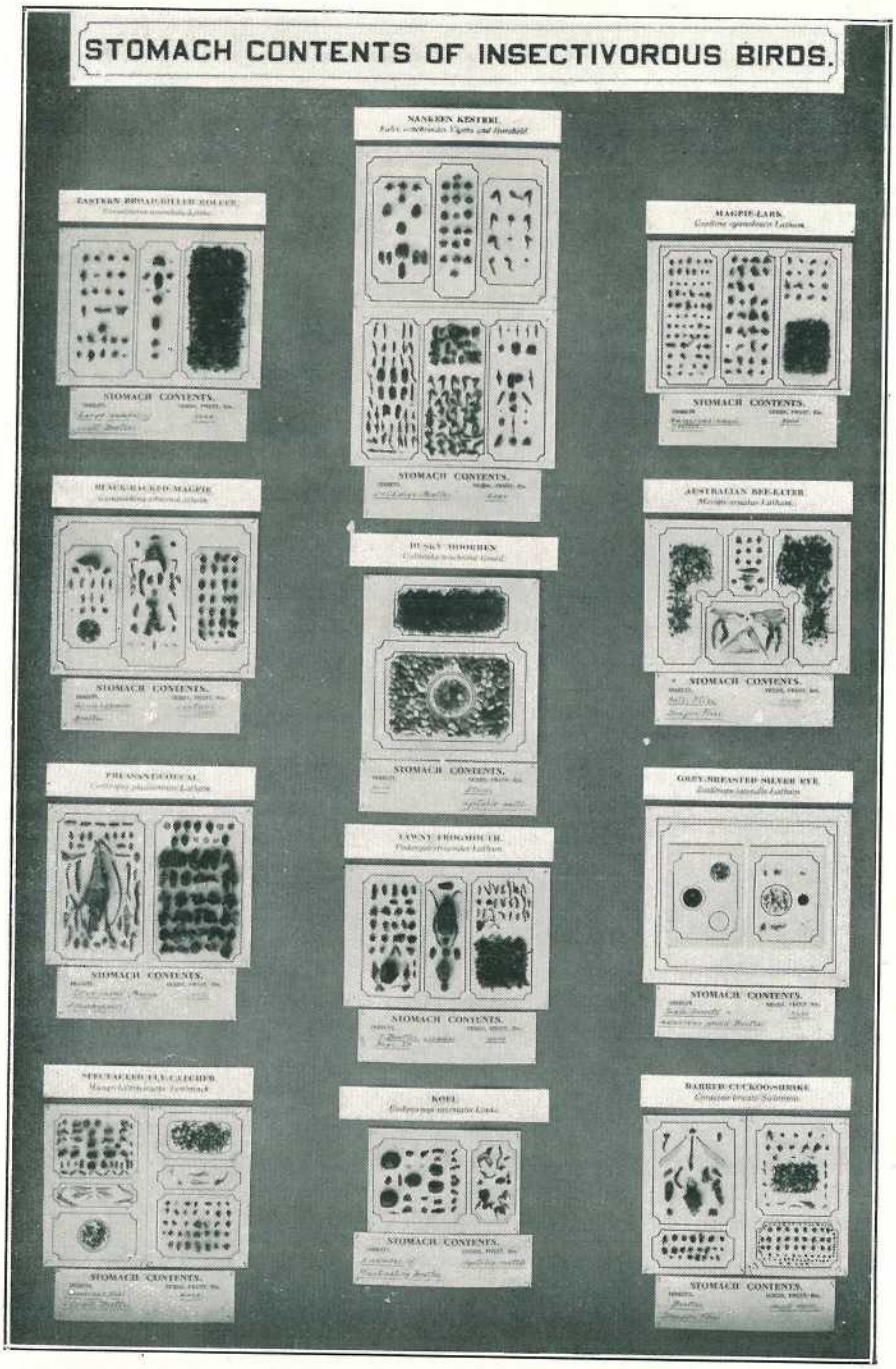

STOMACH CONTENTS OF INSECTIVOROUS BIRDS.
NANKEEN KESTREL.
EASTERN BROAD-BILLED ROLLER.
MAGPIE-LARK.
BLACK-BACKED MAGPIE.
AUSTRALIAN BEE-EATER.
BUSHY MOORHEN.
PHEASANT-COUCAL.
GREY-BREASTED SILVER EYE.
TAWNY FROGMOUTH.
SPECTACLED FLY-CATCHER.
KOEL.
BARRED CUCKOO-SHRIKE.
STOMACH CONTENTS.

PLATE 1.

20. (324) Forest-Kingfisher (*Halcyon* (*Lazulena*) *macleayi* Jardine and Selby)—Dragon flies, large cockroach, ants; no seeds, fruit, &c.

21. (324) Forest-Kingfisher (*Halcyon* (*Lazulena*) *macleayi* Jardine and Selby)—2 grasshoppers, 1 cicada, 9 beetles; no seeds, fruit, &c.

22. (398) Golden Whistler (*Pachycephala pectoralis* Latham)—Coleoptera, 7 or more small beetles; Hymenoptera, ants, 1 Hymenopteron; Heteroptera, 1 plant bug; Larvæ, 4 or more Lepidopterous; no seeds, fruit, &c.

23. (676) Green Catbird (*Ailuroedus crassirostris* Paykull)—Coleoptera, 9 or more large Coprids; 9 large seeds, 3 small seeds.

24. (574) Grey-breasted Silvereye (*Zosterops lateralis* Latham)—Scale insects, numerous small beetles; no seeds, fruit, &c.

25. (361) Grey Fantail (*Rhipidura flabellifera* Gmelin)—1 grasshopper, 2 large spiders, 1 small lizard; no seeds, fruit, &c.

26. (429) Jardine Caterpillar-Eater (Cicada-bird) (*Endoliisoma* (*Metagraucalus*) *tenuirostre* Jardine)—2 large crickets, 4 small cicadas; no seeds, fruit, &c.

27. (429) Jardine Caterpillar-Eater (Cicada-bird) (*Endoliisoma* (*Metagraucalus*) *tenuirostre* Jardine)—Caterpillars, 26 or more (unidentified); 3 seeds.

28. (347) Koel (Cooee-bird) (*Eudynamys orientalis* Linné)—A number of plant-eating beetles; vegetable matter.

29. (322) Laughing Kookaburra (*Dacelo gigas* Boddaert)—1 cicada, 6 large ants, 2 spiders, 6 beetles (1 Clerid species, 1 Anoplognathus species, 4 plant-eaters Paropsis species); no seeds, fruit, &c.

30. (322) Laughing Kookaburra (*Dacelo gigas* Boddaert)—1 land crab; no seeds, fruit, &c.

31. (322) Laughing Kookaburra (*Dacelo gigas* Boddaert)—1 large grasshopper; no seeds, fruit, &c.

32. (415) Magpie-Lark (*Grallina cyanoleuca* Latham)—39 ants, 8 beetles, leaf hoppers; small seeds.

33. (415) Magpie-Lark (*Grallina cyanoleuca* Latham)—Numerous small beetles; no seeds, fruit, &c.

34. (415) Magpie-Lark (*Grallina cyanoleuca* Latham)—40 small beetles, large number of ants; no seeds, fruit, &c.

35. (240) Nankeen Kestrel (*Falco* (*Cerchneis*) *cenchroides* Vigors and Horsfield)—24 large beetles; no seeds, fruit, &c.

36. (645) Noisy Friar-bird (*Philemon* (*Tropidorhynchus*) *corniculatus* Latham)—Beetles (root-eating); no seeds, fruit, &c.

37. (352) Noisy Pitta (*Pitta* (*Coloburis*) *versicolor* Swainson)—Coleoptera, 8 Coprids, 4 weevils (3 species); no seeds, fruit, &c.

38. (352) Noisy Pitta (*Pitta* (*Coloburis*) *versicolor* Swainson)—Coleoptera, 3 large Scarabæids, 12 or more Coprids; 1 Japyx; no seeds, fruit, &c.

39. (686) Paradise Rifle-bird (*Ptiloris paradiseus* Swainson)—Coleoptera, 1 Chalcopterus species, 1 Tenebrionid, 2 large beetles; Hymenoptera, 36 small ants, 3 large specimens; Larvæ, 1 Coleopterous; fragments of wood; 3 seeds (accidental?).

40. (686) Paradise Rifle-bird (*Ptiloris paradiseus* Swainson)—Coleoptera, 3 Tenebrionids; Orthoptera, 2 crickets, 1 small cockroach;

Hymenoptera, 4 or more ants (undetermined); Spiders, 2 or more; Larvæ, 1 large Cerambycid (wood borer); no seeds, fruit, &c.

41. (686) Paradise Rifle-bird (*Ptiloris paradiseus* (Swainson)—Coleoptera, 3 or more Tenebrionids (Chalcopterus); Lepidoptera, 10 larvæ, 5 pupæ; Hymenoptera, 1 wasp; no seeds, fruit, &c.

42. (349) Pheasant-Coucal (*Centropus* (*Polophilus*) *phasianinus* Latham)—Stick insects (Phasmids), grasshoppers; seeds.

43. (349) Pheasant-Coucal (*Centropus* (*Polophilus*) *phasianinus* Latham)—Very large caterpillar, 4 plant-eating beetles; small seeds.

44. (700) Pied Butcher-bird (*Cracticus nigrogularis* Gould)—Heteroptera, 9 water bugs; fragments; no seeds, fruit, &c.

45. (700) Pied Butcher-bird (*Cracticus nigrogularis* Gould)—5 dragon flies, 2 large grasshoppers; no seeds, fruit, &c.

46. (694) Pied Currawong (Bell-Magpie) (*Strepera graculina* Shaw)—Coleoptera, 2 Coprids (large), 1 Coprid (small); Hymenoptera, 2 ants, 1 Ichneumon; Mollusca, 1 snail; small quantity of vegetable matter.

47. (329) Rainbow-bird or Australian Bee-Eater (*Merops* (*Cosmaerops*) *ornatus* Latham)—Ants, flies, dragon flies; no seeds, fruit, &c.

48. (684) Regent Bower-bird (*Sericulus chrysocephalus* Lewin)—Coleoptera, 1 beetle; Orthoptera, 1 grasshopper; Hymenoptera, 1 ant (head only); Dermaptera, 1 earwig; seeds and fragments of vegetable matter.

49. (679) Satin Bower-bird (*Ptilonorhynchus violaceus* Vieillot)—Coleoptera, 3 plant-eating beetles (*Phyllocharis cyaniformis*); native fruit.

50. (679) Satin Bower-bird (*Ptilonorhynchus violaceus* Vieillot)—No insects; lantana seeds, fruit skins.

51. (392) Southern Yellow Robin (*Eopsaltria australis* Shaw)—Lepidoptera, 1 small pupa; Hemiptera, 1 black bug (Aednus species), 2 small Lygaeids; Hymenoptera, 1 Ichneumon, 3 ants; 1 spider; no seeds, fruit, &c.

52. (673) Spangled Drongo (*Chibia* (*Notochibia*) *bracteata* Gould)—1 bug, 15 wasps, 7 plant-eating beetles; no seeds, fruit, &c.

53. (673) Spangled Drongo (*Chibia* (*Notochibia*) *bracteata* Gould)—Coleoptera, bark beetle (Chalcopterus species); Dynastid species; Homoptera, small cicada (Pauropsalta species); no seeds, fruit, &c.

54. (375) Spectacled Fly-Catcher (*Monarcha* (*Symposiachrus*) *trivirgata* Temminck)—Numerous flies and small beetles; no seeds, fruit, &c.

55. (565) Spotted Pardalote (*Pardalotus punctatus* Shaw)—Leaf hoppers, 30 ants; no seeds, fruit, &c.

56. (313) Tawny Frogmouth (*Podargus strigoides* Latham)—7 beetles, cicadas, bugs; no seeds, fruit, &c.

57. (313) Tawny Frogmouth (*Podargus strigoides* Latham)—30 large beetles, 1 mole cricket, 3 large ants; no seeds, fruit, &c.

58. (536) Variegated Wren (*Malurus* (*Leggeornis*) *lamberti* Vigors and Horsfield)—Hymenoptera, 7 or more ants; Hemiptera, 22 plant bugs (Nysius species); 1 spider; no seeds, fruit, &c.

PESTS OF DECIDUOUS FRUITS.*

By ROBERT VEITCH, B.Sc., F.E.S., Chief Entomologist.

The following insects are dealt with in these notes:—Queensland fruit fly, codling moth, woolly apple aphis, and San José scale.

The Queensland Fruit Fly.

The Queensland fruit fly (*Chætodacus tryoni* Froggatt) is rightly regarded as being worthy of inclusion in the category of highly destructive insects. Records of its occurrence were obtained in the early days of fruit-growing in this State, and for almost forty years it has been a subject of great interest to both fruit-growers and scientific investigators. It has frequently been stated that the Queensland fruit fly is identical with an Indian species, *Dacus ferrugineus* F., but local opinion favours the belief that the fly now under discussion is a native of this country and is not the Indian species referred to. The Queensland fruit fly is not confined to this State, for many records of its occurrence have been obtained in the neighbouring State of New South Wales.

DETAILED INVESTIGATIONS.

The following paragraphs contain a brief account of what is at present known with respect to the life history and control of the Queensland fruit fly. The pest was studied by Henry Tryon many years ago, and more recently it has been the subject of a detailed investigation by Hubert Jarvis, the Departmental Entomologist stationed in the Stanthorpe district. Tryon's early reports have long been out of print, but that is not the case with respect to those prepared by Jarvis, and readers who desire fuller details with respect to this pest should accordingly consult the various progress reports published by Jarvis. The Queensland fruit fly has also been extensively studied by F. A. Perkins, who was located at Stanthorpe for several years as Stanthorpe Research Fellow, working in association with the University of Queensland. A number of progress reports by the latter investigator have appeared in the local press.

NATURE OF INJURY.

The larva or maggot is the life-cycle stage in which this insect damages fruit. The larva feeds voraciously and tunnels throughout the fruit in any direction, and not only does it destroy much tissue in doing so, but its presence also leads to the rotting of the attacked fruit, which is rendered valueless for marketing.

FRUITS ATTACKED.

The fact that the Queensland fruit fly has been a pest of outstanding importance of deciduous fruits grown in the Stanthorpe district has sometimes somewhat obscured the additional fact that it is a species that attacks a wide range of cultivated fruits other than those produced at Stanthorpe.

It has been recorded as attacking the following fruits:—Apple, apricot, banana, cape gooseberry, cherry, custard apple, date, fig, granadilla, grape, grape fruit, loquat, mandarin, mango, nectarine, passion

*Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc., published by the Department of Agriculture and Stock, Brisbane, 1929.

fruit, papaw, orange, peach, pear, persimmon, plum, quince, tomato, and walnut. It has also been bred from quite a number of other fruits, including those of certain native trees.

The Queensland fruit fly attacks bananas in the Southern banana districts, but in the North the fruit fly losses in bananas are due to the presence of another species, namely *Chætodacus musæ* Tryon.

It is rather a curious fact that the notorious Mediterranean fruit fly (*Ceratitis capitata* Wied.) does not occur in this State, although it is a very common species in the neighbouring State of New South Wales.

Life Cycle Stages.

The egg (Plate 2, fig. 1) of the Queensland fruit fly is creamy white in colour and is distinctly elongate. It is slightly curved and tapers at both ends, measuring roughly about $\frac{1}{25}$ inch in length. It might quite appropriately be described as being somewhat banana-shaped.

The larva (Plate 2, fig. 2) is creamy white in colour and measures about $\frac{1}{3}$ inch in length when full-grown. It is bluntly rounded off at the anal end but it tapers off to a fine point at the head end. It is legless but is nevertheless capable of moving over a surface when removed from the fruit, and it is, further, capable of jumping quite appreciable distances.

The pupa is formed within a somewhat hard-shelled yellowish-brown or reddish-brown cylinder, known as the puparium (Plate 2, fig. 3). The puparium is bluntly rounded off at either end and is about $\frac{1}{6}$ inch in length.

The adult (Plate 2, fig. 4) is a rather prettily marked fly, of a somewhat reddish-brown colour broken by numerous conspicuous lemon-yellow spots or lines on the thoracic segments. In the female there is an ovipositor or egg-laying tube at the apex of the abdomen (Plate 2, fig. 4); in the male the abdomen has a distinct fringe of bristles on each side (Plate 2, fig. 5). The single pair of wings is clear or hyaline, except for certain areas which are quite distinctly coloured as indicated in the accompanying plate. The fly is about $\frac{1}{3}$ inch in length with a wing-spread of about $\frac{2}{3}$ inch.

Life History.

The female fly, when ready for egg-laying, selects a suitable fruit in the skin of which she makes a slight puncture, and then inserts a number of eggs in the underlying tissue. The site chosen for oviposition by the fly can be detected by the presence of the puncture which, in the case of certain fruits, exudes a small quantity of gum. It is generally agreed that six or seven eggs may be laid when each puncture is made, but a more difficult point is to accurately determine the total egg-laying capacity of each individual. That has not been ascertained, but dissections of Stanthorpe flies have disclosed the presence of some fifty or sixty eggs in the ovaries.

The eggs undergo the usual incubation transformation, and the larvæ hatch out in two or three days in the warm summer months. They then feed on the tissue of the fruit, thus producing the damage and losses already described. The maggot grows rapidly in the height of summer, when it is feeding under favourable conditions, and after passing through a series of moults it becomes full-grown in six or seven days. In colder weather, however, this stage of the life cycle is much prolonged.

Chætodacus tryoni Froggatt.

Fig. 1.
Eggs x 10.

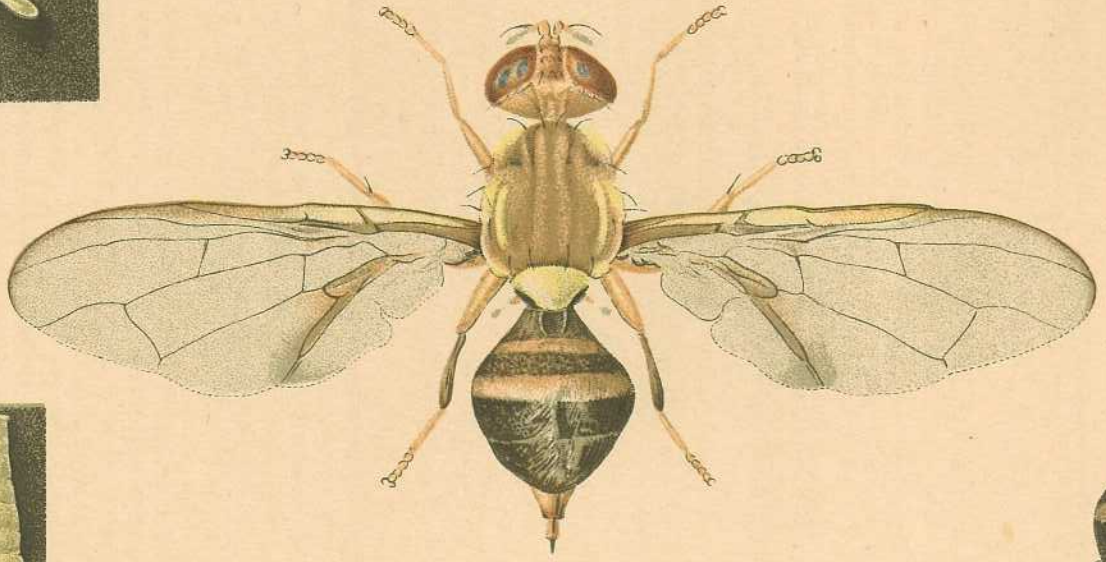


Fig. 3.
Puparium x 5.

Fig. 2.
Larva x 5.

Fig. 4.
Adult x 10.

Fig. 5.
Male Abdomen x 10

PLATE 2. THE QUEENSLAND FRUIT FLY (*Chætodacus tryoni* Froggatt).

(From a water-colour drawing by I. W. Helmsing.)

When the larvæ are full-grown they leave the fruit and burrow into the soil for the purpose of pupating. The pupæ are formed at varying depths, which depend on a variety of factors, including the nature of the soil. They may be found just covered by the soil or they may be located at a depth of several inches, although they are rarely found at a greater depth than 2 inches. As already mentioned, the pupæ are formed within reddish-brown or dark-brown cylindrical puparia. The pupal period may be as short as one week in the height of summer, or it may be very greatly prolonged in the colder months. In fact, the fly has been proved to overwinter in small numbers as pupæ in the Stanthorpe district.

At the end of the pupal period the flies emerge, feed, mate, and lay eggs, and thus the next generation is produced.

NATURAL ENEMIES.

A number of parasites have been bred from the Queensland fruit fly, the best known of which is the Braconid wasp *Opius tryoni* Cameron. In some seasons this parasite is particularly active in attacking the fruit-fly maggots in native fruits, and it has also been bred from fly-infested cultivated fruits.

Certain predatory insects also assist the parasites in maintaining a partial control over this pest. The degree of biological control exercised by these native enemies is, however, only relatively slight, and hence the orchardist must resort to artificial control measures to check the ravages of this pest and to supplement the efforts of the parasitic and predatory enemies.

CONTROL MEASURES.

The preceding brief outline of the life history of the Queensland fruit fly should clearly indicate the possibility of the successful adoption of certain measures of control. Outstandingly important in the campaign against this pest is the collection and destruction of infested fruit. This measure has been consistently advocated ever since the attention of investigators was first directed to the problem some forty years ago, and it should still be retained as an extremely important means of combating the fruit fly.

Orchard hygiene should therefore be the first line of attack against this pest, and infested fruit should be regularly collected and destroyed. To facilitate the picking up of infested fruit that has fallen to the ground, the orchard should be kept as free from weeds as is practicable. If the orchard is overgrown, then efficient picking up will be a matter of considerable difficulty, and much infested fallen fruit will be overlooked, and the maggots contained therein will leave the fruit, pupate in the soil, and produce a fresh brood of flies.

When the infested fruit has been collected, the question of the best means whereby it may be disposed of automatically arises; the orchardist has the choice of several means of dealing with that fruit, and each of these is quite satisfactory, if properly practised.

One at least is, however, open to serious objection if carelessly carried out, and indeed, when proper precautions are not observed, the labour expended on the collection of the fruit is rendered quite valueless. Here reference is made to the burying of the infested fruit.

Boiling infested fruit that has been picked up is a very effective means of disposal, and is one that is in general favour. Burning the stung fruit in a good hot fire can also be practised, and, as already mentioned, the burying of picked-up fruit is an alternative means of disposal. When the latter practice is followed, every precaution must, however, be taken to ensure that the fruit is buried deeply, i.e., with a soil covering of about 18 inches. If the stung fruit is but slightly covered with soil, no good will have been accomplished by its collection, for large numbers of flies can emerge from infested fruit that has been buried in a shallow trench.

The next control measure to which reference must be made is the reduction of the adult fly population by means of luring. A lure and suitable glass traps are now on the market; where these are employed in an orchard they should be placed on boards in leafy trees and then baited with the fruit-fly lure. It is essential that the traps be placed in the orchard early in the season, and that they receive regular attention for such purposes as the renewal of the lure.

A further control measure of value is the elimination of all useless fruit-trees or other plants that may serve to harbour the fly and to act as a source of infestation in which flies will be bred to attack and destroy the cultivated fruits on which the orchardist is making his living.

The possibility of controlling the Queensland fruit fly by the use of both repellents and poison sprays has not infrequently been a subject of inquiry, but, so far as the entomological branch of this department is concerned, it possesses no definite evidence to show that these measures can as yet be recommended as being both practicable and effective. They are, however, worthy of some further attention, but in the meantime efforts at control should be concentrated on the measures already recommended.

Firstly, collect and destroy infested fruit; secondly, trap the adult fly; and thirdly, eliminate worthless, non-commercial fruit-trees.

The Codling Moth.

The codling moth (*Cydia pomonella* Linn.) is without doubt one of the most serious pests of the apple in Queensland, and the losses due to its destructive activities are surpassed only by those inflicted by the Queensland fruit fly. Elsewhere the codling moth is generally regarded as the worst insect pest known to the apple-grower.

It is believed that this pest is a native of South-eastern Europe, whence it has spread to every other continent, and it is safe to say that there are few districts in which apples are grown that are not now thoroughly infested. The Stanthorpe district of Queensland is unfortunately included in the infested areas. It is somewhat difficult to say just when the codling moth reached Queensland, but records show that infested fruit was observed in Brisbane in 1889. Much earlier references to this pest are available in the Southern States, and a severe infestation was recorded in Tasmania as far back as 1857.

The word "codling" is, in the opinion of some investigators, merely a corruption of the old English word "querdlying," a term that was employed to signify a half-grown or immature apple. It has also been employed in more recent years to designate a number of varieties of cooking apples.

The "wormy" apples produced by the feeding of the codling moth larvæ have been referred to in European publications for centuries, and a reference to "wormy apples" occurs even as early as 200 B.C. in Cato's treatise on agriculture.

The codling moth belongs to the family Tortricidæ in the order Lepidoptera, and is very closely allied to several species that also live in fruits and seeds, e.g. the nut fruit tortrix (*Carpocapsa splendidana* Hb.), which attacks the fruits of Spanish chestnuts in Europe.

NATURE OF INJURY.

The injury, as is the case with practically all species of destructive moths, is inflicted in the immature stage known as the larva or caterpillar, the moth itself being quite incapable of attacking the fruit. The larva, on hatching from the egg laid by the moth, enters the fruit and eats its way through the flesh to the core. There it continues feeding, and in doing so it scoops out an irregular cavity and also feeds on the pips. Much of the attacked fruit falls to the ground while still small and green, and is obviously quite unmarketable.

FRUITS ATTACKED.

The apple is pre-eminently the fruit that is severely attacked by the codling moth, although very appreciable losses may also occur in pears, quinces, and walnuts. The peach, nectarine, plum, apricot, and cherry have also been recorded as host fruits of this pest.

LIFE CYCLE STAGES.

The egg (Plate 3, fig. 1) of the codling moth is somewhat oval in outline, and is about the size of a small pin's head. It is a very thin, semi-transparent object, and has been rather aptly described as resembling a fish-scale. When just laid the egg is pearly white in colour, but as the incubation period advances a red ring develops which tends to give it a darker appearance. An examination with a hand lens will show that its surface, particularly round the flange, possesses a beautifully sculptured network of ridges.

The larva (Plate 3, fig. 2), when full-grown, is about $\frac{3}{4}$ inch in length, and is pinkish or whitish in colour, with a brown head and a number of scattered hairs on the body. It possesses eight pairs of legs, three of these being jointed legs situated on the thoracic segments, while the remaining five pairs are fleshy unjointed legs situated on the abdominal segments.

The pupa or chrysalis (Plate 3, fig. 4) is brown in colour, and measures about $\frac{1}{2}$ inch in length. The head, eyes, antennæ, and legs of the future moth can be distinctly seen in the pupa.

The moth (Plate 3, figs. 5, 6) measures about $\frac{3}{4}$ inch when its wings are spread out (as in fig. 5 of Plate 3). The front wings are grey in colour, but the uniformity thereof is broken by a number of irregular darker transverse lines, and is further modified by a patch of beautiful copper-coloured scales of a metallic tint. The hind wings are a plain greyish-brown colour.

LIFE HISTORY.

The codling moth passes through the winter months as a larva in a tough silken cocoon (Plate 3, fig. 3), and the stock of codling moth

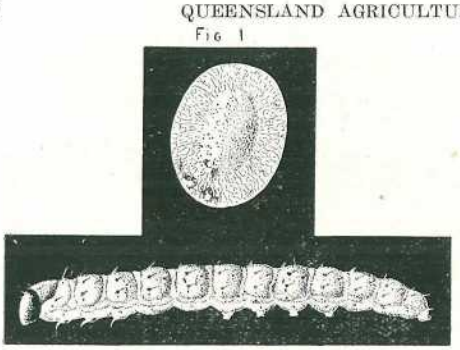


Fig 1

Fig 2

Fig 4

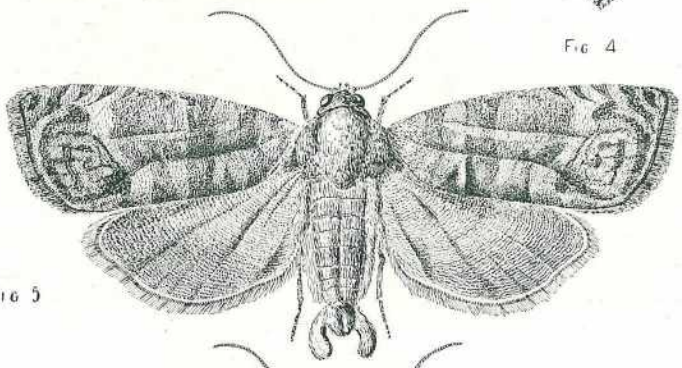


Fig 5

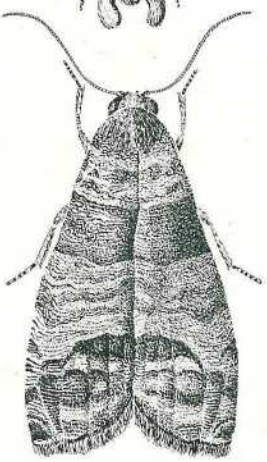


Fig 6

Fig 3

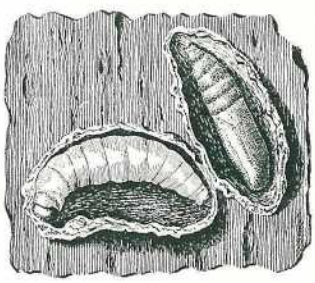


Fig 7

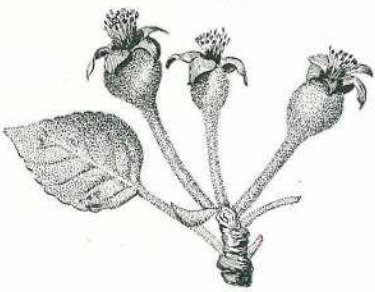


PLATE 3.—THE CODLING MOTH (*Cydia pomonella* Linnæus).

Fig. 1.—Egg of codling moth × 15.
Fig. 2.—Larva × 4.
Fig. 3.—Larva and pupa in silken cocoons × 2.
Fig. 4.—Pupa × 4.
Fig. 5.—Moth or imago with wings spread × 5.
Fig. 6.—Moth or imago with wings folded × 5.
Fig. 7.—Correct time for first spray.

available for starting the infestation each season on the orchard consists of such larvæ as have survived the winter in safe situations.

At the approach of spring these overwintering larvæ transform to pupæ, and in the pupal stage profound reorganisation takes place, as a result of which the moths emerge after a pupal period of about three or four weeks under average conditions.

Many of the moths developed from the overwintering larvæ emerge a few days after the petals have commenced falling from the apple blossoms, and after mating they proceed to lay their eggs. These are laid mainly on the leaves in the case of the spring brood moths at present under consideration, and after an incubation period of about ten days the young larvæ hatch out.

The young larvæ may feed for a short period on the young foliage, but they generally make for the fruit and enter it usually at the calyx or flower end in the case of this first generation. In the later generations, however, many of the larvæ enter at the side of the fruit, particularly where two fruits touch. The larvæ having entered the fruit then work their way to the core, and feed as already indicated in an earlier paragraph. The larvæ of the first generation are generally full-fed in slightly less than four weeks, at the end of which period they leave the fruit and go in search of a suitable spot in which to pupate.

The pupæ are found under pieces of loose rough bark or in cavities or cracks in the limbs of the tree; pupation may also take place under clods of earth at the base of the tree, and in fact in many other situations. The duration of the pupal stage in the first generation, like that of all other life-cycle stages, varies appreciably, but it is generally about twelve or thirteen days, which is very much shorter than in the case of the pupæ formed by the overwintering larvæ.

At the end of the pupal stage the moths emerge, feed, and mate, and in three or four days after mating the females start egg-laying, thus commencing the next or second generation.

There is usually only one brood of codling moth each year in England and in Northern Europe, but in Queensland two generations occur regularly, and a third is quite possible.

CONTROL MEASURES.

The following control measures are available for combating this pest:—

(1) Spraying with arsenate of lead;
(2) Bandaging of trees;
(3) Destruction of windfalls;
(4) Cleaning up packing sheds;
(5) Cleaning bark of infested trees;
(6) Judicious thinning of heavy crops.

While each of these control measures is undoubtedly productive of much good, no one of them will alone give thoroughly effective control. It is therefore strongly recommended that all six measures be enforced, and if that is done there is every reason to believe that in a normal season losses will be reduced to relatively small proportions.

Spraying with arsenate of lead must be repeated several times, and the first spray should be applied as soon as the petals have fallen and

before the calyx-cup has closed. The lobes or sepals of the calyx are wide apart for about a fortnight after the fall of the petals, and a spray applied before these lobes close up coats the calyx-cup with the poison. As already mentioned in the discussion of the life history of this pest, the great majority of the larvæ of the first generation enter at the calyx end of the fruit, and in doing so they are poisoned by the arsenate of lead which they swallow when eating their way in at the calyx. The correct time at which to apply the calyx spray is indicated in fig. 7 of Plate 3.

The mortality among the young larvæ is by no means exclusively caused by their attempting to enter at the poisoned calyx, for observations have shown that many perish before reaching that portion of the fruit. Earlier remarks indicated that many of these larvæ feed for a brief period on the tissue of the leaves on which they hatch out, and in doing so they will in many cases swallow fatal doses of the arsenate of lead with which the foliage is coated.

The calyx spray is of great importance in the control of this pest, and it should invariably be applied. It must, however, be succeeded by several cover sprays at intervals of two or three weeks, the object of these sprays being to coat the growing apple with poison.

The strength at which the arsenate of lead is applied varies to some extent, some investigators recommending 1 lb. of the powder arsenate of lead to 50 gallons of water, or 2 lb. of the paste arsenate of lead to a similar quantity of water. Other workers recommend sprays that are 50 per cent. stronger—i.e., 1½ lb. of powder arsenate of lead to 50 gallons of water. The weaker strength is that at present recommended in Queensland.

No matter how carefully spraying may have been attended to, an appreciable proportion of young codling moth larvæ will escape poisoning, and hence spraying must be supplemented by other control measures.

The bandaging of trees is one of these important supplementary control measures, and its adoption is definitely recommended. It will be found that many of the larvæ, on leaving the fruit to locate suitable spots for pupation, assemble under the bands, and if these are periodically examined at intervals of a week the insects found thereunder can be destroyed. The success of this control measure will largely depend on the trees having previously been cleaned of cover under which the larvæ might otherwise wish to pupate, e.g. under pieces of loose bark. The bandages can be made from a piece of strong cloth 10 inches wide, which is folded to form a double band 5 inches wide, and is then bound tightly round the tree and held in position by a nail. It is recommended that in the Stanthorpe district bandages be in place on the trees at the end of October.

The destruction of windfalls is another important measure of value in reducing codling moth infestation. If windfalls attacked by codling moth larvæ are allowed to remain on the ground, many of the larvæ contained therein will survive and complete their development, thus still further intensifying the infestation.

The cleaning up of packing sheds is a valuable precaution that should not be overlooked, because many of the larvæ in infested fruit leave the fruit when in the packing sheds and select suitable crevices in which to spin their cocoons and overwinter. The flooring boards,

packing benches, and empty cases should therefore be carefully inspected, and, if necessary, treated with boiling water in an endeavour to kill any larvæ that may have taken shelter therein.

Mention has already been made of the fact that, in bandaging, success will be most marked when the banded trees are thoroughly cleaned up, so as to eliminate shelter spots to which the larvæ may go for pupation in preference to assembling under the bands. For this reason it is highly desirable to close up any cavities or cracks that may occur on the branches or main stem of the trees, and also to scrape off any loose bark that may be present. For the former purpose sticky clay or putty is satisfactory, and for the latter any suitable blunt instrument may be used.

Finally some reference must be made to the fact that the thinning of fruit, where a heavy crop of apples has set, is of some material advantage so far as codling moth control is concerned. A judiciously thinned crop can be sprayed in a much more satisfactory manner than one that has not been so treated.

Prominence has recently been given to the trapping of the moths themselves in glass containers baited with suitable attractants. This possible method of control was tested fairly extensively during the 1926-27 season in the Stanthorpe district, but the results obtained, under the conditions then prevailing in that district, were very disappointing, and trapping of the moths cannot be added to the list of control measures.

Reference must also be made to the present attempt to establish some measure of biological control. This originated in September 1927, when a colony of a very small wasp, *Trichogramma minutum* Riley, was received from California. This beneficial insect attacks the eggs of the codling moth, and when Mr. Ranger, manager of the Committee of Direction of Fruit Marketing, was in North America last year he saw the handling of this parasite by Mr. Flanders, the entomologist of the Walnut Growers' Association. Mr. Ranger was much impressed by that work, and accordingly arrangements were made to forward a colony of the parasite to Queensland. It has since been bred in Brisbane and liberated in the orchards. This is not an attempt to introduce a new parasite, the object being to artificially increase the numbers of an already established insect, thus transforming a rare species into a valuable control factor.

To summarise the control measures:—Spray with arsenate of lead, commencing with a calyx spray as soon as the petals have fallen, following thereon with several cover sprays; bandage the trees and examine regularly and destroy the larvæ assembled under the bands; destroy all windfalls; thoroughly clean the packing sheds; scrape loose bark from trees and fill up all cracks and crevices thereon; judiciously thin out heavy crops of fruit.

The Woolly Apple Aphis.

The two preceding pests just dealt with in this chapter, namely, the Queensland fruit fly and the codling moth, have every reason to be regarded as the two most important apple pests in this State. The one now under consideration is, however, a close competitor for inclusion in the category of highly destructive enemies of the apple. Like the codling moth, it has gradually become widely distributed throughout

the world, and there are probably few regions in which apple-growing is now unaccompanied by its very unwelcome presence and associated losses.

The woolly apple aphis (*Eriosoma lanigerum* Hausm.) belongs to the family Aphididæ in the order Hemiptera. The popular name just quoted is that under which it has long been known in Australia, but in England it is very frequently referred to as American blight, while on the continent of Europe it is often spoken of as the blood-louse. The name blood-louse has been suggested by the stain left when the bodies of this aphis are crushed in the hand.

This pest is certainly not a native of Australia, and it would appear that either North America or Europe must accept the somewhat unwelcome responsibility for having presented it to the apple-growers of the world. It was described in Europe by Hausmann in 1802, but according to French, of Victoria, there are records of its occurrence in England as far back as 1789. The same authority also states that it is said to have occurred in Victoria as early as 1849.

NATURE OF INJURY.

The woolly aphis feeds by means of the piercing mouth parts which characterise the order of insects to which it belongs, and as a result of its feeding activities very typical gall-like malformations (Plate 4, fig. 4) are produced on the infested branches and roots, for this pest works both under ground and above ground.

It characteristically feeds in colonies and the injurious effects produced by the constant feeding of large numbers of aphids on the branches and roots must obviously be very prejudicial to the welfare of the tree. Not only is the vitality of the tree reduced by the removal of its sap, but, as a reaction to infestation, the typical deformities already mentioned are produced. While infestation may be a serious matter in trees of any age, it may even be fatal in its results on young stock. It is frequently claimed that the underground colonies of this pest feeding on the root system produce a far more prejudicial effect on the tree's vitality than the more conspicuous colonies feeding on the branches.

PLANTS ATTACKED.

Among cultivated fruits the apple is outstanding as the host plant of this pest. Infestation of pear, quince, and plum has also been recorded, but such occurrences are so extremely rare that the pest might almost be described as exclusively an apple insect at least so far as the orchardist is affected by its presence. This, however, would not be true so far as trees in general are concerned, for in the course of a detailed study of the life history of this pest in North America it was shown that it winters on the elm-trees. The mountain ash and hawthorn are also attacked in the United States.

THE APHIS.

This species of aphis is characterised by a copious secretion of wax which is deposited as a powdery bluish-white substance over the surface of the body. There is, in addition, a secretion of long waxy threads or filaments, which in the branch-feeding colonies are white and fluffy; hence the popular Australian name woolly apple aphis. These

threads also occur in the root-feeding colonies, but they are there of a somewhat bluish-white tinge rather than the pure white colour so typical of the branch-inhabiting individuals.

A close examination of these white woolly masses will show that they merely screen a large number of small oval aphids which have been variously described as being dull purplish brown, slaty blue, or plum-coloured.

The life history of this species has been studied in very considerable detail in the United States, but, so far as is known, it has received but little attention in this country.

CONTROL MEASURES.

The control of the woolly apple aphis has been attempted along three distinct lines, and at the present moment it can be claimed that, in the Stanthorpe district, these three types of control measures constitute between them a very effective check upon this potentially destructive insect.

The first of the control measures referred to is the selection of trees that will be resistant to the attacks of this pest at least on the root system. This was successfully accomplished many years ago, and it has long been the practice to work apples on a stock that has shown resistance or immunity to infestation. For this purpose the Northern Spy and the Winter Majetin have been largely availed of. If the trees are worked on these blight-resistant stocks, then the orchardist need not worry about infestation on the root system, and he can concentrate his attention on the infestation on the branches. This success in eliminating the underground colonies of the aphis constituted a very marked advance in the direction of achieving effective control.

For the control of the branch infestation spraying has been much in favour, nicotine sulphate being employed in summer and oil sprays in winter. To effectively control these above-ground colonies the nicotine sulphate should be sprayed under high pressure close to the infested limbs, so that a drenching spray is produced and the insects thus effectively reached. The oil sprays may be used in winter, but they cannot be employed with the drenching effect referred to in the application of the nicotine sulphate sprays, otherwise excessive and injurious quantities of the oil sprays will collect at the butts of the treated trees. However, if the spraying with nicotine sulphate has been satisfactorily performed in summer and autumn, only a mist-like spray will be necessary in the case of a winter application of a miscible oil. Unfortunately, repeated spraying with nicotine sulphate is necessary for the control of the branch-infesting colonies of this pest during summer and autumn. The orchardist is particularly busy at that time of the year, and hence the necessity for frequent spraying imposes a heavy burden not only on his pocket but on his time, which is so urgently required for other operations on the orchard. The employment of a third type of control measure has, however, very materially reduced the burden of spraying; in fact, it has at present largely but not completely eliminated the necessity for doing so. Long may that continue to be the case.

The third line along which control has been attempted is the utilisation of the services of natural enemies—i.e., the biological control method. Much has been written of late years on this subject, and some

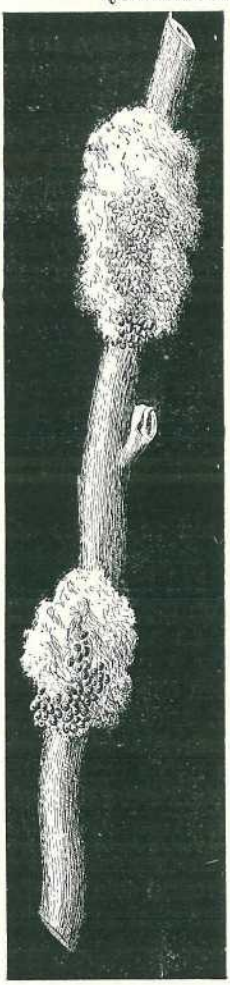


FIG 4

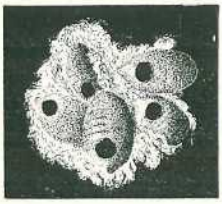


FIG 5

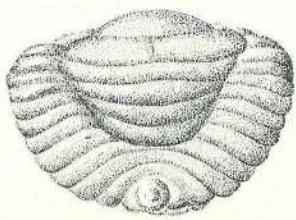


FIG 1.

FIG 2

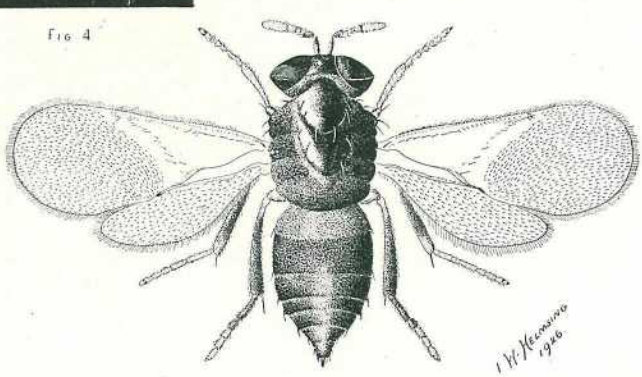


FIG 3

PLATE 4.—THE WOOLLY APHIS PARASITE (*Aphelinus mali* Hald.).

Fig. 1.—Larva of *Aphelinus mali* × 40.
Fig. 2.—Pupa of *Aphelinus mali* × 40.
Fig. 3.—Imago or adult of *Aphelinus mali* × 30.
Fig. 4.—Twig showing parasitized and unparasitized woolly aphis, all those on the lower colony being parasitized, whereas only a few on the lower edge of the upper colony have been attacked. Natural size.
Fig. 5.—Aphis showing the emergence holes of *Aphelinus mali* × 6.

strikingly successful results have been obtained in its application. One must never, however, lose sight of the fact that the prospects of success warrant the expenditure of time and money on this control measure in only a comparatively limited number of problems. However, in the case of woolly apple aphis infestation in the Stanthorpe district it appears to have justified itself in a highly gratifying manner.

The attempt at biological control commenced in 1923 when a colony of a small wasp parasite, *Aphelinus mali* Hald. (Plate 4, fig. 3), was obtained from New Zealand by Hubert Jarvis. This parasite is a native of North America, whence it had been introduced to the former country by the officers of the Cawthron Institute.

The parasite in question is a typical Chalcid wasp measuring about $\frac{1}{25}$ inch in length. It lays its eggs in the bodies of the woolly apple aphis, and the larvæ (Plate 4, fig. 1), hatching from these eggs, feed on the body contents of the destructive insects. When full-grown, the parasite larvæ transform to pupæ (Plate 4, fig. 2) within the woolly aphids, which are by that time dead and consist merely of hard empty shells. In this stage the body contents of the parasites are completely reorganised and the adult wasps are produced. These emerge by cutting circular holes in the shells of their dead hosts (Plate 4, fig. 5).

As already indicated, this introduction has been very successful and has materially reduced the cost of controlling woolly apple aphis.

The San José Scale.

The San José scale (*Aspidiotus perniciosus* Comstock) is probably one of the most widely known of the many pests attacking deciduous fruit-trees. Furthermore it is conspicuous among the most destructive of the numerous scale insect pests. It first acquired notoriety in the San José district of California some fifty or sixty years ago, hence the name by which it is popularly known. It is believed to be a native of China, whence it was unfortunately imported to California. This undesirable immigrant is thought to have reached Australia in 1894.

Nature of Injury.

This pest attacks the trunk, branches, leaves, and fruit of infested trees (Plate 5, figs. 8, 9, 10), and a characteristic reddish or pink discoloration is usually associated with its presence wherever it is feeding on the plant tissue. If immediate steps are not taken to deal with the pest when it shows up in an orchard, the infestation increases with quite extraordinary rapidity, and may become sufficiently acute to eventually kill the attacked trees. This insect, like all other species of scale insects, feeds by sucking the plant sap, and the opinion has been expressed that it has a more prejudicial effect on its host plant than any other scale insect attacking fruit-trees.

Plants Attacked.

The San José scale has a very wide range of food plants, and among the deciduous fruit-trees attacked mention may be made of the following:—Apple, apricot, cherry, peach, pear, plum, prune, and quince.

Life Cycle Stages.

The female scale when full-grown (Plate 5, fig. 6) is roughly about the size of a pin-head, and is almost circular in outline and is slightly

FIG. 1.

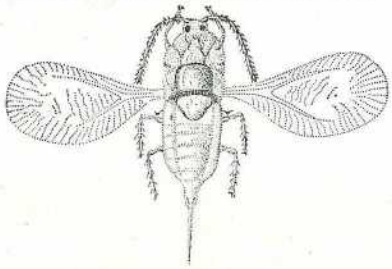


FIG 3.

FIG. 2.

FIG. 4.

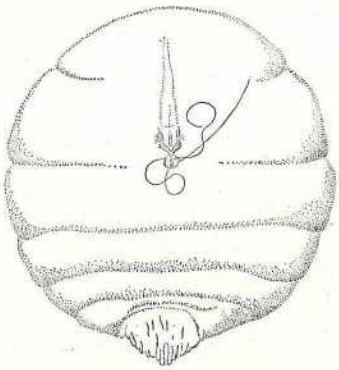


FIG. 5.

FIG. 6.

FIG. 7.

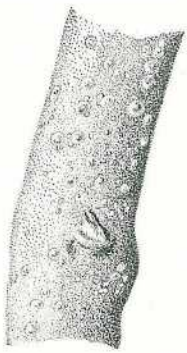


FIG 9

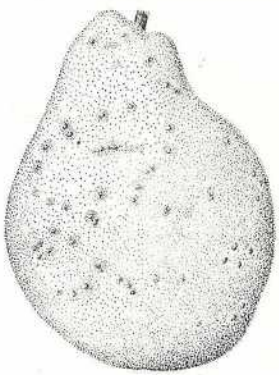


FIG 8.

FIG 10.

PLATE 5.—THE SAN JOSÉ SCALE (*Aspidiotus perniciosus* Comstock).

Fig. 1.—Young larva × 57.
Fig. 2.—Pupa of male × 57.
Fig. 3.—Adult male × 32.
Fig. 4.—Colony of scales in various stages of development × 4.
Fig. 5.—Adult female × 32.
Fig. 6.—Adult female scale turned over to reveal the insect itself × 12.
Fig. 7.—Male scales × 12.
Fig. 8.—Pear fruit, showing infestation.
Fig. 9.—Apple twig, showing infestation.
Fig. 10.—Plum twig, showing infestation.

convex. The scale itself is a greyish-brown colour, and is merely a waxy secretion with incorporated moulted skins which covers and protects the actual insect underneath. The soft-bodied yellowish insect (Plate 5, fig. 5) is circular in shape and is legless.

The male scale (Plate 5, fig. 7) is smaller than the female scale, and is somewhat different in shape, being distinctly more elongate. The adult male insect (Plate 5, fig. 3) is totally different from the female, and is a small delicate insect provided with a single pair of wings.

The young scale insects (Plate 5, fig. 1) are lemon yellow in colour, and possess three pairs of legs. They are very small, and can just be seen with the naked eye.

LIFE HISTORY.

The males and females mate, and several weeks after mating the females commence to give birth to living young, as many as several hundreds being frequently produced by a single female. The small lemon-yellow young or larva leaves the protection of the mother scale and crawls over the tree in search of a suitable spot at which to settle down. Having found such a spot, which is generally obtained in a few hours, the young insect inserts its long, thin, threadlike, piercing mouth parts into the plant tissue and commences sucking the sap. The body gradually becomes covered with waxy threads, and eventually the typical protective scale is produced. The young insects moult in about a fortnight, and they then lose their legs. The males undergo two more moults and then emerge as delicate two-winged insects. The females moult a second time and remain legless, wingless insects. They then mate with the males and subsequently commence to produce living young. Definite figures with respect to the number of generations produced each year in Queensland are not available, but in North America it is believed that three or even four may be produced each year. Bearing in mind this fact, coupled with the rate of production of young per female, it is not difficult to understand that, where this pest is neglected, infestation may rapidly become so serious that the bark is smothered in a mass of scales which give it a greyish scurfy appearance.

CONTROL MEASURES.

San José scale in a well-established orchard can be quite effectively controlled by spraying during the winter months, using either lime sulphur or miscible oils. If only a few infested trees occur in a very young orchard, it is probably worth while to destroy these trees in the hope of exterminating the pest for the time being, although sooner or later the pest will come in from neighbouring orchards. Nursery stock should be fumigated to destroy any scale insects that may be present.

DISEASES OF DECIDUOUS FRUITS.*

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

The diseases discussed in these notes are downy mildew, oidium or powdery mildew, and anthracnose or black spot, all attacking grapes; powdery mildew of pome fruits; prune rust, brown rot, black mould rot, and leaf curl attacking various stone fruits.

Downy Mildew of Grape Vine.

Downy mildew is the most serious disease with which grape-growers have to contend. It is now distributed throughout practically all the chief vine-growing centres of the New and Old Worlds wherever climatic conditions are suited to its development. Australia was fortunate in being one of the last countries to be visited by this disease, which only appeared in epidemic form during the 1917-18 growing season. The malady is one which can be effectively controlled by the application of a fungicide, and hence spraying has become a matter of general routine with all efficient growers except in the drier centres of the State.

SYMPTOMS.

All parts of the vine, including stems, leaves, and bunches, may be attacked in their younger stages. As the tissues mature they become less susceptible to infection. On the leaf the first symptoms appear as light greenish-yellow spots of a roughly circular or sometimes angular shape. When held up to the light these will be seen to be of a clearer and more transparent appearance, giving rise to the name of "oil-spot" which is applied to this stage. If the weather is moist, a delicate white downy growth will be produced on the under surface of the spots as the fruiting bodies of the fungus causing the disease are developed (Plate 9, fig. 1). During hot and dry conditions the fructification will not take place, and the spot turns brown and dries out. By coalescence of the spots large areas of the leaf surface may be affected. The presence of even a small amount of dead tissue may cause distortion of the developing leaf. Affected leaves usually fall off prematurely.

The fruit may be attacked at any period of its development until it commences to colour. When infected during the early stages of growth the bunch usually becomes covered with a downy fungus growth, which has suggested the name of "grey mould" for this particular form of attack. If the berry is approaching maturity the mould is rarely produced. In either case the fruit eventually becomes brown and shrunken and dries up (Plate 9, fig. 1).

CAUSE.

The disease is due to a fungus (*Plasmopara viticola*) belonging to the Peronosporaceæ or downy mildew group, from which are derived many very important plant parasites. When infection has taken place the fungal threads or mycelium ramify between the cells of the plant tissue, absorbing nourishment from these by means of short haustorial branches. After an incubation period of about seven days, during which a definite oil-spot has been formed, the parasite is in a condition to

*Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc., published by the Department of Agriculture and Stock, Brisbane, 1929.

produce its fruiting stage should the right weather conditions be available. Spore formation will take place readily at a temperature from about 60 to 80 deg. Fahr., provided abundant moisture is present. Short aerial hyphæ grow out four to eight together through the openings of the stomata or breathing pores found on the lower surface. These branch and rebranch, forming a tree-like growth, and from each of the ultimate short peg-like branches there is developed a delicate thin-walled ovate spore. These spores are produced in countless numbers, and, being easily carried about by wind and rain, serve to spread the disease during the growing season. Should a spore be deposited on a leaf when moisture in the form of dew or raindrops is present, its contents will divide up into several smaller portions, each provided with two thread-like vibratile flagella. These motile structures are known as zoospores. They escape by rupture of the parent cell or sporangium, and make their way through the film of surface moisture to one of the breathing pores of the leaf, by means of which opening they gain access to the plant.

The summer spores are delicate in structure and are unable to live over from one season to the next. For this latter purpose the fungus is provided with a thick-walled resistant spore known as the oospore. These are formed towards the end of the season within the tissue of the leaf, and remain associated with the rotting foliage during the winter. In the spring, if the weather is sufficiently wet to give rise to a certain amount of water accumulation round the vines, the oospore will germinate in this and give rise to a sporangium which produces zoospores as in the case of the summer spores described above. If another shower should fall and splash the zoospores on the foliage, the infection for the season will be commenced.

CONTROL.

Consideration of the life history of the organism briefly outlined above will show that for a severe outbreak of downy mildew there is necessary a certain temperature combined with abundant moisture. The temperature during the Queensland season, except on abnormally hot days, is quite suitable for mildew development. Rain during the early part of the season in sufficient quantity to provide the necessary moisture requirements for the starting of an attack is always of likely occurrence, while the summer rains provide ideal conditions for its epidemic development. Hence any grower who wishes to make certain of his crop should be prepared to carry out the undermentioned spraying programme, which has been proved to give adequate protection from the disease. It should be noted that the spray to be effective must be present on the leaves before the germination of the spores. Once the fungus has penetrated within the tissues of the plant all attempts to stop its development will be fruitless.

Bordeaux (6-4-40) and Burgundy (6-8-40) are the spraying mixtures commonly used, the advantages lying with the former. Applications should be made as follows:—

(1) As soon as the shoots have reached a few inches in length;
(2) Just before the flowering period;
(3) As soon as the young fruit has set;
(4) Additional applications will depend on weather conditions.

If this is at all wet the vines should be sprayed as often as necessary to keep the foliage well covered. Some growers make it a practice to spray once a week throughout the season until the fruit is coloured.

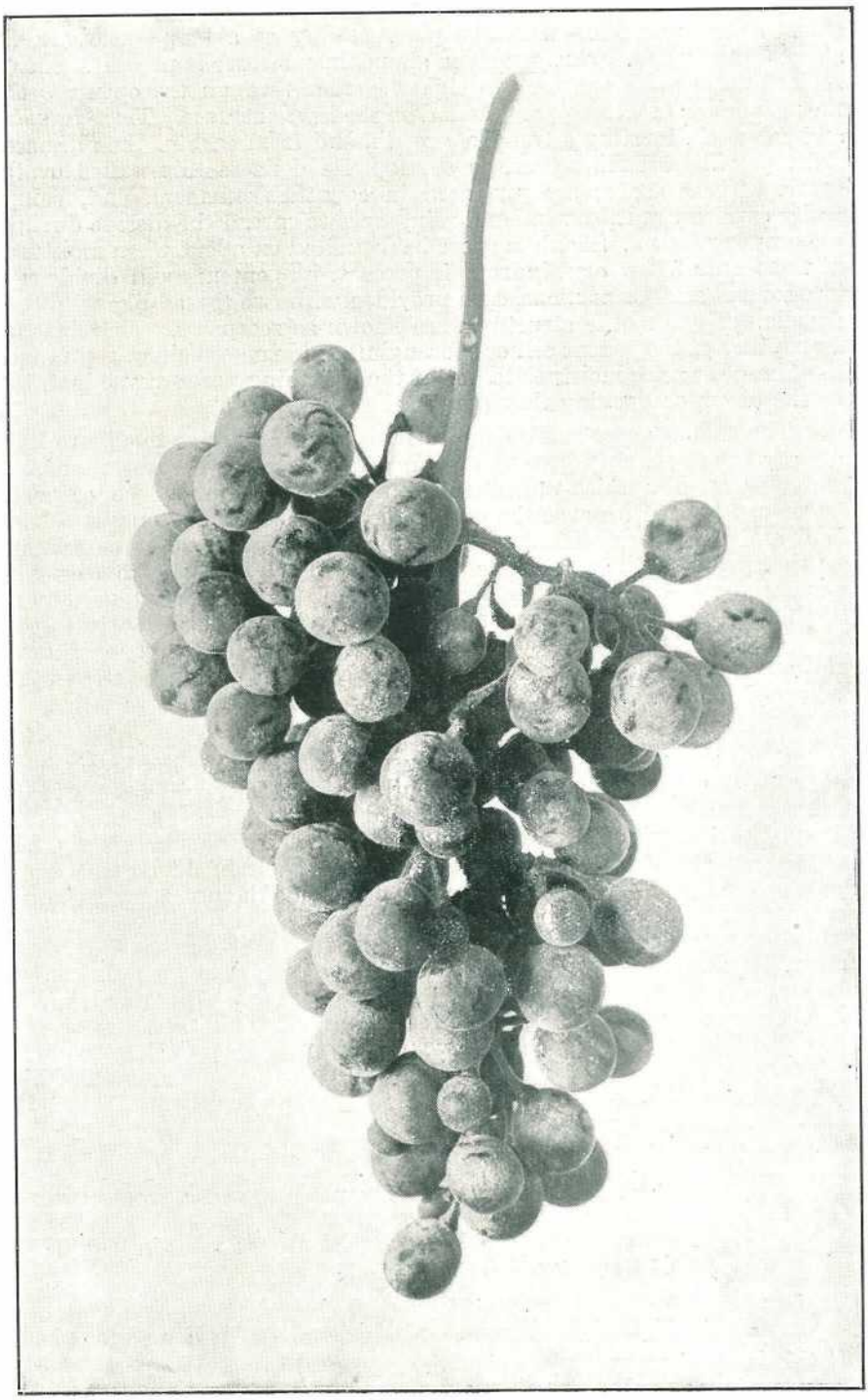


PLATE 6.—OIDIUM OF THE GRAPE.

Oidium or Powdery Mildew of Grape Vine.

Powdery mildew is a disease that has been in Queensland for many years and is quite familiar to most growers. All the younger green parts of the vine, including leaves, canes, and fruit, may be attacked, the damage done depending very largely upon weather conditions. Warm and moist but not necessarily wet weather is most suitable to the development of Oidium.

SYMPTOMS.

On the leaf the fungus appears as greyish-white floury patches on the upper and lower surfaces but more conspicuous on the former. This can usually be easily distinguished from the more elevated downy growth found on the under surface of leaves attacked by downy mildew. The white powdery covering may also develop on the young shoots and the canes. This attack will result in a cessation of growth, and if the part is in the immature developing stage deformation may take place.

The most severe damage takes place when the bunch is affected. If this happens before or shortly after flowering, the flowers and small developing fruit which become covered with the mildew soon dry up and drop off. When older fruit becomes mildewed the growth of the skin is retarded and splitting often occurs. Their appearance is greatly impaired even when this cracking does not take place. (Plate 6.)

The retarding effect of powdery mildew on the growth of the vines during one season will cause a reduction in the quantity and quality of the crop the following year.

CAUSE.

Powdery mildew is caused by a fungus parasite now known as *Uncinula spiralis*. The form in which this organism is commonly met with was first described under the name *Oidium Tuckeri*—hence the common name of Oidium. Later a second and higher form of the fungus was discovered which necessitated the change to the above.

This fungus differs from the organism causing downy mildew in that it belongs to the ectoparasitic type. This difference should be noted since it is of special importance when considering control measures. The fungus grows entirely on the outside of its host, where the mycelial threads form a fine white web-like growth over the affected parts. From the surface mycelium small knob-like processes or haustoria are given off which penetrate the epidermal cells and from them absorb nourishment. The injury done to the plant cells in this way gives rise to dark specklings on the surface of the region affected.

If the weather is warm and moist the fungus will soon proceed to the formation of the fruiting stage. Short upright branches are given off which cut off in succession three or four clear oval spores. These spores serve to spread the disease during summer. They germinate by producing a delicate thread-like germ-tube which commences a superficial growth over the plant surface as before. Oidium spores need for their germination only a sufficiently moist atmosphere to prevent desiccation. The water film so necessary for the zoospores of downy mildew need not be present.

Besides this summer spore a resting spore is produced towards the close of the season. It is of a type which places the fungus in the large group known as the Ascomycetes or sac fungi. This reproductive body consists of a minute rounded structure appearing as a black speck on the leaf surface. Radiating from the surface of these perithecia, as they are

called, are a number of appendages, while within are contained about six sac-like cells or asci each containing four to six ascospores. The ascospores reach the foliage in the spring and commence the new season's infection.

In some countries, of which Queensland is one, the ascospore stage does not appear to occur except perhaps rarely, and it is possible that in this case the fungus overwinters by means of summer spores and mycelium hibernating among the dormant buds of the vine.

CONTROL.

On account of the ectoparasitic nature of the causal fungus one is able actually to cure as well as prevent an attack of powdery mildew. Sulphur applied in the form of a dust will cause the death of the superficial mycelium and spores.

Application should be made as follows:—

(1) When the new shoots are about 12 inches long.
(2) When the vines are in flower. In addition to protecting the young fruit, sulphur applied at this time has an exceedingly beneficial action on the setting of the grapes.
(3) Further applications should be made whenever the disease shows signs of development.

Sulphuring is best done on a warm day, but an application during exceptionally hot weather should be avoided, as some foliage-burning may occur under these conditions.

Anthracnose or Black Spot of Grape Vine.

Anthracnose is a disease which does not often appear in the epidemic form which may be assumed by the two mildews; nevertheless, during wet seasons considerable damage may result from its presence in individual vineyards.

SYMPTOMS.

The disease makes its appearance on the early spring growth. The young leaves, tendrils, and shoots develop black patches of dead tissue which lead to a stunting and distortion of the expanding organs. The most characteristic symptoms are displayed by the lesions on the canes. These appear first as small dark-brown or black spots. The fungus responsible for their development extends through the tissue both radially and in towards the pith, breaking down the plant cells in its progress, with the result that a more or less conspicuous open black scar or canker is produced. (Plate 8, fig. 2.)

If the bunch is affected in its early stages it may be reduced by destruction of flowers and fruit to nothing more than the blackened and withered fruit-stalks. When older berries are attacked a bird's-eye spotting results. The spots are slightly depressed circular areas having a greyish-pink centre surrounded by a dark-brown to black margin. (Plate 7.) Besides the unsightly appearance, the hardening of the skin may cause splitting to take place.

CAUSE.

Anthracnose of the grape is due to the attack of a fungus (*Manginia ampelina*) which resembles in general characters the one responsible for bean anthracnose. Spore formation takes place in the base of the cankers and on the fruit-spots, where the spores in mass give a greyish-pink appearance to the affected area. Clusters of short upright hyphæ

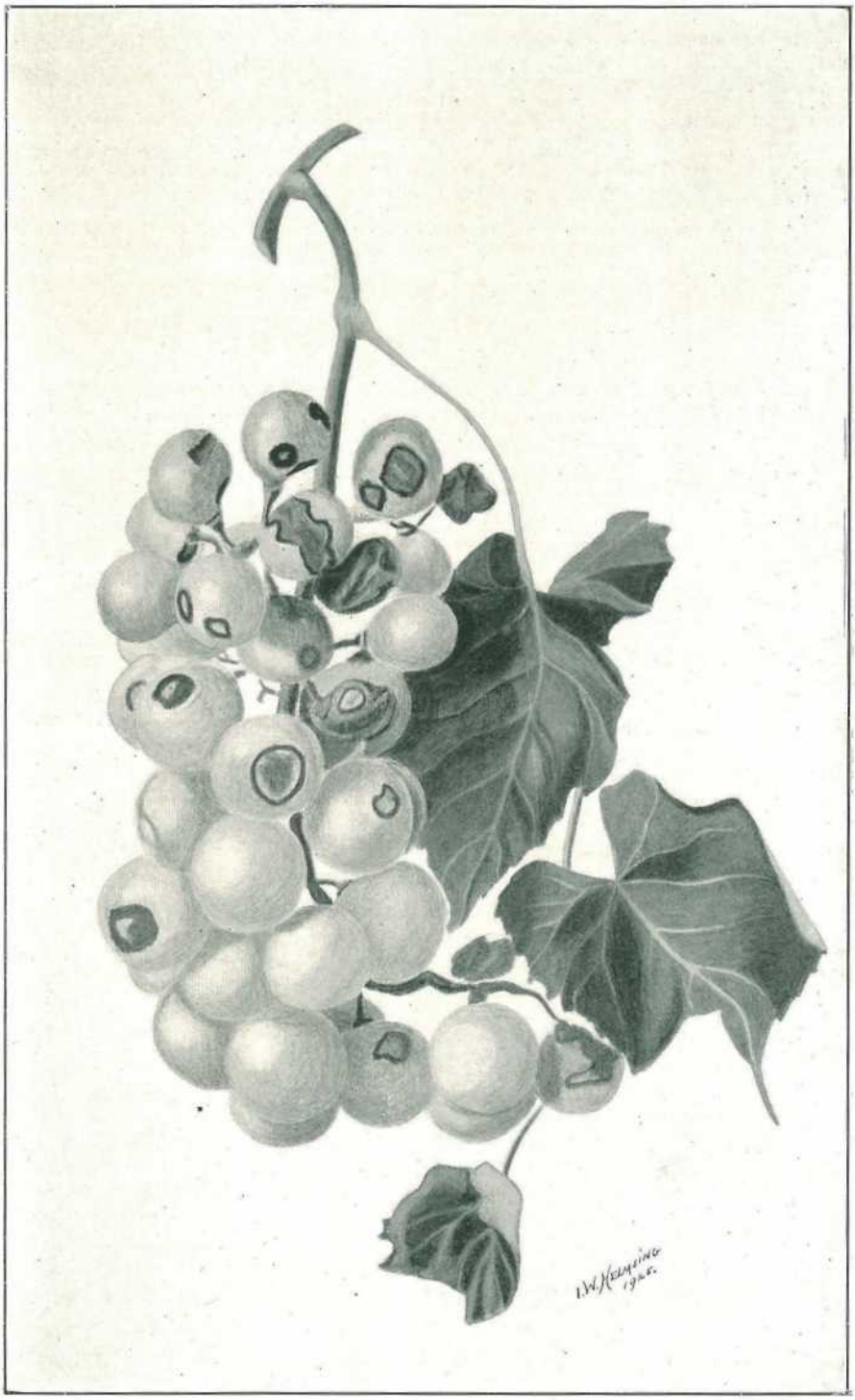


PLATE 7.—ANTHRACNOSE OF THE GRAPE.

arising from beds of interwoven fungal threads cut off from their tips numerous clear oval spores. These tend to stick together in mass, so that spore dispersal and spread of the disease is not so rapid as in the case of the mildews.

The fungus overwinters principally in a vegetative form in old scars. Towards autumn the fungal threads become massed together in the more superficial regions of the stem cankers, and condense into a dark thick-walled resistant form known as a sclerotium. As soon as moist or wet weather occurs in the spring, the exposed portions of these sclerotia produce from their surface the minute spore-bearing structures similar to those developed the previous season on the young lesions. The spores thus produced serve to infect the early spring growth and from the spots so formed the distribution of the disease takes place as before.

CONTROL.

It has been found as a result of long experience that anthracnose can best be controlled by attacking the fungus in its hibernating stage. For this purpose any vines which bear the cankers formed during the previous growing season should be thoroughly swabbed with the following mixture:—

Iron sulphate	20 lb.
Sulphuric acid	8 lb.
Water	10 gails.

The iron sulphate is dissolved in 10 gallons of warm water in a wooden vessel. The sulphuric acid is then added by carefully pouring in a thin stream, with constant stirring so as to avoid splashing and excessive heating. This solution will corrode metal vessels, and even wooden ones are best covered with tar or paraffin.

The solution should be applied just before the buds commence to move. Previous to this all badly diseased and unwanted wood will have been removed and burnt. The swabbing is conveniently done by means of a brush or small mop. Care must be taken that the whole vine and especially any old scars are thoroughly wetted.

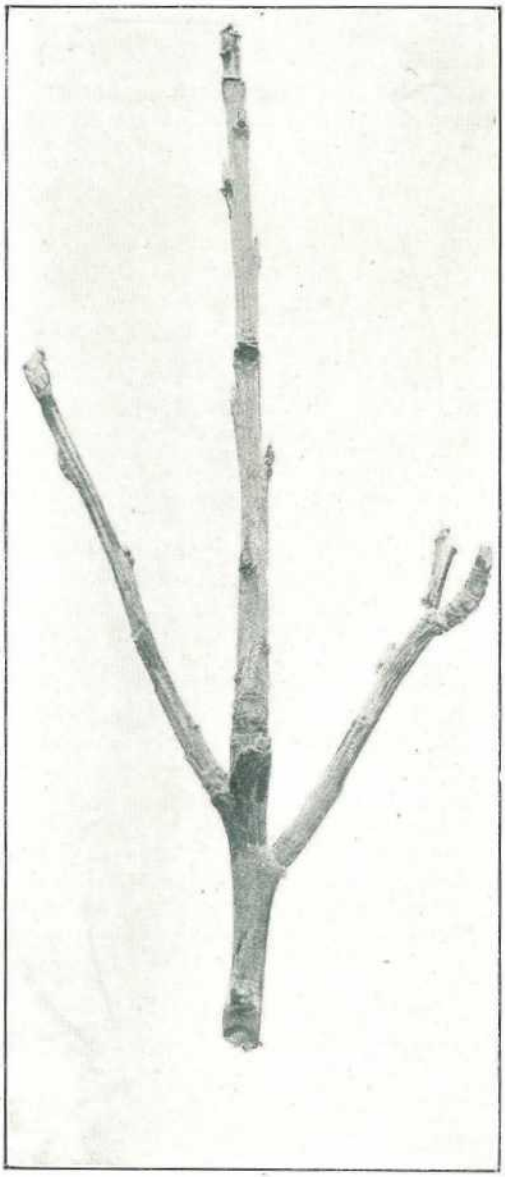
Although the swabbing treatment will greatly reduce the amount of spring infection, it cannot be expected that this will be eliminated entirely. It is therefore advisable as a further precaution to spray the vines when the shoots are a few inches in length, and again a fortnight or three weeks later, with Bordeaux mixture of 6-4-40 strength. The applications of Bordeaux made subsequently for control of downy mildew will serve as a further check on anthracnose development.

Powdery Mildew of Apple.

The apple, pear, and quince may all at times be attacked by powdery mildew, but of these the apple is by far the most seriously affected. The fungus causing this mildew is not so dependent on wet weather for its development as are many other fungus parasites, and therefore damage may result from this disease even during a fairly dry season.

SYMPTOMS.

All current season growth in the form of shoots, leaves, blossoms, and occasionally fruit is liable to attack. On the under surface of young leaves greyish-white powdery patches appear. These enlarge and may cover the whole leaf and then extend down the stalk to the twig. Affected



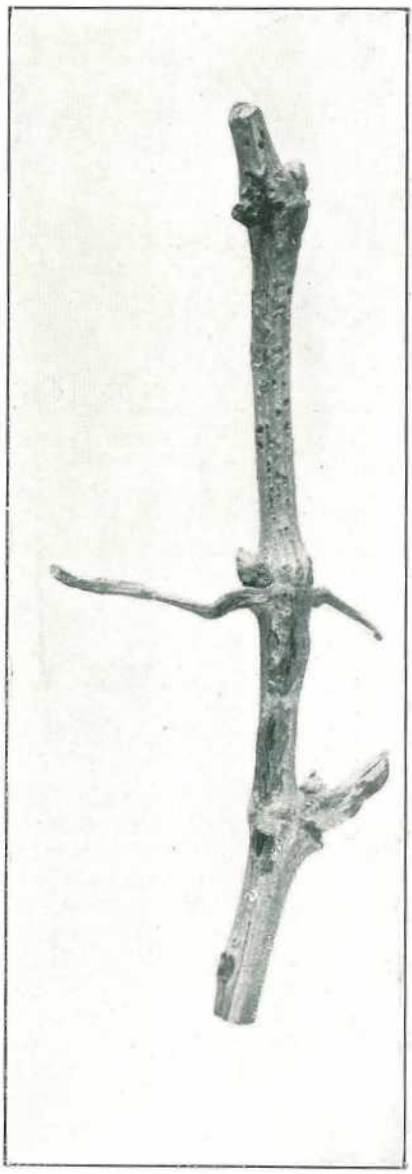


PLATE 8.

Fig. 1.—APPLE TWIG AFFECTED WITH POWDERY MILDEW. (Note the white fungal coat and resulting dieback.)

Fig. 2.—GRAPE VINE EXHIBITING THE CANKER STAGE OF ANTHRACNOSE.

leaves have their tissue hardened, with the result that subsequent growth is restricted and the foliage is stunted and deformed. The same white fungus growth will spread over the young twigs, and will also appear on some of the buds. In the latter case the floral parts become shrivelled and no fruit is formed. Sometimes young fruit are affected soon after they have set, with the result that a russeting is produced. After leaf-fall the affected twigs will be easily picked out by their white, silvery appearance. Many of the buds will be found to be dead, and the shoot itself may be killed back. (Plate 8, fig. 1.)

EFFECTS.

Although the fruit often escapes injury, less obvious damage of a serious nature may result from mildew attack. The reduction in healthy foliage growth will mean a diminution in food supply, with consequent reduction in quantity and quality of the next crop. When the twigs are badly attacked the growth of next year's buds will be greatly interfered with, and these as well as part of the terminal itself may be completely destroyed. The setting of the fruit will be reduced by blossom infection in the spring.

CAUSE.

The cause of apple powdery mildew is a fungus (*Podosphæra sp.*) which is allied to the organisms producing powdery mildew of the grape, cucumber, &c. Like these the apple fungus is ectoparasitic in its habit. In other words, the fine threads making up the fungal plant lie entirely on the surface of the host plant, nourishment being obtained by means of short suckers which penetrate the epidermal cells. It is these superficial mycelial threads which give rise to the white patches mentioned above. From the surface growth short upright threads are given off, and these, by a succession of transverse partitions, cut off numbers of delicate oval spores which, when distributed by wind and rain, serve to spread the disease throughout the orchard.

Besides these summer spores or conidia, the fungus forms towards the latter part of the season another type of fruiting body known as a perithecium. These are dark-brown rounded bodies just visible to the naked eye, clusters together forming dark areas over the previously white patches. Within the perithecia are produced rounded sacs, each of which contains about eight ascospores. The ascospores serve to some extent to carry the fungus through the cold months. The chief method of overwintering is, however, by means of fungal threads which penetrate among the scales of the leaf and flower buds and there hibernate until these organs commence to open in the spring. The fungus then grows along with the developing buds, and affects the young leaves and flowers as described above.

CONTROL.

Since the fungus overwinters in affected twigs, all those exhibiting the white appearance denotive of the presence of mildew should be removed and burnt during the winter pruning.

The trees should be sprayed with lime sulphur 1 in 50—

(1) Just before the flowers open.

(2) When the last petals are falling. N.B.—For this and the next application the fungicide may be combined with the lead arsenate of the codling moth spray.

(3) About a fortnight after the last.
(4) Further applications will be necessary should powdery mildew again make its appearance.

Prune Rust.

Prune rust is a disease to which most of the cultivated varieties of stone fruits are subject, the peach and plum being most seriously affected. The disease is world-wide in distribution, and occurs in practically every region where its host plants are cultivated.

SYMPTOMS.

The presence of prune rust is first denoted by the appearance on the upper surface of the leaf of somewhat angular spots of a greenish-yellow colour. These are few and scattered, or more numerous when they may become confluent and form large discoloured areas. The spots later darken to various shades of brown as the tissue dies and dries out. Frequently the leaf falls before this stage is reached. On the under surface of these spots the fruiting bodies of the fungus causing the disease appear as clusters of small brown powdery pustules (Plate 11, fig. 1). In the case of the peach the disease may also affect the young branches with the production of somewhat elongated brown pustules which rupture the bark. During a bad attack when rust appears early in the season, the fruit of both peach and apricot may become disfigured with brown slightly sunken areas as a result of infection by the rust fungus. Occasionally the stems and fruit of other varieties may be attacked.

EFFECTS.

Rust usually attacks the lower leaves first, and these sooner or later turn somewhat yellow and fall. The disease then progresses more or less rapidly, according to weather conditions, up the branches, so that finally there may be left only a small tuft of leaves at their tips. Spotting may begin to appear about December or January, but during a fairly dry season it is not usually until the approach of autumn that the main defoliation occurs. It is on this account that some orchardists consider the effect of prune rust to be merely the leaf-fall natural to the approach of winter, and take no steps to combat a disease which, given the right climatic conditions, may be the cause of considerable loss.

It must be remembered that, since the peach, for example, produces its fruit on the previous season's wood, the premature loss of leaf in the one season, by reducing the development of this bearing wood, may affect the next season's crop. During a wet season defoliation may take place before the fruit has fully matured, with the result that the crop will be of poor quality or rendered worthless by sun-scald. Spotted peaches are unsightly in appearance, and, as the lesion extends some distance into the flesh, the fruit is rendered unfit for canning.

CAUSE.

Prune rust is caused by a fungus (*Puccinia prunispinosæ*) which, like other rust fungi, exhibit more than one fruiting stage. The more common spore form, which serves to spread the disease during the current season, is known as the uredospore. This is a somewhat angular brown spore produced from the tips of short erect fungal threads or conidiophores, which are closely aggregated together to form the pustules or

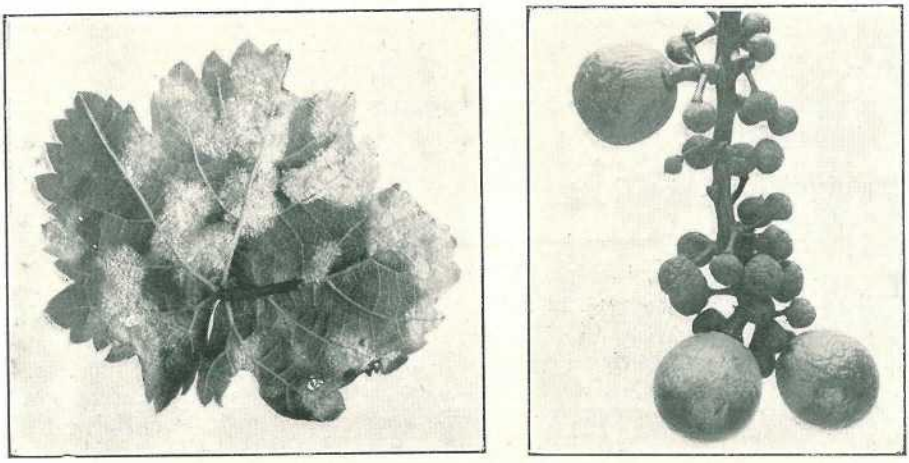


Fig. 1.—DOWNY MILDEW OF THE GRAPE.

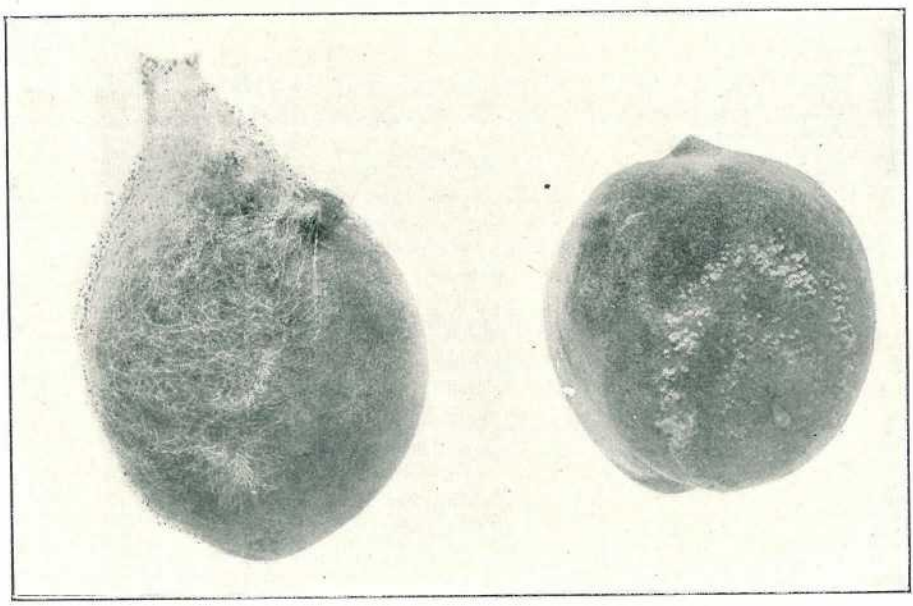


Fig. 2.—TWO PEACHES ILLUSTRATING THE DIFFERENCE BETWEEN BLACK MOULD ROT (left) AND BROWN ROT (right).

PLATE 9.

sori mentioned before. Towards the autumn there may appear, more especially on the plum, pustules, of a dark-brown almost black colour. In these sori are borne a somewhat thicker and more resistant two-celled spore, known as the teleutospore, which serves to carry the fungus over the winter and creates fresh infection in the following spring. A warm wet season is most conducive to rust development.

CONTROL.

1. Prune out all infected twigs.

2. So far as is practicable, burn or plough under the fallen leaves, on which the fungus spores may be present in enormous numbers.

3. Spray as follows:—

(*a*) Bordeaux (6-4-40) or lime sulphur (1 in 10) just before the buds commence to swell.

(*b*) Bordeaux (4-4-40) or lime sulphur (1 in 50) as the leaves are expanding. Owing to the susceptibility of peach foliage to Bordeaux injury, peaches should receive the latter spray. Care must be taken that the fungicide reaches both sides of the leaves.

(*c*) Should rust make its appearance later in the season, the tree should receive a further spraying with lime sulphur (1 in 80).

Brown Rot of Stone Fruits.

Brown rot is probably the most serious disease affecting stone fruit in Queensland. Peaches, nectarines, and plums suffer most. Less frequently, apricots, cherries, and occasionally pome fruits are attacked.

SYMPTOMS.

Rotting of the fruit is usually the most striking symptom of brown rot, but there are other important manifestations which are often overlooked. The disease may commence in the early part of the season as a blossom blight. The floral organs turn brown and wither up but usually still remain attached. If the weather is moist, light-brown powdery spore masses, formed by the fungus causing the disease, may appear on the affected portions. The young twigs, and occasionally the leaves, may be attacked, either by direct infection by the fungus working down from diseased flowers or from spores developed on old mummied fruits. The fungus may pass through the smaller twigs into an older branch, and there produce a large irregular wound or canker.

The fruit may be attacked at any period of its growth, though it is more commonly affected when approaching maturity or during storage. The first symptoms appear as a small brown spot on the skin of the fruit, often associated with a slight injury. If the atmosphere is moist this spot will enlarge rapidly and may involve the whole fruit in twenty-four to forty-eight hours. When the brown area is an inch to an inch and a-half in diameter the fungus usually commences to form its fruiting stage. This appears on the surface of the affected region as light greyish brown powdery tufts often arising in more or less concentric rings (Plate 10, fig. 2). The fruit rot is at first soft, but later the decomposition ceases and the flesh dries out with the production of a firm, dry, shrunken object commonly known as a "mummy" (Plate 10, fig. 1). In pome fruits there is a tendency for the rotting fruit to turn black rather than brown.

CAUSE.

Brown rot is due to the attack of a fungus (*Sclerotinia fructicola*) belonging to the Ascomycetes or sac fungi, and in common with many other members of the group exhibits two distinct methods of reproduction. The common form met with in Queensland is known as the monilia stage. Clusters of thread-like hyphæ push through the surface of the fruit, branch once or twice, and then divide up into bead-like chains of cells which are cut off as spores when mature. It is masses of these structures which form the greyish tufts described above.

The second and perfect stage of the fungus is found (apparently rarely in Queensland) in connection with old mummies which have lain on the ground for a year or more. There is developed from the fungus mycelium within the dried fruit small-stalked saucer-shaped structures. The upper surface of these receptacles consists of narrow, cylindric, sac-like cells, each of which contains eight smaller ascospores. In countries where this stage is produced in quantity the ascospores serve to start the spring infection of the blossoms.

In Australia the fungus overwinters as dormant mycelium, either in cankers and invaded twigs or in the mummified fruit lying on the ground or still attached to the tree. Within the tissue of these organs the massed fungal threads live through the winter in all security. At the approach of warm, moist, spring weather the mycelium again becomes active and bursts through the surface layers to form the greyish-brown tufts of spores by means of which the spring infection commences.

CONTROL.

1. Prune out all twigs whose appearance might suggest infection with brown rot, as otherwise they may be the means of carrying over the disease to the next year.

Carefully remove all mummied fruit and collect those already fallen and destroy by fire or burying.

2. Spray with a fungicide. Owing to the ease with which the peach and some other stone fruits are injured by the common spray mixtures, it is difficult to obtain a spray which will be sufficiently potent against brown rot and yet not injure the plant. C. C. Brittlebank, in Victoria, has lately tried out the following schedule on peaches with considerable success:—

(1) Just before the buds begin to swell, spray with lime sulphur 1 in 9 of Baumé 32 deg.

(2) As buds show pink: Lime sulphur 1 in 35.

(3) As the fruit begins to colour: Lime sulphur 1 in 80.

(4) One month to three weeks before picking: Lime sulphur 1 in 100.

3. Examination of affected fruit at the market would suggest that an injury of some form is often responsible for brown rot infection. Care should therefore be exercised during picking and packing operations to see that injuries in the form of bruises, scratches, &c., are so far as possible avoided. Affected fruit should not be touched while handling sound ones, and all rot material should be kept out of the packing shed. When possible avoid picking and packing when the fruit is wet.

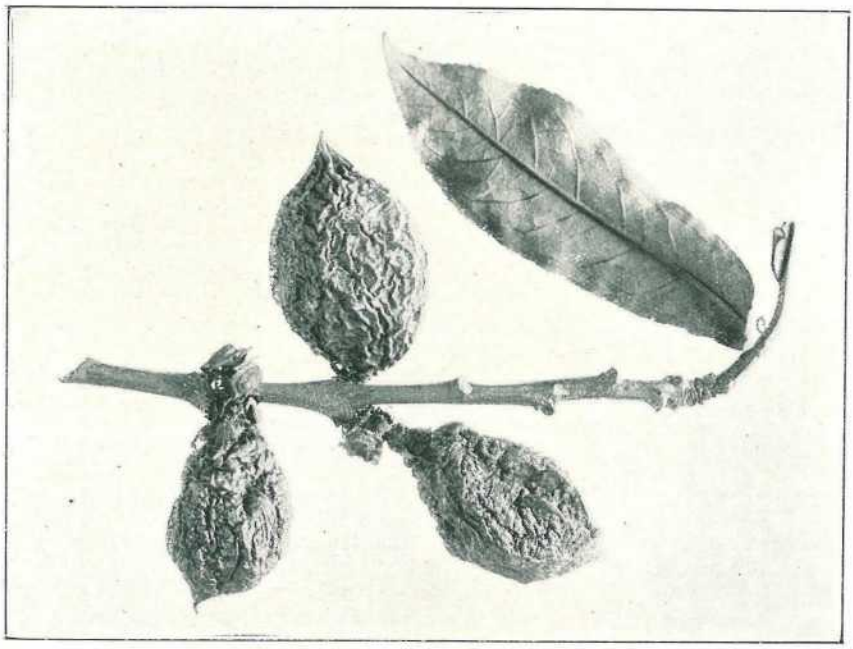


Fig. 1.—Nectarine fruit mummified as a result of Brown Rot attack.

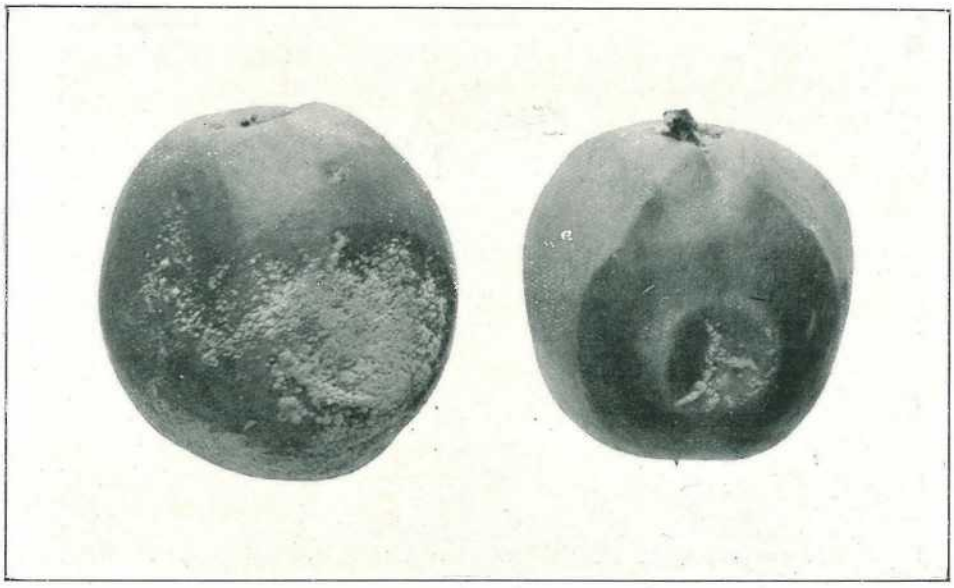


Fig. 2.—Brown Rot of Nectarine. In the fruit on the right infection has originated in a bruise.

PLATE 10.

Black Mould Rot of Stone Fruits.

Black mould rot is a storage trouble sometimes confused with the true brown rot. It has been found affecting more especially peaches and plums, and in connection with these varieties has in some seasons been responsible for even more loss than brown rot.

SYMPTOMS AND CAUSE.

This rot commences as a small brown spot on the surface of the fruit, and in its early stages is indistinguishable from brown rot. Later, instead of the small compact powdery spore masses characteristic of this latter disease, there arise long delicate greyish-white threads of mould growth, which radiate out from the affected region (Plate 9, fig. 2). This mould growth belongs to the fungus (*Rhizopus nigricans*) causing the disease. A single mould "plant" possesses a number of root-like branched threads which ramify amongst the tissue of the fruit, which they destroy and so cause the brown rot. From the point of origin of these root-like processes there is given off a number of long slender aerial threads which are the spore-bearing structures or sporangiophores. These swell at the apex to form a globular sac or sporangium. Within the sporangium the protoplasm divides up into a great number of minute rounded spores which are finally liberated by rupture of the sporangium wall. The sporangia are at first white but as the spores mature they turn dark grey to almost black, and, being just visible to the naked eye, give a grey speckled appearance to the mould growth covering the fruit. Beside the spore-bearing hyphæ there is given off from each fungal "plant" one or more long slender threads or stolons, which grow out over the surface of the fruit until it in its turn becomes attached at some point and develops root-like processes which may penetrate the as yet uninjured skin and so commence a new point of rot.

The original infection of the fruit by means of spores appears to take place very largely if not entirely per medium of injuries to the skin, often very slight, in the form of scratches, bruises, &c. Once a point of infection has been created the mould quickly spreads by means of the stolons over the fruit and from there to the as yet sound ones adjoining. Under suitable conditions a day or two may suffice for the formation of large "nests" of rotten fruit bound together by the abundant grey mould growth commonly called "whiskers." Half a case or more may be involved in one of these nests. It is the rapid spread through a case which enables this mould when present to be responsible for greater loss on the market than brown rot.

CONTROL.

Since wounds appear necessary for the introduction of black mould, and the disease is one of stored fruit, control measures will have to be along similar lines to those found useful in connection with blue mould of citrus.

1. Avoid picking and packing during showery weather and when the fruit is wet. A marked increase of this rot has been noticed during periods of wet weather.

2. Take special care during picking and packing operations to see that the fruit receives no unnecessary injury. Finger-nail scratches and case bruises may be a source of trouble. All fruit showing injury or blemish should be rejected.

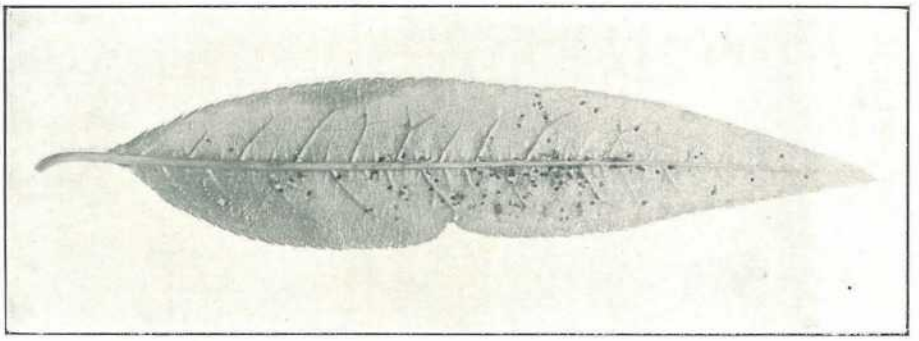


Fig. 1.—Peach leaf showing the sori formed by the Rust fungus (*Puccinia prunispinosæ*).

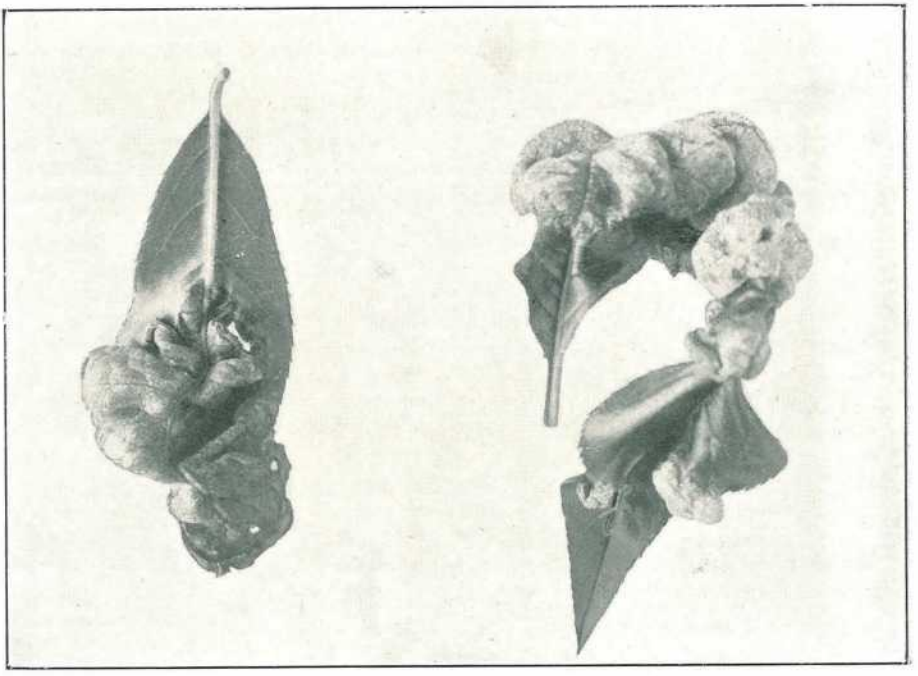


Fig. 2.—Peach leaves exhibiting the malformation characteristic of Leaf Curl.

PLATE 11.

3. Cleanliness in the orchard and packing house is essential. All rotting fruit should be collected at frequent intervals and destroyed by fire or burying.

4. If the quality of the fruit is such as to make wrapping a justifiable outlay, this procedure would greatly reduce the loss by localising the attack to the originally infected fruit.

Peach-leaf Curl.

Leaf curl is a disease affecting chiefly the peach and nectarine, other varieties of stone fruits being rarely attacked. Like rust, this disease is widely distributed throughout the peach-growing centres of the world. Fortunately it is one of the plant maladies most easily controlled.

SYMPTOMS.

Leaves, young shoots, and fruit may be attacked, but the most common and characteristic symptoms appear on the first-mentioned. Affected leaves as they issue from the bud appear of a somewhat yellow or pinkish colour, and on expanding become all or in part curled and puckered (Plate 11, fig. 2). The deformed portions are considerably thicker than the normal leaf, and retain their unnatural coloration for some time. Later this is masked by the development of a grey bloom due to the formation of a layer of the fruiting bodies of the fungus causing the disease over the upper surface.

Finally the leaf turns brown and falls off. If the original infection was heavy the defoliation may be extensive. A new set of leaves is usually formed from dormant buds, but these may be developed too late to mature the fruit and next season's bearing wood. Repeated defoliation lowers the vitality of the tree and may eventually lead to death.

CAUSE.

Leaf curl is induced by a fungus parasite (*Taphrina deformans*), which is one of the more simple type of sac fungi or Ascomycetes. The presence of the mycelial threads of this fungus within the tissue of the leaf stimulates the latter to abnormal growth both in size and number of its constituent cells. This enlargement takes place mostly on the upper side of the leaf, with the result that the leaf becomes puckered and curled as described above. Later the fungus grows out between the epidermal cells and forms on the surface a layer of close, erect, oblong cells known as asci. Each of these contains eight rounded spores known from their method of formation as ascospores. They are liberated by rupture of the enclosing sac.

Some of the ascospores fall into sheltered situations where they are able to pass the winter, to germinate the following spring and infect the developing buds. Cool, moist weather when the buds are swelling provides conditions very suitable to leaf curl attack.

CONTROL.

This disease can be effectually checked by the application of a fungicide before the buds begin to swell in the spring. For this purpose Bordeaux mixture (6-4-40) or lime sulphur 1 in 10 may be used.

THE UPPER BURNETT AND CALLIDE VALLEY.

A NEW AND FERTILE AGRICULTURAL AND GRAZING REGION.

The subjoined notes are taken from a Report by the Land Administration Board on an economic investigation of the Upper Burnett and Callide Valley Land Settlement Scheme. This settlement scheme is, according to the Report, the most ambitious land settlement project in Queensland's history and, as originally conceived, was intended to provide farms for some thousands of settlers who would engage in mixed farming. The Board felt the need of carefully investigating the whole project to make sure that the foundations of the settlement were soundly laid before releasing more land for selection. The Report is a very complete and valuable one, and these brief extracts from it will be read with interest.

We are also indebted to the Land Administration Board for its permission to reproduce the very fine series of plates with which the Report is illustrated.—Ed.

History of the Settlement.

The Upper Burnett and Callide Valley lands extend from near Eidsvold on the south to near Rannes on the north, a distance of about 120 miles, and have an average width of about 40 miles. Although termed a "Valley," the area has an elevation varying from 800 to 1,700 feet. The country embraces all classes of land from rich agricultural soils contained in many of the creek flats to third class grazing land, comprising coarsely grassed mountainous country. The average rainfall is about 29 inches.

The classification of the land made by Staff Surveyors, before the settlement scheme was commenced, was as follows:—

	Agricultural.		Grazing.	
	First Class.	Second Class.	First Class.	Second Class.
	Acres.	Acres.	Acres.	Acres.
Northern Burnett	186,000	400,000	498,000	336,000
Callide	104,000	391,000	90,000	488,000
Totals	290,000	791,000	588,000	824,000
Grand Total	2,493,000 acres.			

Much of the land classified as first class "grazing" land is eminently suited for dairying, as it contains many rich arable pockets. There are considerable belts of softwood and brigalow scrubs. Altogether the area may be regarded as very well adapted for a successful closer settlement scheme.

Before the advent of the settlement scheme the lands comprised in the Upper Burnett and Callide Valley were used almost solely for grazing and were mostly in the occupation of grazing selectors and pastoral lessees. Eventually Parliament authorised the extension of all three of these railways to converge on Monto, a new township in the centre of the area.

Monto lies 103 miles from Gladstone, 179 miles from Maryborough, and 172 miles from Rockhampton. Of the three railways, that connecting with Gladstone, although the shortest, was the most costly and difficult to construct, owing to the mountainous country (the Dawes Range) through which it passes. This railway has been completed to Dalkiel, and is at present under construction to Waratah, eight miles north-east of Monto. The Maryborough-Mundubbera extension is completed and open to traffic to Monto. The Rockhampton-Rannes extension is open to Thangool—63 miles north of Monto. Rails have been laid for a few miles beyond this point, and earthwork constructed still further to Mount Lookerbie, but all work has been discontinued.

PLATE 12.—THE MAIN STREET, MUNDUBBERA, 1914.

PLATE 13.—MUNDUBBERA TO-DAY.

What Mundubbera has done, several centres throughout the Upper Burnett and Callide Valley may do better.

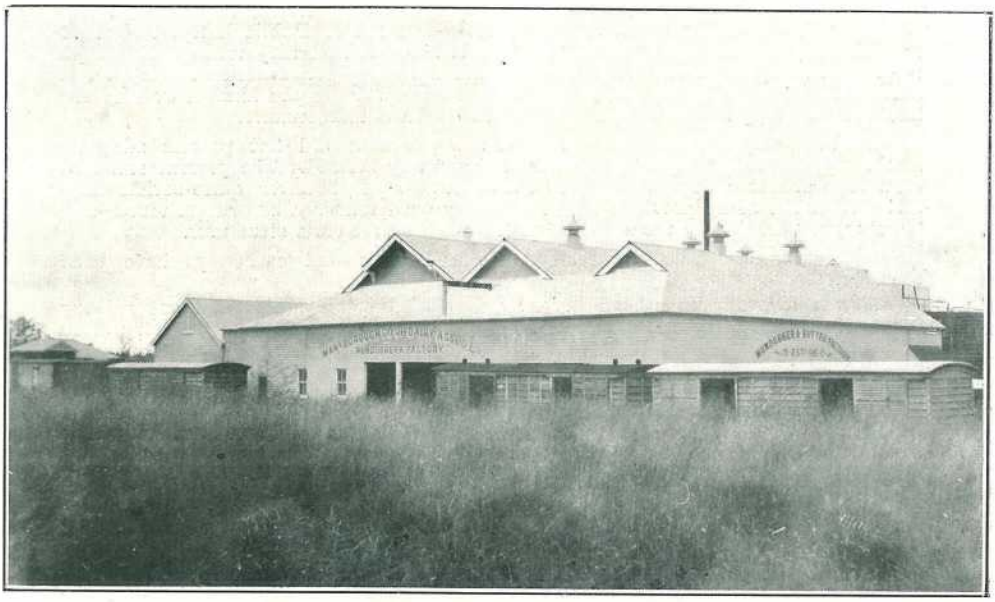


PLATE 14.—MUNDUBBERA BUTTER FACTORY.
Successful land settlement and industrial progress are closely allied.

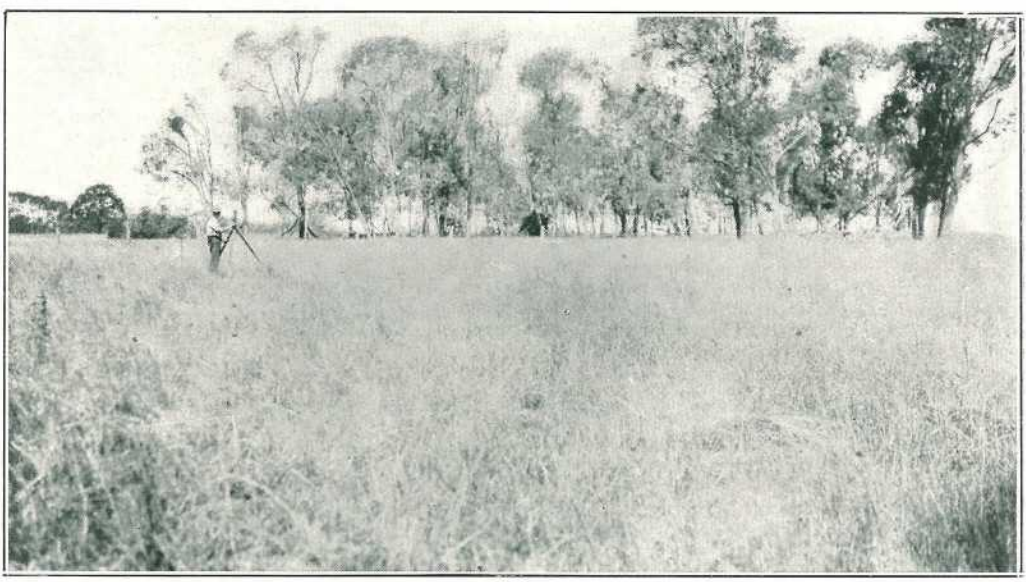


PLATE 15.—SITE OF MONTO, 1924, AT THE COMMENCEMENT OF SETTLEMENT.

Railways, Roads, and Bridges.

As part of the settlement scheme, the Department of Public Lands undertook to construct, free of cost to the Local Authorities, the necessary roads and bridges to give pioneer access to each holding. This work was commenced in 1923 and is still proceeding. After construction, the roads and bridges are handed over to the Local Authorities, who are responsible for their future maintenance.

In the early days of this work the Department did not possess adequate machinery, and many of the roads were indifferently formed. The present standard of work, which is done with the aid of modern plant, is, however, quite satisfactory, and settlers are being provided with reasonably good roads. The bridges throughout the area, constructed by the Lands Department, are first class structures.

Altogether 634 miles of road and five bridges and causeways have been constructed.

New railways were needed in order to open up this land. Without railway communication the Upper Burnett could not have been used for any industry other than grazing, and closer settlement would have been out of the question. For years prior to Parliament authorising the building of the railways, there had been great rivalry between Rockhampton, Gladstone, and Maryborough as to which branch railway should be extended to the country. Each centre was anxious to obtain the trade that was certain to flow from this rich area, and railways from each centre had already been constructed to the fringe of the proposed settlement. Existing railways reached from Rockhampton to Rannes, on the north, from Gladstone to Many Peaks on the east, and from Maryborough to Mundubbera on the south of the area.

Water Supply.

Expenditure by the Government has also been incurred in the provision of water facilities for settlers and in advances by the Agricultural Bank for the assistance of settlers. Both these matters are referred to in detail in the Report.

This expenditure, however, stands in quite a different category to the other expenditure on the settlement. In each instance the money advanced is in the nature of a loan to the settler, and ordinarily should be repaid by him with interest over a period of years.

The Report incidentally makes clear that modern settlement schemes are costly undertakings. If railways have to be pushed out ahead of settlement, if roads and bridges have to be constructed, and other Governmental aid granted to settlers, the burden of all this expenditure must, until the new settlement becomes productive, be carried by the general community.

Land Settlement—Old and New Systems.

The large expenditure that has been incurred illustrates, in a striking way, the difference between old and new settlement schemes.

In the early days of settlement a family would settle on the land, produce almost all its own requirements, and earn in actual money a very small income, which would be expended on articles which the farm could not produce. To live, rather than to earn or produce for the use of others, was the dominating purpose. Now all this has changed. The modern view is that, unless the income received from the products of the farm can approximate the money that would be earned from similar energies elsewhere, there is no inducement to settle on the land.

In former days communities established themselves by years of arduous pioneering work with little outside assistance, and railways were provided only after the settlers had demonstrated the wealth productivity of their lands, and their capacity to provide the railways with considerable business. Now the position is reversed; public expenditure goes first and settlement follows. Such public expenditure must necessarily be unproductive for a few years.

In dealing with settlement schemes the British Economic Mission, in its Report dated 7th January, 1929 (page 6), pointed out that such schemes, financed out of loan moneys, should be self supporting within a reasonable measure of time. The members of the Mission went on to say, "By this we mean that within such measure of time they should, either directly, or indirectly through the increased taxable capacity of the community and the enhanced value and price of Government-owned land attributable to the development schemes, provide at least their own working costs, interest on the loan capital invested in them, and a sinking fund sufficient to provide for its repayment when it falls due." Judged on that basis, the Upper Burnett and Callide Valley Settlement Scheme may be regarded as a sound State investment.

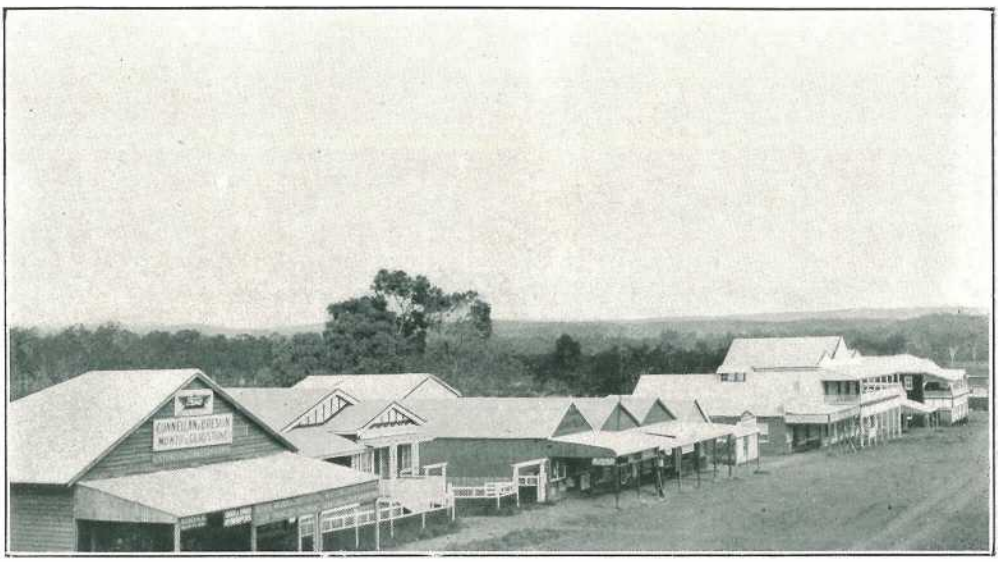


PLATE 16.—THE MAIN STREET, MONTO, TO-DAY.

Less than five years old, Monto is a rising township, in picturesque country in the heart of the Upper Burnett. Surrounded by good dairying and agricultural land, Monto is destined to become the capital of the Upper Burnett and a country township of considerable importance.

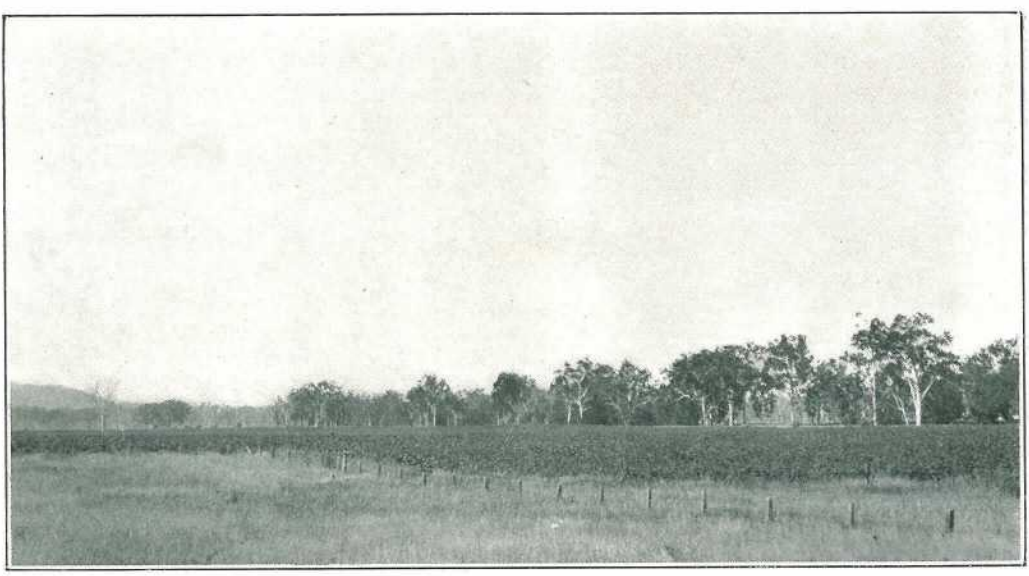


PLATE 17.—A FIELD OF COTTON, WARATAH, UPPER BURNETT.

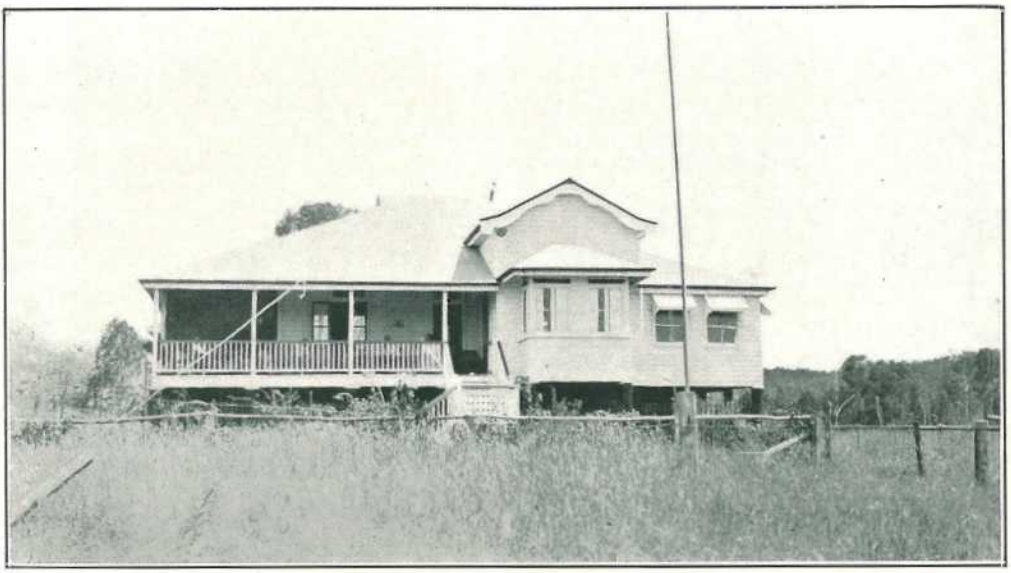


PLATE 18.—"KERWEE," A FARM HOME ON THE UPPER BURNETT SETTLEMENT.

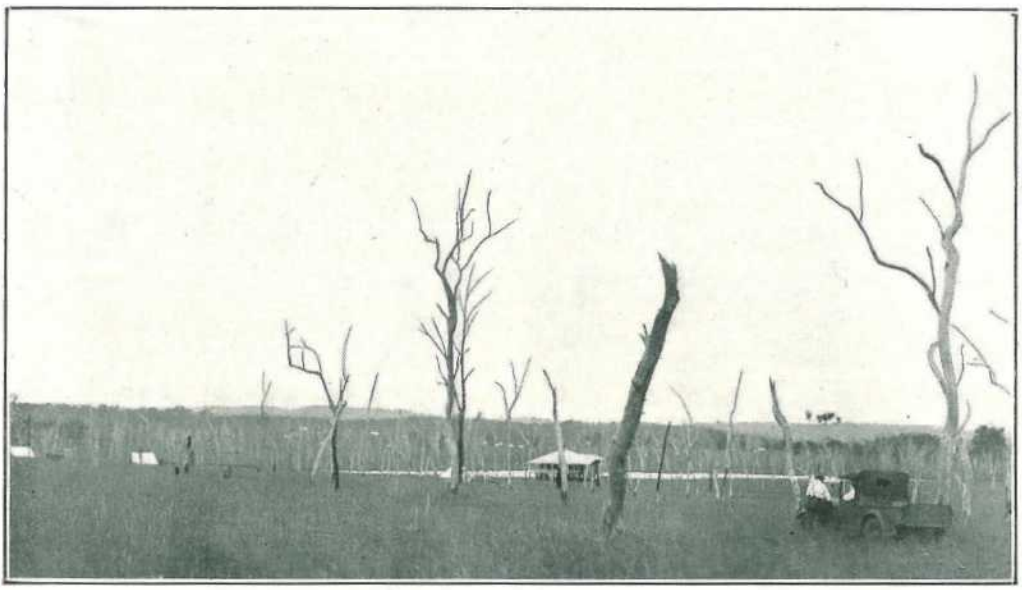


PLATE 19.—THE START OF A NEW TOWNSHIP ON THE MANY PEAKS-MONTO LINE, 13 MILES NORTH-EAST FROM MONTO.

The first building to be erected was the railway station-master's house.

When fully settled on the lines of the Board's recommendations, it is estimated that the settlement will comprise 1,500 mixed farmers, dairymen, and graziers, and the annual production from the settlement will then probably exceed in value one million pounds sterling. All the State expenditure, therefore, that has been incurred in the scheme must be considered in relation to the many advantages to the community of this increased annual production. But there is another and still more important way in which the matter may be measured—in persons rather than in money. Amongst the settlers many are to be found with large families. A number of the witnesses who gave evidence before the Board had families ranging from six to ten children. Allowing, however, for average families of three children, the Upper Burnett and Callide lands will directly support 7,500 people.

Now for every £1,000,000 of wealth produced from the land, it may be said, as a wide generalisation, that about one-third will find its way into the pockets of the producers, while two-thirds, as costs of production and general expenses, will be distributed amongst the community. Therefore, besides the 7,500 people maintained on the land, the distributed wealth will support a further 15,000 people, making 22,500 people all told. Such is the value of this settlement scheme to Queensland.

Much is heard from time to time of progressive settlement schemes in Western Australia. It is surprising how ready some people are to make comparisons to the detriment of Queensland, while lacking even elementary knowledge of the subject being dealt with. For the information of those who like comparisons the Board reproduces in Appendix A of the Report, an analysis of group settlements in Western Australia which appeared in the "London Times" of the 14th September last and which has since been verified.

Having discussed the matter in this general way, the Board proceeds to give particulars of its inquiry and to state in detail the conclusions it has reached regarding the future administration of the Upper Burnett and Callide Valley settlement.

Soil and Climate.

The opinion of the Board is that the Upper Burnett and Callide Valley lands are eminently adapted for a successful closer settlement scheme. The Report continues: Rich belts of country exist which bear comparison with anything to be found in other parts of Queensland, and, if closer settlement could not succeed on such an area, the outlook for increased primary production in Queensland would be dismal indeed. But it must be remembered that the country is, or a few years ago was, largely virgin land, and, therefore, many years of concentrated effort will be needed to put this settlement in the same developed and established condition as the older closer settled districts of the State, such as for instance the South Coast, the Brisbane Valley, or the Wondai-Kingaroy areas. The progress that has already been made, and the towns that have been established throughout the area, speak well for the energy and enterprise of the people, and, in the course of time, there is no reason to doubt that this great new district will compare favourably in prosperity with the other districts mentioned.

The climate of the settlement is invigorating and healthy. Sheltered from the humidity of the coast by the Burnett and Dawes Ranges, the winds that come in from the Pacific are dry and keen. The winters are not unduly severe. The average annual rainfall, taken from official records at places scattered throughout the area, is about 29 inches.

The Upper Burnett and Callide Valley are served by the Burnett River, and many large creeks. On the southern watershed there are Splinter, Three Moon, Monal, Boogolgopal, Cattle, Trevethan, Small's, and other creeks, and the Rawbelle or Nogo River. On the northern watershed the creeks are Grevillea, Kariboe, Kroombit, Callide, and Bell. These creeks drain an extensive area of country, and in heavy rains the water overflows the banks and inundates the adjacent flat country. In places there is a considerable current.

The years 1927 and 1928, and the early part of the current year, were exceptionally wet. In consequence floods were more severe than usual, and much damage was done on the rich alluvial flats adjacent to the creeks. In average years the great bulk of the rich agricultural land in the district may be cultivated without losses by flood.

Products, Markets, and Prices.

The land is capable of producing many and varied products such as different kinds of crops, cream, pigs, and fat stock. For the present cream and cotton are the principal products. The problems of marketing the products from the area are no different from the general problems of marketing which face all primary production in the State. They are not, therefore, specifically referred to in the

PLATE 20.—RINGBARKED RIDGES BETWEEN WARATAH AND KOLONGA, UPPER BURNETT.
Showing the extent of sweet grazing country.

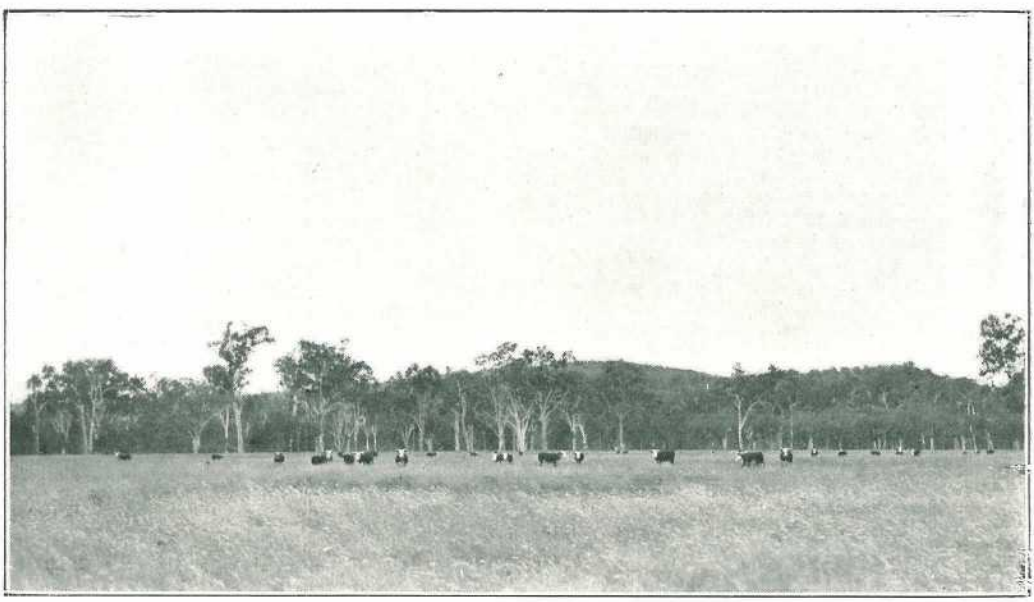


PLATE 21.—HEREFORD CATTLE HOCK-DEEP IN LUSH PASTURE, PARISH OF GREVILLEA, CALLIDE VALLEY.

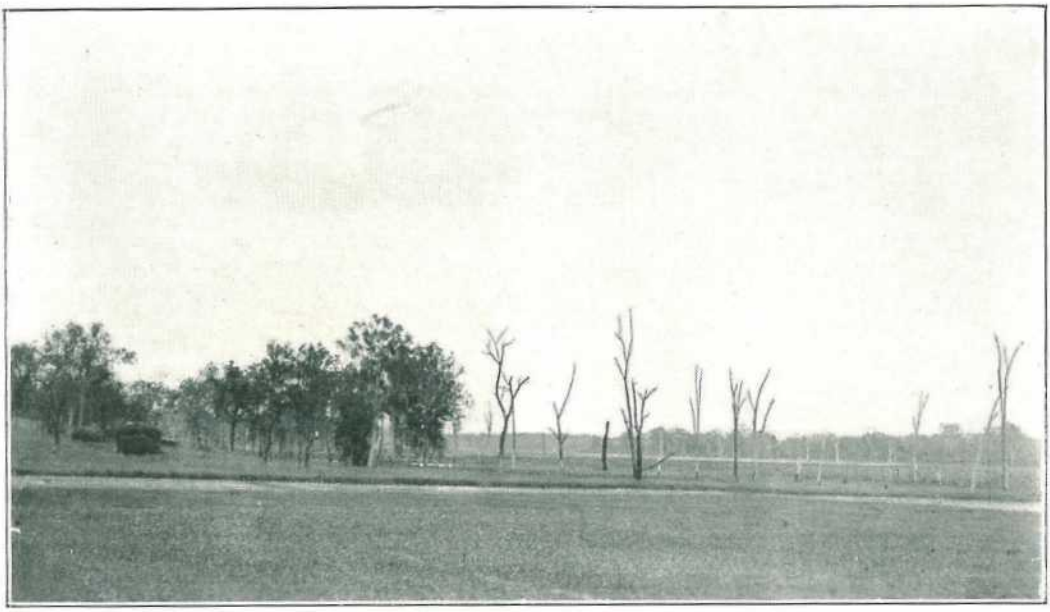


PLATE 22.—FIRST-CLASS CULTIVATION LAND, CANIA ROAD, UPPER BURNETT.

"Rich belts of country exist which bear comparison with anything to be found in other parts of Queensland, and, if closer settlement could not succeed in the Upper Burnett and Callide, the outlook for increased primary production in Queensland would be dismal indeed."

PLATE 23.—A WEALTH OF NATURAL GRASS, PARISH OF GREVILLEA (THIRD SECTION).

Report. The Upper Burnett and Callide Valley and neighbouring districts are specially suited for the production of cotton. In fact they are the chief cotton producing centres of Queensland and Australia. What is the value of the cotton industry to Queensland, and is it worth establishing as an integral part of the life of the State? The Cotton Board answers this query with the following comment:—

> "Already this young industry is playing an important part in the life of the community. With the production of slightly over 12,000,000 lb. of seed cotton in the 1928 season, more than 4,000 pickers were employed, exclusive of family labour. The wages bill is a big one. The payment to the railways for transport charges was approximately £8,000. Further moneys have been paid in connection with the handling of lint for export, and the ginneries and oil mills of the British Australian Cotton Association employed during the season about 120 employees. In addition, this company pays away other large sums of money for cartage, handling, and shipping charges on cake and oil. In the face of these facts it is easy to visualise the very great influence for good which an extensive cotton industry would have on the community in general.
>
> "A quadrupling of the present crop is possible within a very short space of time. This increase in the crop, however, can only be brought about by sales of lint to Australian spinners. This would mean an additional annual income of £600,000. The effect of this increased wealth upon the relieving of unemployment and upon the important national questions of development and migration is difficult to measure.
>
> "If the industry is worth establishing, and this we contend is unquestionable, then due regard must be had to the fact that adequate assistance is necessary during the experimental stage. When one has regard to the fact that the American industry has been in existence 100 years, it is obvious that the Australian industry, which has only been in existence a few short years, has not yet emerged from the experimental stage."

For the Callide Valley the matter of the survival of the cotton industry is of great importance. The foundation of that district, much more so than the Upper Burnett, was based on the growing of cotton. Cotton originally attracted most of the settlers to the land. Cotton kept them going. Cotton established the towns of Biloela and Thangool. Cotton growing, as an industry, must surely and quickly decline unless means can be found to stabilise prices, and ensure a reasonable return to the grower.

Various proposals have been submitted to the Commonwealth Government by the Queensland Cotton Board and by cotton manufacturers to help the growing and manufacturing industries over the difficulties with which they are faced, due to competition from overseas. These proposals may be summarised as follows:—

(*a*) Duty on raw cotton and linters to be imposed so as to ensure the purchase of the Australian article by spinners.
(*b*) Deferred duty on cotton yarn to be made effective.
(*c*) Duty on cotton wadding and oils to be increased.
(*d*) Bounty to be given on percentage yarn.
(*e*) Bounty on cotton yarn to be increased.

The Commonwealth Tariff Board has inquired into these matters, and has reported thereon to the Commonwealth Government, which now has them under consideration.

General Administration.

Matters of general administration in regard to the settlement are discussed in the Report under the following main headings:—

(1) Sound Settlement Areas.
(2) Additional Areas for Settlers.
(3) Capital Values and Rents.
(4) Freehold Tenure *v.* Perpetual Lease.
(5) Water Facilities for Settlers.
(6) Roads and Bridges.
(7) Operations of the Agricultural Bank.
(8) Immigration Settlement.
(9) Prickly-pear Land.
(10) Departmental Organisation.

Altogether the Report is one of the most useful ever presented on land settlement in Queensland.

PLATE 24.—PASTURES THAT HAVE NEVER BEEN FURROWED (GROWTH OF NATURAL GRASS, CALLIDE VALLEY).

PLATE 25.—EXTENSIVE FLATS, PARISH OF GREVILLEA (THIRD SECTION).

The Third Section has not yet been made available for settlement.

"Judged on the basis laid down recently by the British Economic Mission, the Upper Burnett and Callide Valley Settlement Scheme may be regarded as a sound State investment. Indirectly, it will return interest and redemption manifold."

PLATE 26.—A PROSPEROUS TOWN IN THE MAKING (THE MAIN STREET, BILOELA).

PLATE 27.—A BUSY CORNER OF THE MAIN STREET, BILOELA.

"The progress that has already been made, and the towns that have been established throughout the area, speak well for the energy and enterprise of the people, and, in the course of time, there is no reason to doubt that this great new district will compare favourably in prosperity with the older closer settled districts of the State."

PLATE 28.—BRIDGE OVER THREE-MOON CREEK, NEAR MONTO, UPPER BURNETT.

"With the advent of closer settlement entirely new roads had to be constructed to serve the new subdivisions and enable the settlers to get their products to the railway. New bridges, causeways, and crossings were also needed. Whereas, formerly, it was of little economic importance if a cattle grazier were isolated for a few weeks owing to the state of the roads and crossings, it is necessary under the altered settlement conditions that settlers should have daily, or almost daily, communication with the railway."

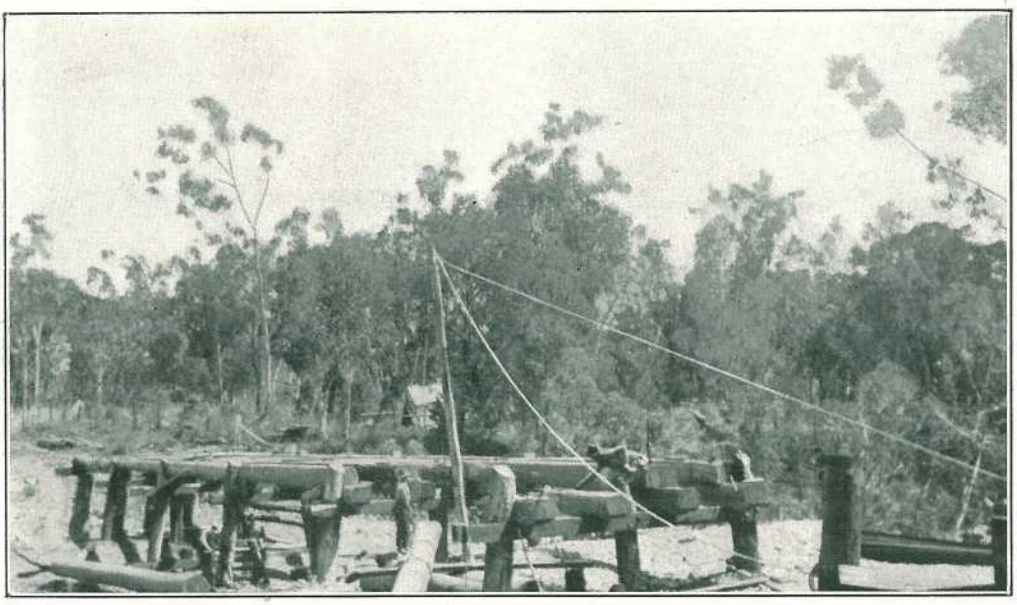


PLATE 29.—KROOMBIT CREEK BRIDGE UNDER CONSTRUCTION, CALLIDE VALLEY.

PLATE 30.—MACK'S CROSSING, MONAL CREEK, NEAR MONTO, UPPER BURNETT.

PLATE 31.—ROAD THROUGH SCRUB COUNTRY NEAR THANGOOL, CALLIDE VALLEY.

"As part of the settlement scheme, the Department undertook to construct, free of cost to the Local Authorities, the necessary roads and bridges to give pioneer access to each holding. The present standard of work which is done with the aid of modern plant is quite satisfactory, and settlers are being provided with reasonably good roads. The bridges throughout the area, constructed by the Lands Department, are first-class structures."

PLATE 32.—SECTION OF ROAD BETWEEN MONTO AND SPLINTER CREEK, UPPER BURNETT.

PLATE 33.—ANOTHER VIEW OF THE ROAD FROM MONTO TO SPLINTER CREEK, UPPER BURNETT.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1929, AND 1928, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1929.	May, 1928.
North Coast.	In.		In.	In.
Atherton	1·91	28	1·29	1·03
Cairns	4·37	47	1·96	2·38
Cardwell	3·48	57	1·61	1·74
Cooktown	2·88	53	0·76	0·62
Herberton	1·59	42	0·81	0·54
Ingham	3·31	37	0·76	1·17
Innisfail	12·22	48	3·77	9·07
Mossman	3·38	16	2·36	1·37
Townsville	1·28	58	0	0
Central Coast.				
Ayr	1·08	42	0	0
Bowen	1·26	58	0	0
Charters Towers	0·75	47	0	0
Mackay	3·73	58	0·34	2·43
Proserpine	4·34	26	1·06	1·23
St. Lawrence	1·74	58	0	0·19
South Coast.				
Biggenden	1·76	30	0	1·71
Bundaberg	2·66	46	0·31	0·86
Brisbane	2·77	78	0·42	1·82
Caboolture	2·82	42	0·47	1·67
Childers	2·15	34	0·22	0·98
Crohamhurst	4·86	35	0·89	4·12
Esk	1·98	42	0·14	2·19
Gayndah	1·52	58	0	0·09
Gympie	2·90	59	0·12	2·14
Kilkivan	1·84	50	0	0·82
Maryborough	3·10	57	0·25	1·16
South Coast—continued:				
Nambour	4·81	33	0·72	2·97
Nanango	1·50	47	0	0·94
Rockhampton	1·43	42	0	0·11
Woodford	2·87	42	0·44	2·57
Darling Downs.				
Dalby	1·31	59	0·12	0·88
Emu Vale	1·12	33	0·31	0·64
Jimbour	1·20	41	0·03	1·43
Miles	1·49	44	0	0·74
Stanthorpe	1·87	56	0·23	1·38
Toowoomba	2·17	57	0·05	1·79
Warwick	1·54	64	0·09	0·95
Maranoa.				
Roma	1·43	55	0	0·40
State Farms, &c.				
Bungeworgorai	0·83	14	0	0·42
Gatton College	1·60	29	0·07	1·36
Gindie	0·92	29	0	0·00
Hermitage	1·18	22	0·09	0·65
Kairi	1·77	14	0·50	1·52
Mackay Sugar Experiment Station	3·28	31	0·35	2·03
Warren	0·89	14	0	..

GEORGE G. BOND,
Divisional Meteorologist.

14th June, 1929.

QUEENSLAND SHOW DATES, 1929.

Townsville: 9th to 11th July.
Woodford: 11th and 12th July.
Home Hill: 12th and 13th July.
Samford: Postponed.
Woombye: 12th and 13th July.
Charters Towers: 17th and 18th July.
Ingham: 19th and 20th July.
Caboolture: 18th and 19th July.
Rosewood: 19th and 20th July.
Ithaca: 20th July.
Laidley: 24th and 25th July.
Nambour: 24th and 25th July.
Ayr: 26th and 27th July.
Barcaldine: 30th and 31st July.
Maleny: 31st July and 1st August.
Bowen: 31st July and 1st August.
Nundah: 3rd August.
Redcliffe: 9th and 10th August.
Royal National: 12th to 17th August.
Crow's Nest: 21st and 22nd August.
Wynnum: 30th and 31st August.
Goombungee: 30th August.
Imbil: 4th and 5th September.
Zillmere: 7th September.
Stephens: 14th September.
Malanda: 18th and 19th September.
Pomona: 18th and 19th September.
Beenleigh: 20th and 21st September.
Rocklea: 28th September.
Kenilworth: 28th September.
Enoggera: 5th October.
Pine Rivers: 15th and 16th November.

CATTLE BREEDING AND MANAGEMENT.

By H. ANNING, Wetherby, via Richmond, Queensland.*

The question of what kind of property to buy is naturally the most important one. The most necessary requirement is good, well-watered country, and how to distinguish good country from bad often puzzles experienced men. It is advisable to shy off country which gets too big a rainfall, as grass is rank and sour there as a rule. Swampy country is bad, as it is a breeding-ground for ticks. It is best to inspect in the off season, say, in August or September, before the storms have started. If cattle are in fair condition then, and appear to be able to hang on for three or four months before losses commence, the country should be all right.

On good country cattle run in big mobs; that is always something to go on. On poor country they split up into twos and threes, and look like kangaroo dogs. Those on the main frontages and camps tell the most eloquent tale. Outside cattle are always in good condition, because they have the country all to themselves. Algy should take particular notice, when riding along the main creeks, of the condition of cattle fringing the big waterholes. The old cows, with young calves at foot, will naturally look the worst. If they are in fair, strong condition, and calves appear well nourished, the rest may be taken for granted. If he be an observant young man, that is the time to pick the camps, because it is the time of year that cattle come in regularly and early, and spend a great part of the day on the camps they choose for themselves.

Coastal country is often good, if the creeks run up to rangy country. Being well drained, they often open out into deep valleys, with little pockets in the ranges composed of black soil plains and flats. These sometimes grow a little Flinders grass, and a rough, course species of Mitchell. Unfortunately—as is generally the case—the further away one gets from the coast the lighter the rainfall. Country gets sweeter, but water gets scarce, and it doesn't pay to have to pump water for cattle —yet. Of course, that kind of country is all right for the early part of the season, but cattle must be shifted when it gets dry. There is any quantity of beautiful downs country to be had for a song, but all the water must be obtained by boring, and raised by windmills and engines, and this does not pay, especially when the cost of boring and equipment is heavy. It is better to put up with inferior country, where the seasons are more reliable and Nature attends to the watering.

The Outback Station.

The question of locality must be carefully considered. If right away out "where the tall gum trees grow, &c.," rents will be low, probably not more than 2s. 6d. per mile. Everything in the nature of stores, saddlery, fencing wire, will be at famine prices. Road carriage will be fearfully high likewise, and most unreliable. The cost of regular drafts of bulls will be something to remember with a shudder. However, as aforesaid, there are compensations. Labour will be cheap and plentiful. A squatter can rent 2,000 square miles of country, and make use of 10,000 if he wants it. There are no rates or taxes, and this is something to be thankful for. A lot can be done with greenhide, which takes the place of leather. Men in those far-out localities are very self-reliant and resourceful. They do all their own saddle repairs, make pack saddles and bags out of greenhide, and look after what they have made very carefully. Hopples and ropes, of course, are made out of the same material.

Salt can be gathered and bagged in hundreds of tons from salt water arms, after high tides have receded and the water evaporated. The salt—though not as good as the refined article—is quite good enough, and most useful to put out for the cattle on the different camps. Some people nail hides around trees, with the fleshy side outwards and the hairy in, and after filling them with salt, nail the upper portions into the trees above. Rain causes the salt to work through the hide, and cattle come on to the camps and lick it. Finally, they tear the hides away to get at the salt. Where salt is plentiful, however, it is best to give the cattle all they want in big troughs. There is nothing better to break cattle into camps, I consider, although I know some good cattlemen condemn it.

The Heads of the Herd.

The greatest drawback to outback stations is, of course, the trouble and expense of getting bulls up when needed. It doesn't pay to get small annual drafts. One way of getting over this is to buy some pure-blooded bulls, and start a small stud. Good cattlemen have tried this and come to grief, but I knew one man who made a brilliant success of it. He used to buy first-class bulls, giving up to 200 guineas

* In the "Pastoral Review" for April and May.

for them. Then he paid a fancy price to the owner of some good herd to allow him to go right through the herd and pick 200 to 300 heifers. After their calves had been branded and culled, he used to go through the young bulls at twelve months old, and cull out anything again which wasn't developing as he liked. Eventually he used to keep about 60 per cent. of the male drop as bulls, and put these into the herd at two years old. The rest he shot. The heifers he sold. He never bred from the progeny. Every few years he disposed of what was left of the stud, and started up again an entirely fresh lot. In this way he avoided inbreeding.

He was most particular about constitution, ruthlessly sacrificing anything savouring of the slightest weakness. He had a decent herd, and a definite type of bullock, suitable to the country, was produced. Of course, the knife was used freely on the station breeders as well. This method saves a lot of expense, but it requires an experienced man to carry it out properly, and Algy would perhaps be well advised to spend more and get his bulls from some good stud.

It may be assumed that after several inspections Algy is eventually suited with a property. Suppose he purchases, pays a deposit, and makes arrangements to take delivery by means of a bang tail muster, to commence as soon as the wet season is over. Then he is all set, and is about to see something which will remain in his memory for many years to come. There are two advantages in buying by bang tail muster. A man only pays for what are delivered, and he also has an opportunity of classifying his herd as they run through the yards, and the opportunity should not be missed.

Of course, the herd is badly knocked about on an unfenced run. Cattle are driven long distances, and the same cattle are driven and handled over and over again, but once it is over they can be given a good spell, and if the new owner is lucky enough to get rain they soon recover. Buying on the "walk-in-walk-out" principle is not to be recommended, since numbers are often over-estimated (by the vendors), and it is best to be quite sure of what one is purchasing.

The Business Side.

There are about 12,000,000 cattle in Australia (or rather there were in 1926). . . In the Northern Territory, most parts of Queensland, and the northern portion of Western Australia the cattle game hasn't paid since 1921. It used to cost about 30s. a head to breed and fatten a bullock in the old days. Now it costs about £6 10s. In ancient times squatters were glad to get £2 10s. for a big fat bullock, and good careful managers made fair incomes then. £1,000 a year was considered a princely income in those days. To-day fat beef is worth 24s. per 100 lb. or thereabouts at northern works. Droving and trucking have to come out of that, and this costs about 30s. per head for bullocks fattened in the Gulf, so that there is no margin for profit yet. Fat beef must rise to 30s. per 100 locally before cattlemen can reckon on a fair profit. The man with 10,000 cattle can then reckon on an income of some £2,000 a year.

Unfortunately herds have depreciated so much in numbers and quality, owing to the lack of markets, rounded off with the horrible drought, that future profits will be largely eaten up in payments of interest and restocking. When cattle do really rise to a good payable price—say, £2 per 100 lb.—most of the existing owners will jump at the chance to sell out, just as they did after the long depression prior to and in the terrible drought of 1902. People buying in now will reap the benefit. All indications point to a good market in the future, and when the tide turns, old-timers will be foolish to sacrifice their holdings.

Getting a Bit o' Country.

In the case of any young man wishing to invest, he must choose between a large area of country, out beyond the rim, with a big neglected herd (probably), or a nice compact little property in a nice district handy to the rail, a well-broken-in herd of good cattle, and, generally speaking, every comfort and convenience. He can estimate to a penny almost what he can make out of such a place, but, of course, there is no chance of expansion. A young man, with a strong constitution, plenty of pluck, determination, and perseverance, I should advise to get well out, and buy a large herd, even if it is badly neglected, and overrun with rowdy bullocks.

Of course, it is advisable to get decent country, well watered naturally. The advantages of buying this way are, that first the place can be bought cheaply, and it is quite possible to resurrect any herd. Labour will be cheap, since abo. stockmen will be plentiful, and, properly and tactfully worked, they are real good men. I will admit they are hard to understand and work, and one must put up with a lot, but in open unfenced country they are indispensable in some respects. Tracking is to them something so natural that they cannot understand anyone not being able

to read, interpret, and follow tracts. Of course, the disadvantages of such a property are obvious enough. Markets will be far distant, but the extra cost of droving is compensated for by the lessened cost of breeding and fattening, while one does not suffer to the same extent from droughts. Apart from all other considerations, a few years spent by a young man under the conditions outlined do him a lot of good, and the experience is a most interesting one to look back upon. If the young man is a novice, it will, of course, pay him to get a good head stockman, and the type to avoid like poison is the "galloping musterer."

The Rowdy Herd.

Now assume he purchases a piece of country, with a herd of 15,000 cattle. There are no fences, and few yards or other improvements. The cattle have been worked on no particular plan or sytsem. Sometimes they are worked up the creek, other times down, and always rounded up on different camps to be cut out. Naturally the poor unfortunate creatures look on man as their natural enemy, and it takes a lot of hard galloping and swearing to steady a mob after it has been sighted. Often they are not sighted; the cattle hearing them come start off at full gallop, and stockmen must race along the tracks to come up with them.

Hereinafter the buyer will be called Algy for short. Algy's first objective is to steady the cattle, break them properly into camp, and always work them the same way. The work of transforming that herd into a quiet one is not going to be done in a day. By going carefully and systematically to work it can be done thoroughly in about five years.

A First Essential.

In all probability Algy will discover there are two main branding yards, about 40 miles or so apart, and a few broken-down tailing yards. The cattle have always been driven great distances to get to a yard. One of the first essentials is to build a chain of tailing yards and small branding yards, and alongside the latter build paddocks, about two miles square, with three strong barbed wires to hold weaners. The branding yards can be built for £100. The tailing yards are best built of posts, three barbed wires, and a top rail. They should be large, say 100 yards square, and placed on soft sites, with some shade trees enclosed. This gives the cattle plenty of room to spread out and lie down.

Branding yards should be built on main creeks, about 15 miles apart. Wherever there is a good permanent waterhole, a soft shady camp on the bank of the creek, and good grass a little way out on both sides, that is a good place to form a camp, build a branding yard, and small paddock. Branding yards should be strong, and built to a proper plan, so that cattle will run well. I have seen a lot of money spent on yards in which cattle had to be badly knocked about to draft, and others in which they ran through like quicksilver. Yards had best be planned by old experienced cattlemen, since a panel too many in a lane makes all the difference to cattle running freely; also the yard should be planned so that cattle work back towards their feeding ground. A chain of substantial yards built along the main creeks and camps need not cost a great deal, and they are indispensable.

Choosing Camps.

The question of choosing camps is most important, since once picked the camp should never be changed. It should be soft, well shaded, and with a good open "face." Superfluous trees can be cut down and burnt. It should be big enough to hold from 1,200, to 1,500 cattle; it is not advisable to put on more cattle than that at once. Another little patch of trees, close handy, does to put "the cut."

Now that is the camp, and it is chosen chiefly because cattle have already demonstrated their affection for it. It is a good thing to buy a few tons of rock salt, and always have some on the camp, especially just before a muster. That increases the attraction. In time to come cattle will make naturally for the camp as soon as they are started up, and take very little holding while cutting out goes on. All this makes ultimately for economical and efficient working. Also, as already pointed out, they get contented and quiet, and cease to regard man as their natural enemy.

The sooner camps are picked, yards built, and the work of breaking cattle in commences, the better. The first year very little improvement can be expected, and Algy will find mustering to be hard uphill work, but assuming that 4,000 weaners have been taken from their mothers before the end of the season and herded in four separate mobs for a month or five weeks by men understanding their work, those weaners will remember the experience, and help instruct the older cattle. They themselves will be no trouble to work the following year, and as bullocks will be good on the road. Weaning regularly and herding soon tells a tale.

THE MAKING OF A CAMP HORSE.

By "CULKAH."*

What a big part in the busy cattle man's life the camp horse plays! Yet he or she (because many mares are just as smart and brainy as t'other) are to-day treated in a fashion that must make the old-time camp rider turn in his grave.

Years agone the camp horse held pride of place, was led to the cattle camp, did his arduous work, got a rub down, and was let go. Not from him or her was the extra work of yarding asked. Moreover, those brainy equine workers knew well what was their legitimate job, and objected, in some instances very plainly, to what they considered extra work, or work that was really quite beneath their dignity.

Yea, camp horse knew his worth, and the old riders knew his worth, therefore some wonder horses lived in the year gone past.

As a brainy boxer will conserve his strength through a gruelling mill, so will the rider and horse that know one another and are on intimate terms see a lot of work put through with minimum effort. Times out of number both horse and rider seize the psychological moment and bluff a beast out before it knows where it is. For the love of Mike don't harass a beast more than is necessary. Give it a chance to see there are other cattle out to bear it company. But we're a bit ahead of the job.

Let's imagine the camp is on, and your hands know their place. The best of 'em are on the face of the camp. All set. A chance occurs, and you can wangle out four or five "not wanteds" together. Take it, by all means, take it. 'Twill save much galloping. Or maybe there's an old matron or so that cares not where she be so long as the infant is with her. Diddle these out quickly as a start.

Good men round that camp will make a mort o' difference. Some chaps without thought will bung in and root the cattle out until they get a ragged edge on their tempers, and they'll do their darndest to give you trouble. Likewise some camp riders will stir up cattle, trot through 'em, and do sundry other uneducated stunts that don't belong to the job. The camp rider that knows his job will insinuate himself in amongst that camp with little more effort than nothing and barely disturb the position.

Too truly there may be some beast of either sex who was born to make trouble, and this lady or gent, as the case may be, will rudely gallop or shoulder its way through your otherwise orderly camp, and stir up some dust. Leave it be, lad. There'll come a time during the play when you get a brilliant chance, and the old wise camp horse knows it just as well as his rider. On that occasion, maybe, 'tis excusable if you bust that refractory skullion out pronto, and show him or her just what you and old Spanish have up your respective sleeves.

Spanish recalls to my memory hard days on the Hodgson and Roper. A brainy old chestnut whom you must needs ride with the girth and 'cingle a-swinging free, and the crupper was all you needed to kerb the good Hemsworth poley all jake. Round about 1895 there were few Anglo-Australian saddles, and out on a big Territory run I happened to own a Gaydon poley. Good horseman Tom Perry rode a clever camp horse known as Ivo in this, and 'twas odds on a fall several times; this is always a possibility until you learn to use the poley.

By the way, 'tis a bad habit to cultivate—that of dropping your hands on the camp horse's neck. It is generally done when the rider is getting a shade weary; likewise camp horse is weary, and he takes it as a signal for a full stop. Maybe the pace is up, and to stop old camp horse has to do a straight up and down prop, dig his toes in, and that bit of leather acts as a catpult—neither comfortable nor graceful, I assure you.

Just a word on camp drafts, as they are termed. Sure, many get a lot of fun out of camp drafting, but from the camp horse's view, and the rider's too, 'tis all skew-whiff. The beast is put out, steered maybe between two posts all O.K., gets a certain distance, and then this horse, that has been taught to put a beast out, is asked to bring it back; then before the two bewildered animals realise what is required of them, tingle-tingle goes the bell. Not a dinkum camp horse's work, I'd say, but just a handy horse on the face of a camp. More in his line.

Well, to see the whole show of camp horse's work you must attend many cattle camps, and draft all manner of beasties, and as the crowd can't get that show, no doubt the camp drafting competitions are all O.K.

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* In the "Pastoral Review" for June.

NATIVE GRASSES AND OTHER FODDERS.

By CHAS. McGRATH, Chief Supervisor of Dairying.*

Queensland possesses an extensive variety of nutritious native grasses, a number of which are noted for their drought-resisting character.

Nutritious herbage and edible shrubs, in conjunction with some 164 species of grass, constitute a natural pasturage that attracted the attention of stock breeders in the early stages of settlement and has placed this State in a prominent position among live stock countries of the world.

There is evidence, however, that the carrying capacity of our native grasses and fodder plants has greatly diminished over a period of many years.

Writings and statements of the early settlers in many parts of the State give us an idea of the wonderful growth of grasses high enough to conceal a flock of sheep, and in some localities of such a height that would allow of its being tied over a horse's back.

In a season such as the present some idea of the luxurious growth of the original native pastures may be formed from a view of the stand of native grass in railway enclosures, where they have been protected from the devastating effects of overstocking. From a glance at the areas outside the railway fences it is evident that many of the excellent varieties of grasses that once formed part of a rich, native pasture have entirely disappeared.

This serious deterioration that our native pastures are undergoing is attributable to a number of causes, the chief of which are overstocking, droughts, indiscriminate burning off by occupiers, and by bush fires.

Spasmodic cultivation has been responsible for the destruction of valuable grasses and has assisted the spread of harmful weeds. Fortunately this State has been spared the ravages of rabbits.

The preservation and improvement of our native pastures is a matter of vital importance, for on the vast fertile areas of this State will be raised the live stock required to meet the increasing food requirements of the Commonwealth and to maintain the flocks of sheep, including the high-class merino, that supply our own and oversea markets with the high quality wool that has become world famous.

To augment declining native pastures and to convert ungrassed areas into pasture areas a number of grasses have been introduced into the closer-settled portions of the State.

With the development of the dairying industry, extensive areas of what was once jungle-covered country have been converted into rich pastures for dairy stock, thereby materially increasing the meadowland of the State.

In some cases crops are grown for one or more years after the burn, while in many instances the land was seeded with grasses after the burn.

The grasses chiefly grown are Paspalum dilitatum, Rhodes, Kikuyu, and Prairie. Conditions that favoured the growth of one or more of these grasses exist in large areas on the coastal tableland and Downs portions of this State.

In the more northern portions Panicum muticum grass is also grown successfully, being favoured with a liberal rainfall.

The area under introduced grasses is approximately 546,575 acres.

The value of pasturage native and introduced cannot be too strongly stressed, as it is an all-important factor in our live stock industries and has a direct bearing on the economical production of meats, wool, dairy, and subsidiary products.

The harvesting of pastures and fodder crops by the animals lowers the cost of production, and suitable mixed pasture is a class of food that appeals to the appetites of the animals and encourages maximum yields.

The splendid crop of native pasture throughout the present season is reflected in the increased output of dairy products, and the results of the work of the herd recording officers disclose an increase in the average production per cow.

It would be difficult to over-estimate the value of our native grasses, fodder plants, and introduced grasses as harvested by the dairy cows.

In the economic harvesting of pasture and its conversion into condensed forms of nutritious food for human consumption the dairy cow stands pre-eminent amongst live stock.

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* From a radio lecture through 4QG.

The beneficial influence of succulent native pastures on the quality of our butter was mentioned by Professor Hunziker when referring to the delicate, full, natural flavour and aroma of our high-grade product.

A reference to statistical records shows a rapid development in the dairy industry in this State.

Upwards of 22,500 persons are located on dairy farms and co-operatively own and operate fifty-two butter and seventy-three cheese factories. The amount of capital invested in the industry is approximately £35,000,000, and upwards of 90,000 persons, or 10 per cent. of the population of the State, are dependent on the industry for a livelihood, which gives a yearly return of a value of approximately 7,500,000 sterling.

As large areas of Crown lands suitable for dairy farming still await settlement, the expansion of the industry in the coming years will exceed that of recent years.

The production per dairy cow varies greatly with breed, individuality, locality, quantity, and quality of pasture and food available, and there is evidence that the quality and quantity of pasturage and food available on dairy farms has a great influence on the returns from our dairy herds.

On many dairy farms native pasturage has so deteriorated that it is necessary to reintroduce suitable grasses to increase the grazing capacity of the holdings; which, together with the conservation of fodder, will prove a factor that will allow the dairy cow to yield to her full capacity and thereby increase the average yearly yield per cow.

Large areas in the coastal belt consisting of scrub-covered flats and hills, open fertile flats and forest ridges, with a rainfall of 30 inches and upwards, remain to be brought under closely-settled conditions. The grassing of scrub-covered and other suitable areas with pasture grasses such as Paspalum dilatatum, Rhodes, Kikuyu, couch, and Panicum muticum grasses is work that awaits the pioneer.

Large areas of rich scrub alluvial and forest soils are met with on tablelands and inner Downs areas.

A variety of fodder crops can be grown on such areas as well as on the coastal belts.

Considerable areas of lands suitable for the growth of lucerne also exist, and a stand of this valuable fodder should be established on every dairy farm where conditions permit of its growth.

Development of the dairying industry along efficient lines such as the breeding of high-class stock, production recording, conservation, and top dressing of pastures must receive our serious consideration.

The future prosperity of this State is chiefly dependent upon the successful development of the meat, wool, and dairy industries. The economics of these industries are closely associated with the maintenance and improvement of native pastures, the conversion of further areas into meadow lands, and the growth and conservation of stock foods.

Considering the importance of such industries to the welfare of the State, an appeal to graziers and sheep and dairy farmers to conserve and improve the pasture areas of the State should not be in vain.

AVOCADO PEARS.

The Avocado pear is one of the most nutritious and tasty sub-tropical salad and dessert food-fruits ever introduced into Queensland.

Secured direct from Professor Popenoe, of Berkeley University, San Francisco, on his arrival home from an eighteen months' tour of Mexico, Guatemala, and South America, there are growing on Mr. R. Walsh's place at Redcliffe, near Brisbane, fifteen selected named varieties from these countries, where this fruit forms the principal part of the food of the inhabitants. We are indebted to Mr. Walsh for the following note:—

"Avocado varieties vary in size, from a few ounces up to 3 lb. weight; they are grown on beautiful evergreen trees, and are from nearly round to pear shape. In colour the mature fruit ranges from light-yellowish green through dark-green to purplish-black—each fruit containing a single large seed, some tight in cavity, and others free. The flesh of the fruit is of a creamy, buttery, custard, nutty flavour, and in colour varies from pale-cream to deep golden-yellow, and just inside the skin a rich green tint. Several varieties ripen at different periods, and we hope to

have them maturing over many months of the year, when they must be hand-clipped from the tree—handled carefully, not bruised or pulled or knocked off—since the Avocado is ripened best off the tree.

"Composition and nutritive values are extraordinarily rich. Personally, I think them superb as a salad; alone, or in mixture, also eaten with pepper and salt, and with or without a biscuit. The wonderful nutty flavour lingers.

"The dietetic and nutritive values of the Avocado, as revealed by investigation and analysis at Berkeley University, show them rich in vitamins, and the digestion coefficient of Avocado fat (93.8) identical with the digestibility of butter-fat. . . . The matured ripe fruit is delicious, and has just recently been properly marketed in the big cities by the Californian Avocado Growers' Organisation—graded, selected fruit only, in attractive boxes, each containing one dozen, under the registered name of "Calavos," each fruit and box being stamped with this registered title. The demand absorbs the offerings, which in a few years are expected to be 5,000 to 6,000 boxes annually. (They can be grown to perfection in Queensland.)" Mr. Walsh has been good enough at different times to submit specimen boxes of his Avocados and also grape fruit to the Department, where they are recognised as being of excellent quality.

OPEN SEASON FOR OPOSSUMS.

NATIVE BEARS ABSOLUTELY PROTECTED.

The Minister for Agriculture and Stock (Mr. H. F. Walker) made further reference recently to the intention of the Government to declare an open season for opossums extending from the 8th July to the 7th August next.

The Minister stated that he particularly wished to emphasise that the open season did not refer in any way to the koala or native bear, and this animal had been for some time receiving, and would continue to receive, absolute protection under the Animals and Birds Acts.

Cyanide and Searchlights Prohibited.

Trappers are warned that it is illegal for them to have in their possession, or use, cyanide for the purpose of poisoning opossums, and the use of flashlights and searchlights is also prohibited.

Arrangements have been made with the Commissioner of Police for the co-operation of his officers with this Department in preventing the violation of any of the provisions of the Acts which refer to the taking of fur skins.

Trappers holding permits have certain prescribed rights under the Acts, and they will be required to adhere strictly to the conditions under which the permit is issued. As a result of the activities of the rangers appointed under the Act and the Police officers, at least fifty prosecutions have been taken, or are pending, against persons who have engaged in the trapping of fur-bearing animals contrary to the Acts.

Sanctuaries Remain Strictly Closed.

No permit will be issued applying the trapper's rights to any sanctuary within the State. Additionally, owners of areas in excess of 2,560 acres are privileged, under the Acts, to reserve from the operations of trappers one-sixth of their total area for any specified purpose. All areas under 2,560 acres are exempt from the operations of trappers unless with the consent of the owner. The area now comprised within the sanctuaries in this State aggregates almost 2,000,000 acres, and the native fauna in this area is totally protected.

The Sawfly and Opossum—An Interesting Experiment.

The Minister added that a deputation of pastoralists had represented to him that the opossum was of considerable advantage in keeping in check the sawfly pest, which was in evidence in some of the pastoral areas of this State where considerable losses of stock had periodically occurred. With a view of determining the efficacy of the opossum in restricting the ravages of this pest, the Minister had arranged that an area of approximately 400 square miles in the Maranoa district had been excluded from opossum-trapping operations. The area which will be utilised for the purpose of this experiment will be kept under close observation by officers of this Department, who will, from time to time, furnish reports as to the influence of the opossum in checking the depredatory work of the sawfly.

QUEENSLAND RAIN-FOREST TREES.

By W. D. FRANCIS, Assistant Government Botanist.

The Bat's Wing Coral Tree (*Erythrina vespertilio*) is not confined to the scrubs or rain forests, but is also common in the open forests. It is a very widely distributed tree in coastal and inland parts of Queensland, and extends into the Northern Territory. The trees are sometimes known as Cork-wood. On the larger trees the bark is rough. The accompanying field picture conveys a faithful impression of the peculiar markings or rough oblique ridges which are often seen on the large trees. The wood is soft and very light. The flowers are bright red in colour and fairly large.

Photo.: W. D. Francis.]

PLATE 34.—BAT'S WING CORAL TREE, *Erythrina vespertilio*, A TREE IN RAIN FOREST OF IMBIL.

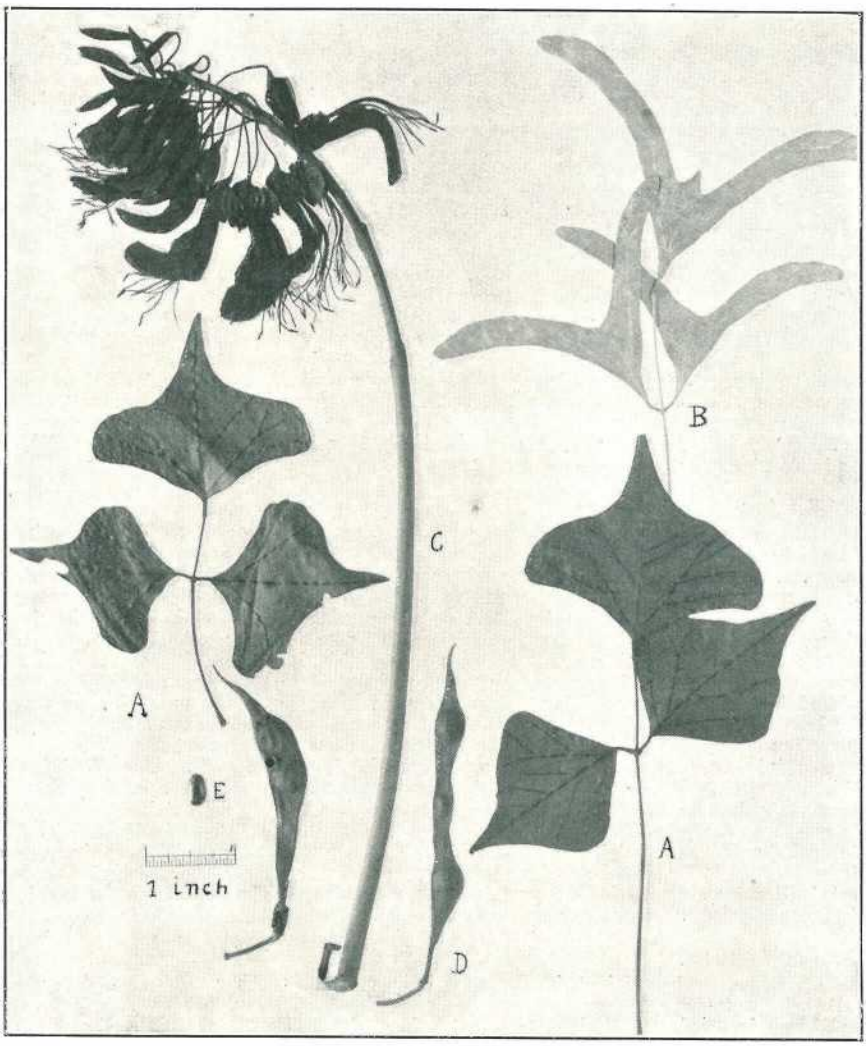

Photo.: Dept. of Agriculture and Stock.]

PLATE 35.—BAT'S WING CORAL TREE, *Erythrina vespertilio.*

A, leaves; B, leaf of the inland form of the species; C, inflorescence; D, pod; E, seed.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

FARM TRACTORS.

By E. T. BROWN.*

Farm tractors have one, two, or four cylinders. The day may come when these power units are fitted with six and eight-cylinder engines. More and more motor-cars are being built with an increased number of cylinders, and there is no gainsaying it that, within reason, the greater the number the more even the turning effort, or "torque" as it is called. A one-cylinder engine gives a very jerky movement. This is due to the fact that there is only one impulse stroke out of every four. The torque during the power stroke is at least eight times that of the torque during the one and a-half revolutions of the main shaft occasioned by the power stored by in the flywheel. Two and four-cylinder engines give one and two power strokes for every revolution of the main shaft. This naturally gives more even running, and, consequently, imposes less strain on the various working parts. Most tractor engines of two or more cylinders are constructed with the cylinders behind each other, on the line principle. It is possible, however, to arrange them differently. They may be V-shaped or horizontally opposed, but as yet neither of these two types is common. The last mentioned gives particularly sweet and even running. In this case a two-way throw main shaft is employed, and the explosions therefore occur at regular intervals. This gives a perfect balance to the reciprocating parts. A four-cylinder straight engine may fire in one or two orders. Some fire 1, 3, 4, and 2—number one cylinder being the one next to the radiator or in front of the engine—or 1, 2, 4, and 3.

Lubricating Systems.

The commonest form of lubrication is by what is known as the splash system. In this case the oil is fed automatically to the sump or base by the action of a pump. A dipper is attached to the lower part of each big end, and, as the piston moves up and down, a small quantity of oil is scooped up and flung—in the form of mist or fog—over the bearings and on to the walls of the cylinders. This is a simple and efficient method, for there is nothing to go wrong except the pump. A rotary form of pump is usually employed, and this is practically everlasting. In some cases the oil on its way to the sump is caused to pass through a glass tube placed in sight of the operator. It can be told instantly if the pump be defective. As has been mentioned previously, it is extremely difficult to vaporise the kerosene; therefore, a little remains in its liquid form. This travels past the pistons and passes into the sump, where it mixes with the lubricating oil. The oil is thus thinned, and it is for this reason that makers generally advise renewing the oil every day the tractor is at work. To overcome this difficulty an outside oil reservoir is sometimes fitted. By a system of pipes a definite quantity of oil is delivered to each bearing, the oil being forced by the action of a pump. When this system is employed a sight feed is always fitted, so that the driver can determine if the lubrication is being carried out properly. Any surplus oil given off from the bearings is drained off and passed out on to the ground.

Cooling Systems.

Air cooling is efficient in the case of a rapidly moving engine, such as one fitted to a motor-cycle or an aeroplane, as the current of air passing over the cylinders is ample to dissipate the extra heat developed. But this system is not practical in the case of the tractor engine, which moves comparatively slowly at all times. Water is, therefore, the cooling agent universally employed. The upper part of each cylinder is enclosed in a jacket and water is caused to pass through it. A radiator—an arrangement of small tubes between an upper and lower reservoir—is fitted, and as the water becomes heated in the water jackets it passes into the radiator, where it is afforded an opportunity of losing its heat; hence cold water is constantly passing into the jackets. The circulation of the water may be carried out in one of two ways. A pump may be fitted, this generally being driven off the gears in the timing case. To ensure sufficient cooling a belt-driven fan is mounted behind the radiator, so that a large current of air is drawn between the tubes. The majority of tractor engines, however, are cooled on the thermo-syphon system, since the pump method is more costly and more likely to get out of order. In this case a natural law is made use of—namely, that hot water tends to rise and cold water tends to sink. As the water is heated in the jacket it rises through a pipe to the top of the radiator and cold water takes its place, while the hot water passes downwards through the radiator tubes and thus becomes cold again. Both systems are excellent. The pump system allows of a smaller quantity of water being used, because the circulation is more rapid, but the pump requires attention. The main advantage of the thermo-syphon system is that the circulation of the water is governed by the needs of the engine at the moment as it depends upon the amount of heat extracted from the cylinder walls.

* In the "Farmer and Settler."

RURAL LIFE IN OTHER LANDS—II.

BY THE EDITOR.*

IN our last talk on this subject we made a rapid survey of some of the trends of agriculture in France. We saw in them some resemblance to present-day conditions of rural industry in Queensland, particularly in respect to the migration of country people to the city, which most of us, I think, recognise as a world-wide phenomenon. There are, however, some superficial thinkers amongst us who regard the extraordinary expansion of Brisbane and other cities and the relatively slow increase in rural population in this State as due entirely, or almost entirely, to a purely local set of circumstances, social and otherwise. In fact, the same idea is held to some extent in respect to Australia generally. A study of world-wide conditions of the agricultural industry, however, reveals to us that this rural exodus is going on in every civilised country. Particularly is this so in France.

French Agriculture.

We have considered a few of the trends in French agriculture, with the idea of learning from them some lessons, or extracting some information that might be of use to us in the study, or in our appreciation of our own particular rural problems. We showed how adaptable the French farmer is to changing economic conditions; how, when the world market was flooded with wheat, he intensified livestock production; when he lost his wool market, he concentrated on meat production; and when, more recently, the world market was swamped with frozen beef, mutton, and pork, he turned his attention more intensely to dairying. Starting where we left off: The general trends in French agriculture at the outbreak of the war, to summarise them, were: Change from cereals to fodder crops; expansion of grasslands or pastures; a much more intense interest in animal husbandry; and, to some extent, the replacement of men by women on the farms. Just here I should like to pay a passing and very small tribute to the wonderful character of the women of rural France—the women of the peasant class as they are called. During the war they took the place of their men in the field, engaging in all sorts of hard manual labour. At the same time they carried on their domestic work, attended to their children, and kept their homes scrupulously clean; and throughout the whole heart-breaking time of stress and bereavement, showed a courage and a capacity for endurance that was most inspiring and compelled our reverent admiration.

Development of Animal Husbandry.

The type of agriculture which developed from the general trends I have mentioned rendered France relatively independent of outside sources of supply as regards meat, of which only about 2 per cent. of the country's total requirements had to be imported.

Exportable surpluses of draught animals and cattle were produced and there was a net exportation of dairy products, although France imported more cheese than she shipped abroad. On the whole, trade in animals and animal products appeared as a credit item on the balance-sheet.

Cereals, particularly wheat and oats, were imported in very large quantities, but all things considered, before the war France was self-sufficient in regard to foodstuffs.

The Effect of the World War.

The immediate effect of the world war was, primarily, an enormous depletion of the nation's man-power, and, secondarily the devastation of a large area, including some of the richest agricultural districts in the country.

The general effect of the war upon agriculture in France was to intensify each of the four general trends to which I have referred and which characterised the farming of the country when the lid blew off Europe in 1914. These effects influenced in a similar manner, though to a different degree, the 77 Departments outside the war zone, the 10 Departments occupied in whole or in part by war operations, and the 3 Departments of Alsace-Lorraine which were restored to France at the end of the war.

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* In a radio lecturette through 4QG.

From the viewpoint of land utilisation, the return of Alsace-Lorraine had no appreciable effect on the agricultural situation in France. Generally speaking those provinces proved to be, what might be called a deficit region from an agricultural standpoint, for much of their primary produce had to be supplied from other parts of France, though against that was a fair proportion of root-cropped areas, grazing land, and forest country. All things considered, the acquisition of Alasce-Lorraine laid an added burden on the agricultural resources of the French nation.

In the reconstruction of French agriculture since 1919 the same difficulties were encountered as have been met with in every agricultural country. We are very familiar with the same economic difficulties in Queensland, but under a progressive—I might also say aggressive—rural policy in this State, we are doing much, in my opinion, to minimise them.

Increased Demand for Meat.

An interesting fact is that, since the war, the demand for meat in the cities and other industrial centres has increased in France. Not only has there been an actual increase in the numbers of city dwellers—the official figures for 1925 show that there were nearly nineteen millions in the actual city populations of France; that doesn't include, of course, the populations of minor towns and villages that are purely rural—but after the war the ex-service men, who had acquired a taste for beef and mutton in the army, demanded more and better meat on their return to civil life. A higher wage scale also since the war has enabled industrial workers to establish a higher standard of living than was possible in 1914.

Land Utilisation.

What impressed many of us who lived in France for some time was how the land is utilised in that country. Between the time of the French Revolution in 1790 and the middle of the last century, there had been a general expansion in agriculture. Lands that for centuries had lain unproductive as State lands or as parks and pleasure grounds of large private estates were put into cultivation. Even extensive tracts of forests were felled and the soil ploughed. Large holdings were divided into small farms and the number of landed proprietors, for the most part peasants, was greatly increased.

For more than thirty years before the world war, gradual but persistent changes had been taking place in the agriculture of France. The farmers of the nation had been slowly putting more and more of their plough lands into grass, abandoning the cultivation of cereals, industrial and leguminous plants, and putting more acres into roots, tubers, and annual forage crops. These changes in the relative acreages laid down to different field crops marked a general shift from extensive field-crop production to intensive animal husbandry. Field crops, except wheat, were produced more and more for feeding cattle and horses, the cash income of the farm being obtained in increasing proportion from the sale of animals and animal products, until during 1913-14 more than 70 per cent. of the total receipts of "middle-sized" farms were derived from this source of revenue.

The war deprived French agriculture of from 60 to 80 per cent. of its male labourers, some 3,284,000 farmers having been mobilised by 1918. Immediately following the opening of hostilities, the larger part of ten of the most productive Departments was occupied by the enemy forces. The immediate effect of the war was to cut down man power, which reacted in cutting down the acreage of all crops requiring hand labour and in increasing areas of crops that could be produced with less expenditure of labour. Cereals, leguminous plants, roots, and tubers decreased greatly during the war period, whereas grasslands and fallow lands were increased.

Soon after the signing of the armistice the French began to restore, as far as possible, the devastated provinces. The reclamation has been accomplished largely by means of power cultivation, although as late as 1925 certain areas had not been touched by the plough.

It is probable that the new levels of land utilisation established in French agriculture during the world war and post-war years are indicative of trends that are bound to become more or less permanent. The great expansion of cereal acreage in the United States, Canada, Australia, and other countries is rendering cereal production not only in France, but in Central and Western Europe (excepting Italy) less and less profitable, and the farmers of these countries are turning their attention to more payable lines of farming, in spite of attempts on the part of the Governments to bring the agriculture of each country as far as possible up to a stage of self-sufficiency in cereals from which is made their daily bread.

BETTER QUALITY CREAM.

UNITED EFFORT REQUIRED.

"The suppliers of a choice article are entitled to, and they should receive, a higher value for their produce than a supplier who only tries to produce a first-grade article. Instead of all factory managers encouraging the production of quality cream, we find that the evil practice of working primarily for increased quantities still exists, and inducements in many cases are held out for individual suppliers and groups of suppliers to break away from the factory of which they are shareholders. Following a more effective grading of milk and cream by all factories there would naturally be a movement by the producers, the great majority of whom are always anxious to secure the best results."

THESE remarks were made by Mr. G. Newton, of Maleny, in a paper read at the annual conference of the Queensland Butter and Cheese Managers and Secretaries, held in Brisbane last month. "The value of the dairying industry to Australia," said Mr. Newton, "demands very great improvements in the methods of production of milk and its products. During the past ten years practically all efforts towards improvement have been concentrated on the manufacture of cheese and butter, the pasteurising of milk and cream being accepted as the solution of quality defects; hundreds of thousands of pounds sterling have been spent in rebuilding and equipping factories with modern machinery. It cannot be claimed that the results to date are satisfactory. The quality of the manufactured article certainly shows a little improvement, but, unfortunately, the percentage of choice quality butter and cheese is altogether too low. This fact, together with practically no increase in production, demonstrates that financially the industry has made no progress whatever. The raising of values by artificial means, such as the Paterson scheme, cannot be claimed as having uplifted the industry at all.

"Generally speaking, the production of milk continues in the same haphazard manner to-day as it did ten or even twenty years ago. The dairy farms still provide excellent pastures when the rainfall is satisfactory, the cows produce about the same quantity of milk, which contains no more butter-fat, and nothing more is being done towards improving the quantity of the milk and cream delivered at the factories. . . ." It appears that what is required is more assistance for the industry by educating.

More Production per Cow.

"In the first place increased production is urgently required. By this I do not mean more dairy farms and more cows, but more milk and more butter-fat per cow. I believe that this is the easiest of all problems with which we are faced to-day, and it is one that is exercising the minds of leading men in the industry throughout the Commonwealth. If every dairy farmer would realise how much better off he would be financially at the end of every year by keeping cows which would produce at least 300 lb. of butter-fat per annum, there would very soon be an enormous increase in production, and, of course, a corresponding reduction in the cost of producing butter and cheese. The experience of progressive dairy farmers in recent years has proved that 300 lb. of butter-fat per cow per annum can be produced from good pastures when the dairy herd has been selected by the use of the scales and Babcock tester. Pastures also can be improved by the use of a good strong chain harrow in the winter and spring months for breaking up and evenly distributing the lumps of manure and loosening the surface of the soil. A top-dressing of superphosphate every second or third year has been proved to be a paying proposition in many districts. Periodical ploughing and sowing of winter grass seeds of a nitrogenous nature, preferably clover, are also helpful. By increasing production the dairy farmers would be in a much better position financially, and they should be encouraged to provide fodder of some kind for use in the winter and early spring, when the pastures are not of much use; also on other occasions, when the rainfall is unsatisfactory.

The Question of Quality.

"Secondly, we come to one of the most difficult problems (and, in my opinion, the most important one) facing us to-day, viz.:—The quality of milk and cream delivered at the factories. I feel sure that all of us present will admit that the

average quality of milk and cream delivered at the factories has not improved very much, if at all, during the last ten years. Factory managers must accept some responsibility for this. Apparently, too much has been expected of the pasteuriser as a means of removing defects in milk or cream before being made into cheese or butter; also the desire appears to be to cater for large supplies irrespective of quality, and then to turn out an article that while in a fresh condition will get past the grading officials as first grade or 'Kangaroo' quality, with a bit of luck. This policy, I believe, has been responsible for the low average value of Australian butter on the London market. Since the Commonwealth Government instituted a system of partial stock grading in London, we find that the majority of butter and cheese deteriorates during storage and shipment to a very serious extent. The explanation of this is, I feel certain, due to the fact that unsuitable milk or cream has been used, and the pasteurising treatment has not been effectively carried out. It is our duty to aim at producing quality butter and cheese. By this I mean an article that will open up after at least three months' storage true to label. The markets of the world will always absorb the best quality at the best price, and the purchaser is entitled to receive the best.

Importance of Cleanliness.

"Cleanliness is not given the consideration that it should receive by those who milk the cows and carry out the work in the dairies and factories. The custom is to allow any one to take a job at this work, irrespective of whether such persons have received any instruction at all as to the absolute necessity of keeping all surroundings, utensils, &c., in the milking-yards, dairies, and factories absolutely clean. Milk for cheese-making and cream for butter-making, we all know, should be cooled so as to extract the animal heat and to get rid of feed gases, but this practice is most unfortunately the exception in far too many dairies to-day. Tainted cream during the summer months, caused by unclean surroundings or utensils and uneven ripening owing to lack of cooling is a very serious matter, and there is no doubt that too much of this class of cream is accepted by the factories as first grade. The supplier is satisfied, and, in many instances, the butter gets through the grading officials as first grade, but there is very little chance of it being any better than second grade by the time it reaches the London market, although, probably, a fair percentage of choice cream has been blended with the lower grade cream before being manufactured into butter. Carelessness, neglect, and lack of knowledge are the worst amongst the enemies of the dairying industry, and until all engaged in the production of milk realise this, and make a determined effort to attack and rout these enemies, progress is not going to make any advance.

United Effort Required.

"I believe that the first movement should be a united effort by all factory managers, by tightening up the grading of milk and cream, to aim at turning out an article of undoubted quality that will maintain such quality until it has passed into consumption. This is being done in some instances, and it can be done by us all. The standard of Australian butter and cheese must be lifted out of the rut in which it has wallowed for so long on the London market, so as to obtain for Australian producers a financial return at least equal to that of the producers of New Zealand. Will Queensland factory managers make a move in this direction?"

Responsibility of Producers.

Mr. Newton stated that some factory managers who had endeavoured to raise the quality of their output by effectively grading the article supplied had lost suppliers owing to the fact that managers of factories in other districts had accepted a cream of low quality, and returned to the suppliers a higher grade for their cream. The final result of this procedure was a continuance of the present low standard and value of Australian butter on the London market. If all factories graded cream strictly according to its quality, the only form of attack left to the supplier of low-quality produce would be to improve his methods and clean up his own area. This would bring about some means of instructing all those engaged in the production of milk on the absolute necessity of thorough cleanliness at every stage in the carrying out of each part of the work. This instruction, no doubt, would be very costly, but Mr. Newton expressed the opinion that it would be justified, and in a very brief time the increased financial return to the industry would show a handsome profit on the expenditure. The instructor could give very valuable assistance to the industry by acting as herd-tester, and he also should be qualified to give lectures on such matters as top-dressing of pastures, conservation of fodder, and the feeding of cows for milk production. To be effective the area allotted to each instructor should not include more than, say, 500 average dairy farms, which would allow of a reliable service at a total cost of not more than £2 per farm.

WET VERSUS DRY MILKING.

By L. VERNEY, Dairy Inspector.

This subject has a direct bearing on the hygienic production of milk. Milk is the only perfect food containing all the elements necessary for the growth and development of the human body, consequently anything that is likely to cause a change in its nature should be carefully checked.

The healthfulness of milk depends solely upon its freedom from disease germs. Cleanliness may be preserved by the prevention of dirt contaminating the milk during the process of milking. If both these conditions are present, it naturally follows that the keeping quality will not be lacking, providing the utensils employed are sterilised before being used. The operation of milking is sometimes, unfortunately, conducted rather slovenly, and attention is not paid to absolute cleanliness in person, practice, and containers; in other words, to personal cleanliness, clean milking practices, and clean buckets.

The practice of "wet" milking has nothing to commend it. It is an unclean habit, and carries with it attendant evils. "Wet" milking, quite apart from contaminating the milk with harmful bacteria and dirt, is harmful to the cow by causing chapped teats and warts. The former results from the practice of allowing the animal to leave the milking-shed with wet and sticky teats. That very sore and annoying skin complaint known to most dairymen as "milk rot" is another evil effect of "wet" milking.

After one has had years of inspection work making notes of observations of the various phases and operations of dairying, one is able to come to a quick decision as to whether "wet" or "dry" milking is practised in any particular dairy, by examining the push-rods of the bails, division rails, leg-ropes, and milking stools for milk incrustations. These incrustations are silent but strong witnesses to the unclean habit of "wet" milking. In every instance where investigations have been made to ascertain the cause of the high bacterial count in the milk samples taken by the Department of Public Health, I have found that "wet" milking has been the underlying cause of the trouble. In no single instance have I been called upon to investigate on a farm where "dry" milking is practised. This alone should be sufficient to induce those dairy farmers who "wet" milk to adopt the more hygenic "dry" process. Before milking starts, the udder, teats, and flanks of the cow should be brushed. This should not be looked upon as superfluous, but as a very wise precaution, and should take no longer than is necessary to clean one's hands. If the udder and its attendant parts are encrusted with hard dirt, it is necessary to clean them with warm water—not cold, as is usually the case. The quicker action of warm water in the removal of dirt, and consequently the saving of time, should be sufficient inducement to the dairy farmer to always provide a supply of warm water for this purpose.

DAIRY PRODUCTS EXHIBITION.

ADDRESS BY THE MINISTER.

THE Tenth Annual Show of the Butter and Cheese Factory Managers' and Secretaries' Association was opened by the Minister for Agriculture and Stock (Mr. H. F. Walker) on 19th June, at the Hamilton Cold Stores.

The show was a great success, both as regards the quality of the exhibits and the number of entries, while the attendance of those interested in the dairying industry was larger than it had been for some years.

Introducing the Minister, Mr. W. S. Hartley, South Burnett Co-operative Dairy Company, remarked that Mr. Walker had been connected with the dairying industry for many years. Those engaged in that industry would find in him a sympathetic friend, who would, at all times, do everything to advance their interests.

Mr. Walker, after commenting on the tremendous amount of minute work the judges had to do, and the care and discretion which they had to exercise in forming their conclusions, went on to praise the work done by the Queensland Butter and Cheese Factory Managers' and Secretaries' Association during the last ten years. "You are composed of the best brains that we have in the industry," he said, "and you avail yourselves of anything that is to be gained from a visit of experts from the South. By an exchange of ideas and the carrying out from time to time of these competitions, particularly under existing conditions, when there are such a large number of entries of the very finest quality from all over the State, you must be doing a tremendous amount of good for the industry."

Need for Continued Improvement.

Mr. Walker added that after looking through the exhibition, even although he had travelled the world, he had no hesitation in saying he had never seen keener competition. If only the exhibition were sent home to the old country, and placed in a warehouse in Tooley street, it would command the respect of all of the experts there, and probably of the world. Naturally, after seeing the exhibits, the question arose: "Is it possible to improve upon the effort?" At the present time they might be inclined to say, "Almost impossible." That statement, however, had been uttered many years ago, but since then they had improved their exhibits to such an extent that to-day butter was entered which was almost unbeatable, and cheese was on view which the judge said was the best he had ever judged. It was only a few years since pasteurisation came in, but look what it had done for the industry.

They now had butter second to none in the world, and much of that improvement in quality was due to pasteurisation, which was introduced only fourteen or fifteen years ago. He wanted to say that they had to go on improving their product until they were in a position to say that Australia was the best butter-producing country in the world from a quality point of view. They, too, had to remember that they had not yet reached the maximum amount it was possible to produce. When the lands now vacant were occupied, and herd-testing was universally adopted, they would find that the industry now was only in its infancy. It was their duty as citizens to develop Australia so that it would carry at least twice the population of to-day, and could produce two or three times the amount of produce it was producing to-day.

Problem of Wood Taint.

Mr. Walker recalled the words of Mr. Proud, that wood taint was the curse of the industry on the other side. "We have got to sit down as directors of our respective companies and take notice of a man like him," he said. "We must work with one common object in view, to rectify that trouble. If we cannot remedy the trouble as laymen or butter managers, then we will have to go to the department, which I can assure you will be prepared to help in overcoming this defect. In no circumstances must we have a continuance of this particular defect." The Minister said he was particularly pleased with the magnificent display. He congratulated the Kingaroy factory on winning the Australian championship in butter, and the Nanango factory on taking the Queensland championship. Although those two companies had won the big prizes, the Goombungee factory had created history by winning five firsts and a second. In the cheese section, he desired to congratulate Westbrook on winning the Australian championship, and Moola on winning the Queensland championship.

THE MILKING MACHINE—ITS CARE AND OPERATION.

At the Third Annual Conference of members of the New South Wales Agricultural Bureau for the South Coast and Monaro Districts, held at Bega (New South Wales) recently, Mr. Stan Solomon (Candelo) read a paper on the care and operation of milking machines, and the conference was so convinced of its practical nature that it is thought worth while quoting rather fully, as follows:—It is now over thirteen years since I first became acquainted with milking machines, and from experience I am convinced that the greatest factor governing success with a milking plant is absolute cleanliness. For this purpose water is required in large quantities, and provision should therefore be made to ensure a plentiful supply.

First, I will endeavour to clear up a point on which there is a great deal of misunderstanding, viz., the spread of mammitis through the herd by the machine. True, this is quite possible, but only by carelessness on the part of the dairy farmer. The examination of a few squirts of milk drawn from the cow by hand before fitting the cups on the teats will safeguard against putting the machine on an affected cow. Such cows should be returned to the waiting yard and later milked by hand. The milk drawn from the cows for examination is no great loss, as the first milk drawn from a cow contains very little butter-fat. It is likely to be contaminated with bacteria, and it is perhaps best rejected even if it is known definitely that the cow is healthy.

Mammitis can be spread through a herd by careless hand milkers just as readily as by machines. If an affected cow is milked and the milker continues milking other cows without thoroughly scouring his hands, he is taking the trouble along with him.

Affected cows should be left until last and milked into an old bucket kept for this purpose only. This prevents the germ-laden milk from reaching the floor. The habit of allowing this milk to reach the floor of the bails is all too common. A breeding ground is thus created for germs of a contagious nature, which are picked up by the cows' feet and carried to the pastures, where they gain entrance to the cow's system.

A four-cow plant may be handled efficiently by three capable people. Two need do nothing other than strip the milked cows, while the third party keeps the cows yarded, bails them, washes the teats and udders, and changes the machines from cow to cow as required. An alternative working system is for the entire staff to strip and attend to their own machines. The extra bail allows room to shift around. Waste of time must not be tolerated, or it will be reflected in increased fuel bills and general wear and tear. The work is fast but not heavy, and being soon finished the cows are at liberty to spend much more time in the pastures instead of standing about the yards.

Immediately after each milking the machine must be properly washed. Remove the rubber plug from the end of the main milk pipe. This admits a rush of air into the pipe and draws along any milk left there and delivers it to the separator vat. Next, each set of cups must be scrubbed externally to remove all dirt from them, which if left would be drawn up into the machine during the next washing and cause contamination. Then obtain a supply of cold water, about one gallon for each machine. Replace the plug in the pipe again, and commencing at the bail farthest from the releaser, place the machines, one at a time, into the water, which is drawn through the pipes. It is a good plan to keep lifting the machine from the water to allow it to clear itself; the bubbling action thus set up has an added cleansing effect also. The same operations are carried out, using boiling water to which a handful of washing soda has been added. After this, run the brush with a long cord attached through the main milk pipe. The vacuum draws this brush through; the cord is necessary when withdrawing. Once a week the cups and fittings should be entirely dismantled and thoroughly cleaned. Any rubbers that are worn out can then be renewed.

The releaser is also taken down each time and washed with the separator parts. About once a week the vacuum or main air pipe should be washed out, as a small quantity of grease from the pulsator slides finds its way into the pipe. This does not affect the milk, for it is in the pump air line and not in direct contact with any milk. To clean this pipe the pulsator drive is disconnected and the pulsators placed in the "closed" position. Next, place the small down air pipe into a bucket of boiling water containing a little caustic soda. This removes all grease from the pipe and carries it to the vacuum tank, which is then taken down, emptied, and scrubbed out. The vacuum tank must be taken down after each milking, and all taps left open to allow the free passage of air through the pipes.

This method of cleaning and general care has always been rigidly adhered to with my plant, and records over a period of ten years show no butter graded below choicest. The cleaning methods mentioned would appear to entail much time and trouble, but actually the description takes about as long as the daily cleaning, while about three hours once a week will see the dismantling through.

A 4 h.p. engine is used. This is more than necessary for ordinary purposes. An engine from 3 to 3½ h.p. will drive a milking plant and separator comfortably. It is convenient, however, to have an engine capable of operating the separator at the same time as the milking machine, for it is a great saving of time and money to complete the separating at the same time as the milking.

The cows have always behaved quietly and contentedly while being milked with the machine. The average returns over periods of machine milking compare most favourably with similar periods of hand milking. I believe if a cow is made comfortable and contented, a machine does not affect the production adversely.

I find the machine costs, on an average, £57 per annum for general maintenance, about £36 10s. being the cost of kerosene fuel. This is based on one tin of kerosene for every five days, 10s. per tin being the present price. If power kerosene is purchased in quantities of ¾ or ½ ton lots this cost is reduced considerably. Approximately £6 and £5 per annum is expended on benzine and lubricating oils, respectively. The benzine is used for starting the engine. The balance, about £9, is expended on rubbers and other replacements. Teat cup inflations last from three to four months, claw tubes from six to nine months, while the main 33-inch milk tubes and vacuum tubes have an average life of about four years.

To give best results a machine must not work with more than 15 inches of vacuum; about 14 inches is the usual working reading. In the air pipe there is a relief valve to control the vacuum suction. The stem of this valve must be oiled occasionally to prevent sticking. If the vacuum suddenly drops below 14 inches it is sure evidence of a leakage of air. Commonly this happens while a machine is being changed, but this loss can be avoided as one becomes experienced at changing. A constant leakage may be traced to an old swollen rubber ring in the releaser preventing the flap valves closing properly. If all rubber connections are found to be in good condition and the vacuum still shows a low reading, the spring on the relief valve may have weakened and become loose. This can be remedied by screwing down the spring until the gauge reads correctly. If the gauge is too high the spring, of course, must be loosened. The inflations are best kept tight; the machine then stays on difficult cows considerably better, and the milk is drawn more rapidly. A tin of water and clean cloth should be provided in each bail for washing the udders and teats of the cows.

For the man who is short of labour or desires to reduce the wages list the machine solves the problem. If it dispenses with the labour of only one man, it pays to have the machine. Added advantages are the more congenial working conditions, and the production of a cleaner and superior quality milk. The milk is cleaner, for it is under cover from the time it leaves the cow until it enters the vat. This difference is noticeable in the bowl of the separator.

During the discussion which followed, Mr. E. H. Filmer said that Mr. Solomon's advice was always of the soundest nature, and, what was more, he always practised what he preached. For years Mr. Solomon had been noted as the supplier of the best cream to the Bimbaya factory.

The question was raised as to whether machine or hand milking was the more economical during the slack winter period. It was generally admitted that milking by hand was perhaps quicker and less costly during those months when only a comparatively few cows were in milk.

In answer to a query, Mr. Solomon said that he preferred a kerosene engine because of the cheapness of the fuel, but agreed that a petrol engine was cleaner. He would not like to recommend one type of machine in preference to another.

YOUNG FARMERS AT THE BRISBANE SHOW.

ANNUAL CAMP.

The Department of Public Instruction is considering the preparation of an exhibit for the forthcoming Royal National Association's Show in August.

Last year the display was indicative of the department's activities generally. This year, in view of the growing interest in country districts in the Home Project Club scheme, it is proposed to make a display which will afford the public an insight into the nature and purpose of that particular section of the department's activities. In 1928, in connection with the Annual Show, the Royal National Association established a farm boys' camp, the members of which were nominated by the schools participating in the schools' agricultural home project movement, and an interesting and instructive week was spent in Brisbane by the selected members, addresses being given by prominent citizens, agricultural and stock experts.

This year a camp will again be held, and to attend it a selection of the most efficient members of school project clubs will be made from all the clubs operating in the country. In the pavilion will be displayed an exhibit appropriately displaying models suggestive of the interest, knowledge, and practical skill displayed, which has earned for these selected club members the privilege of attending the Show as the guests of the Royal National Association.

The possibility of showing models of the work of these schoolboy members of these agricultural project clubs is now being considered, and it is hoped that an interesting exhibit will be staged.

Photo.: Dept. of Public Instruction.]

PLATE 36.—PIG CLUB MEMBERS AT A COUNTRY SHOW.

Not the least enthusiastic exhibitors at some of the Country Shows are members of the local School Pig Club.

Photo.: Dept. of Public Instruction.]

PLATE 37.—THE BOY AND HIS PRIZE.

This earnest young Pig Club member is proud of his fine exhibit.

Photo.: Dept. of Public Instruction.]

PLATE 38.—THE PRIDE OF THE YOUNG QUEENSLAND DAIRY PEOPLE.

Home Project Schemes are becoming increasingly popular in Queensland Country Schools. Scholars voluntarily form the clubs under the supervision of trained instructors who are enthusiastic stockmen. The projects embrace Pig Clubs, Calf Clubs, Poultry Clubs, Maize Clubs, and Fruit-Packing Clubs.

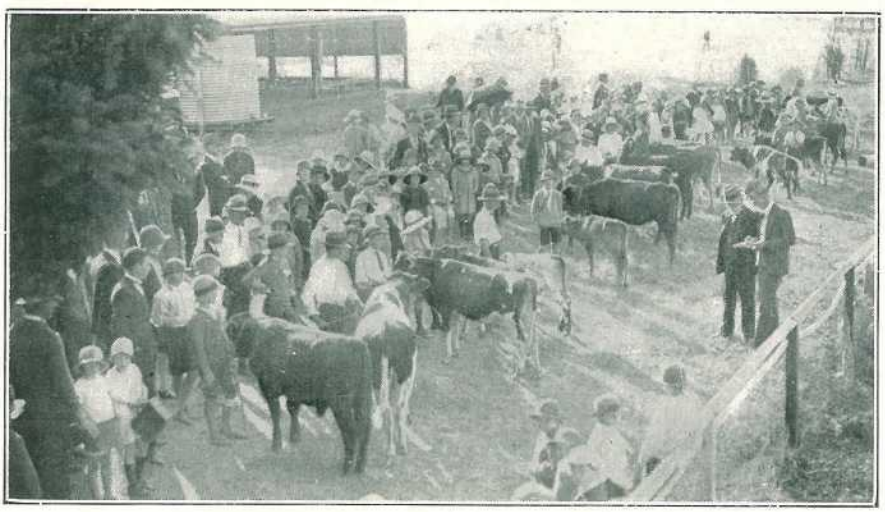

Photo.: Dept. of Public Instruction.]

PLATE 39.—THE "DAY OF JUDGMENT" FOR CALF CLUB MEMBERS.

A typical scene in a country school ground when the fortunate animals, the object of the unremitting care of anxious, yet proud young owners for so many weeks, are paraded for the critical and impartial scrutiny of kindly judges.

STERILITY IN BREEDING SOWS.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

We have recently received many inquiries on the subject of sterility or barrenness in sows, of which the following is typical:—

"I have two Berkshire sows and one boar which have been specially selected from a leading stud as foundation stock for my Berkshire herd. These pigs are now nearly eighteen months' old, but up to the present the sows have had no litters, and they have not shown any inclination to breed. They are running in a 2-acre paddock, sometimes with the boar and sometimes apart, but the boar does not seem to have any inclination to breed either. I think the pigs have been handled correctly though for some months during the summer both boar and sows were rather fat, but during recent months they have been out grazing and are not overfat now. What I should like to know is, is there any way of inducing sexual activity, and is it any use carrying these animals on any longer?"

The following answer was supplied:—

A great many of the cases of sterility and barrenness in pigs are due to the animals being overfat and lazy. There are many instances also in which the boar is too fat and lacking vigour. It is unfortunate that many strains of pigs, particularly purebred pigs, have been practically ruined through being kept in a very fat show condition for exhibition purposes over lengthy periods; it is equally unfortunate that many of their progeny suffer as a result and fail to breed satisfactorily if they breed at all. These conditions can very largely be overcome by reducing the condition, first by lessened diet, by the use of green foods, and also by compulsory and regular exercise. Frequent doses of Epsom salts should be given, using from two to four ounce packets per dose in half a pint of warm water, preferably as a drench first thing in the morning or in the food. The pigs should be compelled to hunt for part of their living over reasonably large, well-grassed pig paddocks (an acre or more in area). Green foods (lucerne, clover, sorghums, pumpkins, rape, and barley), root crops (sweet potatoes and artichokes, &c.) are suggested. Some cases of barrenness are due to septic inflammation of the womb, the result of germ infection due to stock being kept in unclean sties, and to boars serving clean sows after having bred to sows suffering from infectious diseases of the womb. In these cases, and in all cases where the sow will not hold to the service of the boar, it is advised to syringe the uterus with a solution of one tablespoonful of salt in one pint of sterile water, i.e., water that has been boiled and that has been allowed to cool down to blood heat. If this does not give satisfactory results, try 20 grains of permanganate of potash in one pint of sterile water at blood heat, and follow up with a salt solution every day for three days before service. During treatment also give Epsom salts as a purgative. It is advisable also, if at all possible, to change the boar, using a young vigorous animal. The sows should be kept away from the boar until they are ready for service, and after being stinted they should immediately be placed in a clean, dry sty, away from the other pigs, and should be kept quiet for several hours. If they still seem restless, mate them again the following evening and follow the same practice. Sterility is also often induced through the animals being improperly nourished and through their lacking stamina and vitality.

Many sows commence stud duties too young, many boars are also ruined in this way; neither should be so used before ten or twelve months old.

Hereditary influence is also a factor, the progeny of shy breeders often failing to breed at all. Injuries to the genital organs of the male are also a frequent cause of the sows failing to breed. The boar may have become weakened through frequent unsuccessful attempts at service, this especially so when a young boar is running with a lot of full-grown sows. The boar in this case is often punished severely by the sows and kept away from the food trough. It frequently happens that a young boar so injured becomes so "cowed" that he is ever afterwards afraid, and becomes quite effeminate. There are many other causes, too, such as the use of improperly balanced rations, diseases of the genital organs of the boar, hot, dry seasons, and so on.

The remedy lies in the removal of the cause wherever that is possible and in culling out unsatisfactory breeders. Satisfactory specifics for the treatment of pigs that are unsatisfactory breeders are well advertised. In a general way, however, we do not recommend the use of medicinal agents for the purpose indicated.

SCHOOL OF INSTRUCTION FOR PIG FARMERS.

AT GATTON COLLEGE, 10th TO 21st JUNE, 1929.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

Discussing matters associated with the Second Annual School of Instruction to Pig Farmers, members of this school referred to the opportunities thus offered as an immense success; a grand opportunity for getting together; an educational treat for both young and old; and a school at which farmers in increasing numbers from every part of the State should endeavour to be present.

As at last year's function the school was again conducted at the Queensland Agricultural High School and College, Gatton, the scheme being a co-operative one, organised by officers of the Departments of Agriculture and Stock and Public Instruction.

The school represents the most important function of its kind in the pig industry throughout Australia, and is destined to become of increasing importance as its membership grows and more people become informed of its possibilities. In age the members of the school ranged from a lad of fourteen years (Arthur Mills), a member of the Gilston State School Pig Club, on the South Coast, to Mr. E. Hill and Mr. B. G. Wilson, experienced and successful farmers from the Beaudesert and Rosewood districts, with farmers of varying ages and experiences between making up the balance. It is the principal school of its type in the Commonwealth, though Farmers' Winter Schools, at which special lectures and demonstrations on pig raising are given, have been a feature in the Southern States for some years.

At this School of Instruction, Pig Raising in all its different branches is the special subject studied, though a perusal of the programme indicates that there are a wide range of subjects for study and inquiry, and quite a number of lectures and demonstrations on allied subjects with lecturers drawn both from Government Departments and from business enterprises.

Those present at the school were drawn from districts extending from Millaa Millaa on the Atherton Tableland, to Gilston, via Nerang, on the South Coast, Brigalow and Dalby districts in the West, and from other areas in the Central and Southern parts of Queensland. A number of college students attended some of the lectures, while several university students were also present when subjects of special importance were being discussed.

Pig Production.

In his opening address the Principal of the College, Professor J. K. Murray, B.A., B.Sc., N.D.D., officially welcomed the students on behalf of the Departments of Public Instruction and Agriculture and Stock. College life and routine were dealt with in detail and the visiting students were invited to dine with the college

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NOMINAL ROLL FOR PLATE 40.

Front Row (left to right)—

B. G. Wilson (Rosewood); E. J. Shelton, H.D.A. (Senior Instructor in Pig Raising, Department of Agriculture and Stock, Brisbane); Professor J. K. Murray (Principal, Gatton College); A. J. Mackenzie (Instructor in Animal Husbandry, Gatton College); Walter Baker (Chairman of Pig School Committee, Greenmount).

Second Row (left to right)—

Arthur Mills (Gilston); W. Koehler (Yamsion); Fred. Davison (North Arm); G. Muller (Brigalow); E. Hutchinson (Staff at College).

Third Row (left to right)—

A. Muller (Brigalow); Clem Manning (Department of Agriculture and Stock, Brisbane); Noel Harding (Flaxton); D. F. L. Skerman (Kaimkillenbun).

Fourth Row (left to right)—

E. Retchford (Millaa Millaa); M. Lyndon (Worongary); Robt. Turpin (Manly); Alex. Davidson (Brisbane); R. M. Moffatt (Tarome); E. Hill (Beaudesert); J. Woodward (College).

Back Row (left to right)—

Noel Muspratt (Littlemore); C. W. Bowden (Gilston); J. Canty (College); T. Friis (College); Otto Lolauja (College).

Absent—R. D. Johnston (Kingaroy) and G. A. Salisbury.

Photo.: T. Harris.]

PLATE 40.—GATHERING OF PIG FARMERS AT THE SCHOOL OF INSTRUCTION, GATTON COLLEGE, QUEENSLAND, JUNE, 1929.

(See page 82.)

students and to make the fullest use possible of the lecture rooms, library, and reading rooms; and to visit other sections of the college, as well as the Pig Section, at which he explained more than 300 pigs were kept, and where an extensive series of experiments in the breeding and handling of bacon pigs were in progress.

Discussing various aspects of the pig industry the Principal supplied statistics showing the distribution of pigs throughout the Commonwealth, and pointed out that the increase in the number of pigs throughout the Commonwealth was steady to 1917, when the number of 1,169,565 was the total for the Commonwealth. This million decreased somewhat, but passed the million again in 1925. In that year the number of pigs in Queensland was about 200,000, in Victoria well over 300,000, and in New South Wales well over 400,000. The number carried in the United States of America and Europe indicated that there should be a marked increase in hog raising in the Commonwealth. In other parts of the world, notably in the United States, the growth of maize and the raising of pigs have followed closely together. In fact, during the war years, when lard was required in large quantities, the United States fixed the price of pigs on the basis of value of 13 bushels of maize, this value being expected to encourage the use of maize for pork production. Queensland's conditions make it the greatest maize State of the Commonwealth, maize being a summer-growing crop, and Queensland enjoying summer rains. This was also a great dairying country, and there were no two better foodstuffs for pig breeding than separated milk and maize.

Economics of the Industry.

The rises and falls in the volume of pig production were more sensitive to price fluctuations than was for instance, orchard production. This followed from the ability of the farmer to increase or decrease production rapidly owing to the prolificacy of swine. A satisfactory market price was then a major controlling factor in production. The export market undoubtedly existed but the price received was not encouraging. It was well to remember that an increase of profit could be equally as well obtained from decreased cost of production as from an increased market. Studies in the costs of production at schools like this could do a great deal of good and effect a national service. The discussions of improvements in farm management indicate that very often crossbreds give the best economic returns and suit the market requirements. Information regarding the balancing of rations and the lowering of their cost, details of crossing and grading of pigs, the care of the sow and her litter—all these could greatly help in determining the cost of production. Notes on the requirements of marketing and the co-operative efforts to handle the output might indicate ways in which the farmer helps himself by helping others. The industry should be careful not to adopt schemes which encourage faulty methods and inefficiency.

Promotion of Efficiency.

Professor Murray concluded his lecture by pointing out that not only must there follow an increase in efficiency through the experiments in pig breeding at the college, but also through making full use of the great mass of knowledge already available but sadly neglected. He believed that such schools for the assistance of farmers were a most important activity of an agricultural college.

Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising, and Mr. Mackenzie, Lecturer in Animal Husbandry, at the college, also welcomed the visiting farmers and forecasted a very useful term of association with the college and its staff.

Syllabus.

The syllabus was a comprehensive one, and included the following:—

Subject.	Lecturer.
Agricultural Education	Professor J. K. Murray, B.A., B.Sc., N.D.D., Principal of the College.
Microbes	
Principles of Feeding	
Economic Phases of the Industry	Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.
Description of Breeds	
Design and Construction of Piggeries	
General Care of Pigs	
Judging	
Results of Cross Breeding	
Preparation of Pigs for Show and Market	
Fodder Crops	College Staff.

Anatomy Diseases of the Pig Improvement of Breeds Physiology Administration of Medicines Post Mortem Examinations	Major A. J. Mackenzie, Lecturer in Animal Husbandry.
Commercial Pig Farming	Mr. R. G. Watson.
More Money in the Farmer's Pocket	Mr. J. F. F. Reid, Editor of Publications, Department of Agriculture.
Paper on Pig Hygiene	Mr. H. G. Cheeseman, Senior Slaughtering Inspector, Department of Agriculture and Stock.
Farm Book and Record Keeping	Mr. J. H. Woodward, Senior Clerk, Queensland Agricultural High School and College.
Soils	Mr. G. J. Saunders, M.Sc., B.E., A.A.C.I., Principal, Technical College, Ipswich.
Disinfectants Tuberculosis in Pigs	Mr. C. J. Pound, Government Bacteriologist.
Marketing Pigs	Mr. Geo. Setch, Marburg.
Pig Clubs	Mr. A. G. Aitchison, Organiser of Agricultural Projects, Department of Public Instruction.
Australian Stud Pig Breeders' Society	Mr. Percy Campbell, President of the Queensland Branch.
Address by Mr. Ernest Baynes	President, Royal National Agricultural Association.
Agricultural Economics	Mr. L. R. Macgregor, Director of Marketing, Department of Agriculture and Stock.
Demonstration of Value of Various Cuts of Bacon	Mr. A. B. Anderson, of J. C. Hutton's Proprietary, Limited.

Visit to Bacon Factories.

On the occasion of the visit by the party of farmers and college students numbering forty-five to the Queensland Co-operative Bacon Association Ltd. factory at Murarrie and Messrs. Foggitt Jones, Pty. Ltd. factory at Oxley (both bacon) curing and canning establishments), the visitors were hospitably received and were shown every possible courtesy. They were given the opportunity of inspecting the several sections of the plants, noting the treatment of pigs from the time they arrived by train or road from farmers throughout the State, to the time they were slaughtered and converted into innumerable appetising products. The party was particularly impressed by the immensity of the business and with the up-to-date system adopted at these factories, and in the efficient and expeditious handling of the factory products. At Foggitt Jones, Pty. Ltd. a display of no fewer than forty-five lines of canned delicacies was on view in addition to other fresh and preserved products. Luncheon and afternoon tea were provided at these functions, pork products being a special feature of the menu.

At Murarrie.

In a short address Mr. J. A. Heading, Chairman of Directors of the Queensland Co-operative Bacon Association Ltd. at Murarrie, welcomed the party of farmers and students and emphasised the importance of farmers visiting the factories at which their pigs were treated, so that they would become more conversant with the classification and grading of the animals and carcases and with methods of manufacture and distribution.

Mr. Heading thought the building up of co-operative bacon factories owned and financed entirely by the farmers should engender a pride in the heart of every producer, especially as in this case, the factory had only been established fourteen years. He explained that the co-operative factories were run entirely in the interests of the farmers resident in the State and pigs were treated, both on behalf of the shareholders and other suppliers, the resultant profits being utilised both for payment

of bonuses as well as for providing funds for financing extensions of operations, and in making provision for future years.

He dealt with the type and quality of the pigs marketed and was proud to say there had been a marked improvement in this regard in recent years. There were, he said, unfortunately, still a number of pigs coming forward that were not suited to the requirements of the curer, and the treatment of these incurred a heavy loss on the factory. It was a fact, he added, that the consumers as a body were much more particular now-a-days than they were in years gone by. The housewife wanted prime quality, fleshy pork, bacon, and ham, and she did not want it too fat, nor would it suit if it were too lean, and there was but little sale for heavy weight meat of any description. It therefore behoved everybody to take a keen interest in the business so that they could give the consumers the article they required and were prepared to pay for in increasing quantity.

If this could be done it would mean more money in the farmers' pocket and greater profits in the process of manufacture. Good seasonal conditions, he explained, often resulted in farmers holding the pigs too long on their farm and then marketing them in an overfat condition. This was a means of utilisation of greater quantities of farm foods, but farmers should remember that market demands were more stable than seasons. They should, therefore, aim continuously at marketing at prime weight and in medium condition, pigs showing a larger proportion of lean meat than fat.

Development of the Industry.

He stressed the extent to which the industry had developed in recent years, but emphasised that market requirements were also changing, and there was little likelihood of a return to the days when heavy fat meat was in demand. Conditions overseas had changed also, though the 200 lb. comparatively fat pig was still saleable there. Consumers in colder countries could do with a good, thick slice of fat with their bacon and ham, but where warmer climatic conditions prevailed there was and had been a decided tendency to reject the fat in favour of more lean meat.

He explained that the Queensland Co-operative Bacon Association was made up of 5,000 shareholder suppliers, and about 1,000 more in process of becoming shareholders in the concern. He did not think the producers need fear over-production so long as the quality of the pigs were maintained. Farmers in every portion of the State had actually proved in their own factories that they could produce and market stock of desirable quality at lucrative prices, and he urged them to give a greater consideration to the matters such as were being stressed at the pig school and by the various marketing organisations. More than £2,000 were recently spent at Murarrie in improvements and still further additions were contemplated.

He also emphasised the importance of strict attention to cleanliness and sanitation, with a view to reducing losses and ridding their farms of disease. He hoped the various schemes for providing instruction for both senior and junior farmers would expand, until every portion of the State was provided for and every farmer fully informed as to the importance of producing clean, healthy pigs.

Theory and Practice.

Mr. A. J. Mackenzie thanked the association, on behalf of the college, for the opportunity the party had enjoyed of seeing the operation of the factories. The college, he said, could teach the theory, but it remained for the factories to demonstrate the practical aspect from the killing floor to the consumer's plate.

Mr. Shelton also thanked the directors and management for their courtesy and hospitality, and explained that there were farmers present from many distant portions of the State. He hoped farmers would busy themselves and ask as many questions as possible with a view to gaining greater knowledge. He also hoped that at future schools similar opportunities would be provided, for thus bringing farmers and their sons together.

Mr. Walter Baker, chairman of the Pig School Committee, thanked the directors and staff on behalf of the farmers and felt sure that much good would result from the visits.

At Oxley.

At the Oxley Factory the party were met by Mr. F. W. Martin, representing the Proprietary Bacon Factories of Queensland, Mr. Waters, of Foggitt Jones, Pty. Ltd., Mr. White, foreman of the Oxley Factory, and Mr. Shand, foreman of the Canning Department, and were shown over the whole of the plant, including that portion of the works where cattle are treated in increasing numbers each year.

Back at the College.

In the course of an address Mr. George Setch, of Marburg, a prominent local farmer and a director of long standing at the Queensland Co-operative Bacon Association Limited, referred to his experiences during visits to countries overseas, where pigs are marketed in far greater numbers than is the case in Australia. He also stressed the value of the production of pigs of correct type and quality, and the utilisation on the farm of as much of the farm produce as possible. He stated that in his experience over a long period of years he had marketed thousands of pigs at a profit. To do this he had utilised food produced on his own property and had not sold a bag of corn or a bale of hay, except as pigs on the hoof or cream in the can. He recommended all present to aim at reducing costs of production by more efficient methods and by studying the market conditions at all seasons of the year.

Mr. John Hardcastle, of Dugandan, was unfortunately unable to attend to give his address on Weighing and Branding of Pigs, and Mr. F. W. Martin, of Stock Agents Ltd., through indisposition, was compelled to forego the opportunity of addressing the gathering as a representative of the Proprietary Bacon Factories, on the marketing of pigs.

Mr. A. B. Anderson, of J. C. Hutton's Pty. Ltd., gave a short talk on the importance of studying the requirements of the consumer.

A "pork products luncheon" was supplied through the courtesy of the Queensland Bacon Curers Association, representing Southern Queensland Bacon Factories.

In next month's journal several of the interesting papers read in the course of the school will be summarised for the benefit of those who were unable to attend the school.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril White, F.L.S.:—

"Wheat Grass."

S.D. (Oakey)—

Your specimen is *Agropyrum scabrum*, a fairly common grass in parts of Queensland and New South Wales, generally known by the name of "Wheat Grass," and always occurring in small patches in the ordinary mixed downs pasture. It varies considerably according to the class of soil on which it is growing, but on the better-class soils makes a good vigorous growth of rather succulent forage relished by stock, and is of value as growing through the winter and spring months when other food is scarce.

"Caustic Creeper"—*Euphorbia Drummondii.*

J. J. O'S (Boobin, Great Northern Railway)—

Your specimen is the "Caustic Creeper", *Euphorbia Drummondii*, found in practically all the Australian States, and generally regarded as poisonous to stock. "Caustic Creeper" is a name commonly given to it, though in Queensland it is just as frequently known by its botanical name. Reports about the poisonous properties of this plant in the past have been very conflicting, sheep at times having eaten fairly large quantities of it without ill effects following, but having more effect on travelling stock than on resting sheep or cattle. In New South Wales it has been found recently that the plant commonly possesses a prussic-acid-yielding glucoside, but though for some years past we have made repeated tests with the Queensland-grown specimens, they have always yielded negative results, and the symptoms as reported by drovers, &c., are not those of prussic-acid poisoning. The general symptoms of poisoning by this plant are a distinct swelling in the head and neck of the affected animals. Sometimes when these are particularly large they are opened by sheepmen and an amber-colourd fluid exudes. The sheep may recover, but the face has the appearance of having the skin scorched off it.

Dip for Spraying Horses.

K.N. (Wellington Point) asks what is the maximum proportion of phenyle (sheep dip) and water that may be safely used as a wash on a horse troubled with ticks. Veterinary Surgeon J. A. Rudd advises:—

I find Cooper's Cattle Dip best for spraying horses. One ounce of Cooper's Dip to one gallon of water makes a strength of 1 to 160. I have sprayed a horse at a strength of 1 to 150 with Cooper's Dip once every seven days for two years without any harmful results. One ounce of Cooper's Dip to seven and a-half pints of rain water will make this strength, and hand-washing is not advisable. Spraying is the better method, and should be practised when using Cooper's Dip. I have seen some bad results caused by hand-washing at this strength.

Australian Grapes in Canada.

D.G. (Stanthorpe)—

The Australian grapes consigned to Vancouver by the s.s. "Niagara" were of the Obanez variety, and were packed at the Griffith (N.S.W.) Producers' Co-operative sheds under the supervision of Mr. V. C. Williams, a director of the company, and shipped on or about 11th April last.

The cases used were three-quarter bushel with a centre division, and were made of white American case wood (spruce or hemlock).

At the time of packing the fruit was on the green side, and was allowed to wilt until the berries showed signs of shrinking; the time allowed for wilting varies from two to five days, according to the weather conditions.

The cases were first lined with paper, a layer of cork placed in the bottom, and then a layer of grapes, which were covered with cork, and the cork shaken well through the bunches. The second layer of fruit was then packed and the case filled with cork dust, care being taken to see that a reasonable quantity of cork was between the fruit and the sides of the case. After nailing down, two wires were bound round the case. The cases contained from 21 lb. to 22 lb. of grapes, and approximately 4½ lb. of cork dust. According to a Press message from Vancouver of 2nd May, the shipment arrived in perfect condition. The flavour of the fruit was reported to be excellent, and the price at which they sold on an eager market was 1s. 6d. a lb.

DIRT AND DIET DEFICIENCY IN PIGS.

Good food, in a fresh state and fed under cleanly conditions, goes a long way towards preserving health in pigs.

Good food means food which in the total has all the elements of nutrition. Pigs, like other animals, must have a proper proportion of such mineral substances as lime and phosphorus for the building of their frames, and especially is such a sufficiency important in the case of breeding sows—neglect to ensure it results in bad litters and poor growth. There are strong indications that mineral deficiency is the factor responsible for a number of those conditions described as paralysis, and it is also intimately associated with rickets.

Deficiency of lime and phosphorus can be repaired by the addition to the feed of, say, half an ounce (about a dessert spoonful) daily of sterilised bonemeal. A supply of wood ash and charcoal, to which a little sulphur and salt have been added, is also appreciated by the young pigs, and supplies any shortage in the mineral constituents of their food.

The pig is well adapted for the disposal of many waste foods of the household, farm, orchard, and dairy, but unless these foods are in a sound and wholesome condition serious troubles may be caused by their use, and the quality and market value of the carcase may suffer. Scours and inflammation of the stomach and bowels are usually due to incorrect and filthy feeding. Food such as swill, skim milk, and buttermilk which is stored in old tanks, casks, and like receptacles is liable to cause similar trouble if no effort is made to keep the vessels in a sanitary condition.

Strict cleanliness with regard to vats, troughs, and other feeding utensils is essential. Uneaten food should be removed, and the troughs cleaned before another supply is given. Where swill and hotel refuse is collected for food it should be fed before it becomes soured, since there is great danger of poisoning from soured swill. In addition, it should always be boiled before use.

Fruit, vegetables, and root crops when rotting are also a common source of digestive derangement, whilst maize fed in a mouldy condition may cause poisoning and nervous disorders. The danger of sickness may be lessened in all these cases by boiling the food before giving it to the pigs.

Pamphlets of interest to pig farmers are available free on application to the Under Secretary, Department of Agriculture, William street, Brisbane.

ANIMAL MANURES.

Farmyard manures are solid and liquid excreta from animals, and form one of the universal manures used by most gardeners—complete for all purposes in horticulture. It must, however, be used with care and intelligence. In some places where large and cheap supplies are available, the soil is saturated with manure.

The greater the quantity of manure incorporated with the soil, the greater the necessity for plenty of fresh air to bring about decomposition and ultimately humus. Now, if a soil has not been deeply dug or trenched, and it happens to be of a heavy nature, it is possible that the rains will not pass away readily; then the manure begins to get sour, fresh air, with its oxygen is driven out, carbonic acid gas develops too freely, and the beneficial bacteria are suffocated or annihilated by their enemies, which come into being owing to the lack of fresh air.

To avoid these troubles the soil should be well and deeply dug, and whenever extra large quantities of manure are used, the soil should be afterwards dressed with lime to keep it in a sweet condition.

General Notes.

Staff Changes and Appointments.

Messrs. A. H. Corry, M.R.C.V.S., E. Baynes, P. Short, and Jas. Sprott have been appointed Members of the Southern District Stallion Board. Major Cory will act as Chairman of the Board.

Mr. J. H. Gregory, of Melbourne, has been appointed Instructor in Fruit Packing, on probation for a period of six months.

The following have been appointed Assistant Cane Testers for the forthcoming sugar season, at the mill set out opposite each:—

Miss O. Knight, Bingera; Mr. T. F. Corbett, Marian; Mr. C. H. Humphreys, Moreton; Mr. H. T. Whitcher, Maryborough;

and Miss E. Rowe has been appointed to Millaquin Mill instead of to Marian Mill as previously approved.

The resignation of Mr. D. A. Parker, of Eungella, Mackay, as Officer under the Animals and Birds Acts has been accepted as tendered.

Mr. J. Legg, D.V.Sc., M.R.C.V.S., Townsville, has been appointed Chairman of the Northern Opossum Board, vice Mr. W. R. Holmes, transferred.

It has been approved that Messrs. E. T. Lewin and S. C. Allan, Inspectors of Stock, be attached to Julia Creek and Cloncurry Districts, respectively.

Mr. Thomas Law, of Arawee, Adavale, has been appointed Government Representative on the Adavale Dingo Board, vice Mr. F. B. Rutledge, resigned, and Mr. R. E. Gibson has been appointed a member of the Board, vice Mr. W. Hazlett, resigned.

The following members of the Police Force have been appointed Inspectors of Slaughterhouses:—Acting Sergeant M. Cranitch, Wondai; Constable C. B. I. McNaught, Yaraka; and Constable T. E. Martin.

Mr. W. J. Sheahan has been admitted to the Public Service and appointed Inspector of Stock on probation, and will be stationed in the Helidon district.

Mr. H. A. Galloway (Clerk, Depositions, Petty Sessions Office, Brisbane), at present seconded for duty to the Chief Secretary's Office, Brisbane, has been seconded for duty to the Chief Office, Department of Agriculture and Stock, as from 6th June, 1929, and until otherwise determined.

Mr. A. H. Knuth has been appointed trappers' representative on the Northern Opossum Board, vice Mr. A. H. Baumann, and Mr. Thos. Fisher appointed trappers' representative on the Northern Coast Opossum Board, vice Mr. Daniel Brophy.

The following have been appointed Cane Testers and Assistant Cane Testers for the forthcoming sugar season, and will be stationed at the Mills set out opposite them:—

Cane Testers.—Miss S. Riley, Babinda; Mr. V. F. Worthington, Cattle Creek; Mr. C. J. Boast, Fairymead; Miss I. Palmer, Farleigh; Mr. T. D. Cullen, Gin Gin; Miss A. L. Levy, Isis; Mr. H. Jensen, Inkerman; Mr. P. H. Compton, Marian; Mr. W. J. Richardson, Kalamia; Mr. L. Chadwick, Maryborough; Mr. L. G. F. Helbach, Millaquin; Miss M. T. Smith, Moreton; Mr. A. G. Kelly, Mulgrave; Miss D. Marles, Mourilyan; Mr. T. Herbert, Mossman; Mr. C. H. Jorgensen, Pioneer; Mr. T. V. Breen, Pleystowe; Miss F. Parkinson, Proserpine; Miss J. O'Flynn, Qunaba; Mr. L. C. Home, Racecourse; Mr. J. Howard, Rocky Point; Mr. F. C. J. Jorss, South Johnstone; Miss E. Christsen, Tully; Mr. W. J. Mason, Bingera; Mr. W. Ahern, Invicta; Miss J. Orr, Mount Bauple; Miss N. Walsh, North Eton; Mr. T. P. Brown, Plane Creek.

Assistant Cane Testers.—Miss M. A. Lyle, Farleigh; Miss G. Dingle, Inkerman; Mr. G. Tait, Kalamia; Miss D. Bowder, Marian; Miss E. Rowe, Marian; Miss M. Whittle, Plane Creek; Miss C. Humphreys, Pleystowe; Miss A. Mullin, Pleystowe; Miss M. A. Morris, Proserpine; Miss M. Orr, Tully.

New Sanctuaries—Islands off the Central Coast.

Miall and Middle Islands in Keppel Bay, Heron Island in the Capricorn Group, and portions of Westgrove and Warrinilla Holdings, lying to the north of Injune, have been declared sanctuaries for animals and birds. The lastnamed sanctuary was made in view of the fact that the opossums therein are doing valuable work in the destruction of the caterpillars of the Saw Fly, which do much damage to stock in the district.

Merging of Important Australian Industries.

Users of rubber tyres and rubber products of every description throughout Australia will no doubt be interested in the union of the Dunlop and Perdriau companies. The development of these two Australian enterprises since their formation has been phenomenal, but it was realised that by a consolidation of interests considerable economy would be effected.

In future the new organisation will be known as the Dunlop-Perdriau Rubber Company, Limited.

Its aim is, in brief, to make Australia independent of supplies from outside sources so far as manufactured rubber goods are concerned, and the company hopes to merit the hearty support of all Australians towards achieving this worthy objective.

Who———?

"I am the foundation of all business. I am the fount of all prosperity. I am the parent of genius. I am the salt that gives life its savour. I have laid the foundation of every fortune. I must be loved before I can bestow my greatest blessings and achieve my greatest ends. Loved, I can make life sweet and purposeful and fruitful. I can do more to advance a youth than his parents, be they ever so rich. Fools hate me; wise men love me. I am represented in every loaf of bread that comes from the oven; in every train that crosses the country; in every newspaper that comes from the press. I am the mother of Democracy. All progress springs from me."

"Who am I?" "What am I?" "I am Work."—"Cummins and Campbell's Monthly Magazine" (Townsville, North Queensland).

Country Correspondence Pupils—High Percentage of Scholarship Passes.

Nineteen candidates of the State Correspondence Primary School passed this year's State scholarship examination, and, as that school presented twenty-seven candidates, its average percentage of passes was in excess of the percentage obtained by the State schools generally.

The Minister for Works and Education (Mr. R. M. King) has expressed his satisfaction at this result, and pointed to another very pleasing feature of the work of the Correspondence School. It was that two scholarship candidates—one from the South-west and the other from the Central district—each of whom had joined the Correspondence Primary School at its inception seven years ago, and had passed through it from its lowest grade of the first class, had been successful. In the seven years they had covered the whole range of primary school work, thus demonstrating that they had made progress quite as rapidly as pupils attending the ordinary State schools. "The objective of the State Correspondence School is to pass its pupils through all the grades of primary instruction to the secondary school standard," said Mr. King, "and that objective is being achieved."

Commercial Aviation in Australia.

With the idea of stimulating interest in aviation in Australia along the lines of privately-owned aircraft, the Shell Company of Australia has purchased a modern triple-engined machine with which it expects to carry out useful exploratory and experimental work. The machine will show the latest development in aeroplane construction, and will, it is expected, be the only one of its type in Australia.

The flying operations of the company will be in charge of Captain E. F. Jones, M.C., D.F.C., who has resigned the position of Deputy Controller of Civil Aviation to take over the work. Captain Jones has had lengthy experience with flying operations, both military and civil. He served with distinction during the war as Flight Commander with No. 3 Squadron A.F.C. On his return to Australia, he joined the Australian Air Corps which formed the nucleus of the present R.A.A.F. When the Civil Aviation Branch was formed, he was appointed to the position of Superintendent of Flying Operations. Captain Jones's cross-country flights in Australia date from 1921, when he flew from Melbourne to Derby via Perth, and then back to Melbourne again. A little later he made the first journey to encircle the Commonwealth in a land type of machine. He is remembered, too, as making the flight with Colonel Brinsmead to Darwin to meet Cobham on his arrival in Australia from England. More recently, he carried out a flight from Melbourne to Normanton and return in the remarkable flying time of 36 hours, taking only four days for the entire trip.

It is anticipated that Captain Jones's appointment to this charge of the flying operations of the Shell Company will usher in a period of extensive activity in that company along the lines of industrial aviation.

Banana Grades in Victoria.

According to a Press message (25th June, 1929) from Melbourne new regulations governing the grading of bananas have been approved by the State Executive Council. The regulations fix four grade standards for Cavendish bananas. The first grade, described as "special," must consist only of sound, clean bananas of a minimum length of 9 in. and a minimum circumference of 5 in. The next grade, described as "choice," must consist of clean, fresh fruit of a minimum length of 8 in., and a minimum circumference of 4¾ in. Bananas in the third, or "standard" grade, must be not less than 6½ in. in length and 4½ in. in circumference. The fourth, or "plain," grade must consist of fruit of a minimum length of 5½ in., and a minimum circumference of 4 in. When bananas of any grade other than Cavendish are sold in any parcel, the bananas must be marked plainly to show the varieties included.

Increased Dairy Production.

Speaking at the recent Butter and Cheese Factory Managers' Conference, Mr. M. Wallace invited attention to the question of increased production. This question was sometimes viewed, he said, from an oblique angle. He stressed the necessity for greater efficiency in the direction of obtaining greater production per cow. There was no country in the world where the conditions were always favourable for dairying, and unless they were prepared to accept the role of waiters upon Providence, they must mitigate unfavourable circumstances by making preparations for bad times. The factory managers should exert themselves to stimulate their suppliers in regard to providing fodder reserves, so that milk production would be maintained throughout the year. While the return from the exported surplus of butter did not on present prices, and on the basis of the average production per cow, offer tempting prospects, the position would be entirely altered if they could produce 3 lb. of butter for every 2 lb. now yielded, without increasing the cost. It was no exaggeration to say that this was possible.

Synthetic Wool.

Of an exhibition in London of articles made from a mixture of wool and synthetic wool, by Textiles (New) Process, Limited, the company holding the world rights of the artificial product known as N.T., an English paper said:—"By using the N.T. as an admixture, it will be possible, it is hoped, to lower the cost of the raw materials used in a wide range of woollen textile productions by 35 per cent., and in certain cases by an even greater amount. Actual manufacturing tests are claimed to have proved that the artificial product, the basis of which is a waste vegetable material, dyes equal to wool, is as durable as wool, and washes in the same way, and with the same results. It can be spun in counts up to 95 mm., and woven by existing woollen machinery. In this respect it differs from artificial silk, as well as in the fact that operatives do not have to undergo a special training before they are accomplished in its use. If the claims made for the new product are realised, they should prove as advantageous to this country as the discovery and manufacture of artificial silk. In the same way as the prosperity of the artificial silk industry has favourably affected the demand for real silk, so an artificial wool, which passes the most exacting tests, should increase the demand for wool."

A Reminder about Leaf Curl.

The disease known as leaf curl affects various stone fruits, but it occurs mainly in the peach, and in seasons favourable to its development the question of how to deal with the condition is a matter of frequent inquiry. Unfortunately, by the time the disease has made itself evident, it is too late to do anything. Leaf curl is caused by a parasitic fungus, and if it is to be avoided the grower must spray his trees with a fungicide spray in the winter, before the swelling of the buds.

Lime-sulphur, Bordeaux mixture, or Burgundy mixture should be applied at winter strength. If desired, miscible oil may be added to Bordeaux, thus making a dual-purpose spray.

It is most important that the trees be sprayed prior to swelling of the buds. Later applications are of absolutely no value in control of this disease; moreover, these sprays themselves may cause defoliation of peach and nectarine trees if applied after the setting of the fruit.

If the disease is observed to have caused serious defoliation of the trees through failure to spray at the correct time, the new growth of leaves may be facilitated by a light application of a quickly acting fertiliser such as sodium nitrate.

Imperial Bureau of Soil Science.

The Imperial Bureau of Soil Science (one of the eight bureaux the formation of which was recommended by the Imperial Agricultural Research Conference of 1927) commenced work on the 1st May at the Rothamsted Experimental Station. Sir John Russell, Director of Rothamsted, is also the Director of the Bureau, and Dr. A. F. Joseph, lately Sudan Government Chemist, has been appointed Deputy Director. The functions of the bureau include the collection and distribution of all research work on soils of importance to the British Empire, the assistance of research workers in the prosecution of their investigations in whatever ways it can, the bringing together of workers from different parts of the Empire (either by correspondence or in conference) interested in the same subjects, and to supply information generally which may facilitate the work of soil experts in the development of agriculture.

It is hoped that before long the bureau will be in close touch with all soil investigators of the Empire, both at home and abroad, and that by means of information circulars and other methods the results of studies carried on in one part of the Empire will be made available for all. Arrangements will also be made to supply information dealing with soil investigations in foreign countries, the results of which (owing to language or other difficulties) are not readily available.

Queensland a Tropic Wonderland—Southern Visitors Impressed.

The newly-appointed Director of the Australian National Travel Association (Mr. C. H. Holmes), who is paying an unofficial visit to Queensland, in company with the Director of the Victorian Government Tourist Bureau (Mr. Gollan), has informed the Press that a commencement would be made this month on the detailed work of advertising Australia with the object of attracting a greater number of investors, investor-settlers, and tourists, as well as dissipating the colossal ignorance which exists overseas regarding our country.

"Although I have travelled extensively, particularly in the far North," remarked Mr. Holmes, "I never realised until this visit that within forty-four hours of comfortable travel from Melbourne, and twenty-six hours from Sydney, where there are over 2,500,000 people, the visitor can not only be transported into winter sunshine, but can enjoy a tropical wonderland of fruits and vegetation. Yesterday I saw the palm grove on the coast side of Tamborine Mountain. I am told that but a small percentage of Queenslanders have been there, and that the vast majority of visitors to the mountain miss seeing this remarkable grove of giant palms and enormous crow's-foot, elms, and other unique trees, shrubs, and ferns. In my opinion, it is superior to anything of the kind in other parts of this State, and is worth travelling across a Continent to see. This grove, together with the tropical fruit areas within easy distance of Brisbane, and others further North, in the Nambour area, have much impressed me from a tourist point of view. These are the features the Southerner and the overseas visitor are most anxious to see, although, perhaps, they may be commonplace to Queenslanders. From Tamborine Mountain, I saw a golden beach with rolling surf. Mr. Harold W. Clapp told me he thought it one of the finest surf beaches in Australia, and possibly in the world. To-morrow I hope to see it at close quarters.

"The popular conception down South is that you must travel to the far North to enjoy the tropical presentations I mention, that it costs much money and much time, and with many the idea of visiting Queensland is thus not further explored in detail. Mr. Gollan shares my view, and he, of course, has close contact with the public. I think that in the Great Barrier Reef—that submarine chain of mountains which scientists tell us is built up of 'little lumps of animated jelly'—Queensland possesses one of the wonders of the world. If exploited, the reef should prove one of the greatest tourist features of Australia. Some day, perhaps, seasonal encampments, or hotel accommodation, will be erected on the reef, so that tourists may visit this unusual and scenic area. The Australian National Travel Association, in which Mr. J. W. Hayes is seeking to interest Queenslanders, will be in a position to materially help this amazingly interesting State. It will take a broad survey of the whole of Australia, and then proceed to classify travel for advertising overseas, both in a broad way and in detail. The association will also seek to co-ordinate effort in Australia as between the various entities interested in travel. In the past, I suggest that too many matters have been left to the Government. This project, although supported by Governments, is not in any way subject to Government control. It is a job entrusted to business men to carry out as they see fit. Here is an opportunity for Australians to co-operate and do something for themselves in a business-like way. Australia," concluded Mr. Holmes, "has done something for all of us—let us do something for Australia."

What is a Dairy Herd?—An Important Ruling.

What constitutes a dairy herd of forty cows was a point raised in action before Mr. Justice Mocatta and a jury at the Grafton (N.S.W.) District Court recently. The action was for a breach of a share farm agreement, alleging failure to keep the plaintiff supplied with at least forty milking cows. For the plaintiff it was said that the defendant never gave the plaintiff forty cows, except for three months, when she had fifty-two. Sometimes she had only twenty and twenty-four, and as low as eighteen. The defendant contended that he supplied the required number of cows.

For the defendant, it was said that in a dairying district the term "dairy herd" had a certain recognised meaning. His Honour thought the words "dairy herd of forty cows" meant forty cows capable of being used as dairy cows for milking purposes.

Counsel for defendant contended that a dairy cow was a dairy cow whether it was milking or not, the same as a peach tree was a peach tree although it might not at the particular date be bearing peaches. His Honour said the agreement stipulated for a dairy herd of forty cows, and it obviously meant that cows in milk should be provided during the period of the agreement.

This could not be taken to mean that the plaintiff should be supplied with forty cows in full milk every day of the year.

His Honour said that was what the agreement implied. If the defendant made such an agreement, that was his lookout. He did not see how it could be put any other way. A non-milker could not be used as a dairy cow.

Lengthy evidence was given, and the hearing occupied the best part of two days. The jury returned a verdict that in view of the judge's interpretation of the agreement, they found for the plaintiff, damages being assessed at £40.

Bristol Boys for the Dominions.

H.R.H. Prince Arthur of Connaught visited Bristol, England, on 9th May to open a commodious hostel in which forty boys are to be in residence for training for farm work in Australia and Canada. A nine to twelve weeks' training course is projected, so that 120 to 160 boys and youths will be sent out each year.

This scheme has been launched by the Bristol Migration Committee, which has the Lord Mayor at its head, and which, with the co-operation of the City Council, will be able to train the boys on the Corporation Farm of 300 acres. It has a herd of cattle ranging from 60 to 100, sheep, horses, a big herd of pigs, and about 800 poultry. The boys will be taught to adapt themselves generally to farm life.

In addition to the hostel the committee are using Cabot House—reminiscent of that Sebastian and John Cabot who sailed from Bristol to discover North America—and here the boys will learn carpentering, boot repairing, and clothes mending, and be generally taught to become handy men.

His Royal Highness, in opening the hostel, said:—

"It furnishes an example of what can be done by wholeheated co-operation between all sections of the community. I am glad to know that the hostel has been generously supported by the City Corporation and by the Government. From my personal knowledge of the Dominions, I am certain that they offer great opportunities to British boys. At the same time, it is vital that boys going to the Dominions should be tested and prepared for the new life they are to live out there. The testing and the training which will be given at this hostel will undoubtedly stand them in good stead.

"Just over 400 years ago the citizens of Bristol equipped Sebastian Cabot to sail from this port on a voyage which is famous even in your famous annals. They did better than they knew, for, though the voyage showed no commercial profit, it was the first practical step towards founding our Empire overseas. (Applause.) I believe Cabot took with him five cabin boys from this district—no doubt, boys of similar ages to those I see round me now—and it is, I think, specially appropriate that the Corporation and citizens of Bristol should follow up and consolidate that work by helping their young manhood to maintain the British stock and the British traditions in our great Dominions overseas. (Applause.) I know that these boys will be heartily welcomed there by their kith and kin. They are going to help in the creation of wealth from the fertile land of these new countries, and it is well that their fellow-citizens should see to it that they are properly equipped, as Cabot and his companions were, for the work that lies before them. I wish the boys every success. I would urge them to work hard and play the game, never forgetting their parents, their city, or their motherland." (Applause.)

The Haunts of Genius.

There is nowhere in the land any home so remote, so humble, that it may not contain the power of mind and heart and conscience to which nations yield and history submits its processes. Nature pays no tribute to aristocracy, subscribes to no creed or caste, renders fealty to no monarch or master of any name or kind. Genius is no snob. It does not run after titles or seek by preference the high circles of society. It affects humble company as well as great. It pays no special tribute to universities or learned societies or conventional standards of greatness, but serenely chooses its own comrades, its own haunts, its own cradle even, and its own life of adventure and of training.—The late President Wilson.

Britain's Best Customers.

Our best customers are our own fellow subjects, says the "Morning Post" (London). For example, out of exports valued at £723,000,000 last year the Empire absorbed £327,000,000, or 45.5 per cent., which is an increase of a third over the pre-war average. More than that, of our fully manufactured exports, the Empire now absorbs 50 per cent. Canada, dominated as she is by the proximity of the United States, last year bought from us goods to the value of £34,300,000—which is three-quarters of what the United States bought, though the population of Canada is to that of her mighty neighbour as one is to thirteen. Australia is a better customer than the Argentine, New Zealand than Denmark, and South Africa than Brazil. The population of Australia and New Zealand is, roughly, seven millions and a-half; yet last year those two Dominions bought from us greater value of goods than all South America, or all Central Europe, or France, Belgium, Italy, Spain, and Portugal together. Surely those are facts that are more material to our workers even than to our capitalists.

Cleanliness in the Dairy.

As the great majority of the defects of milk and dairy products arise through lack of cleanliness, it is well to recognise just what cleanliness involves. If the cleaning is to be effective, the dirt must not merely be completely removed, and the organisms present must not only be killed, but care must be taken that no fresh organisms are introduced.

The main object in cleaning is to get rid of the bacteria, and as these are usually embedded in the dirt, the first step is to remove it. In doing this the great majority of the organisms will be removed as well, while the few which remain will be prevented from multiplying owing to lack of nutrition. In order to remove the dirt, which in the case under discussion consists of the constituents of milk, it must be dissolved, and at least loosened by the use of hot water. The water should not, however, be used too warm to begin with, or the proteins will be rendered insoluble. By the use of soda the casein is dissolved, and the fat is emulsified. Soda also acts as a poison to bacteria. Lime is to be preferred for cleansing woodwork, because if scrubbed in it will remain for some time, so that its disinfecting action will be prolonged, and it will fill up the pores of the wood and render the surface smooth and firm. The cleaning process must always be finished by a thorough rinsing with plenty of hot water, either pure or containing one of the chemicals mentioned, or dissolved dirt will remain behind.

Tinned or other metal vessels or utensils should, if possible, be boiled or steamed as a final treatment, thus ensuring an extra sterilisation and rapid drying. If they are dipped it is absolutely essential that the water be actually boiling, and they should be immersed for three minutes if the process is to be thoroughly effective. The last point is very important, for in spite of all reasonable care absolute cleanliness and sterility are seldom achieved, but if only the vessels dry as soon as possible no new growth will develop in them. Wherever possible, the best use should be made of direct sunlight, which both dries and sterilises.

What has been said as applying to utensils, piping, &c., applies equally well to the cloths and scrubbing brushes used in cleaning. These must be thoroughly cleaned and finally scalded with boiling water and dried to prevent them becoming slimy. Every dairyman should clearly understand that cloths and brushes may do more harm than good if not perfectly clean.

It is well known that cleansing cannot be effective if the vessels have inaccessible corners or rough surfaces; frayed woodwork or rusty pails should therefore not be tolerated. To thoroughly clean woodwork it is as well to sometimes wash it with commercial formalin diluted with twenty to forty times its bulk of water.

Plenty of hot water is essential in the dairy, and in this connection the installation of an ordinary domestic bath heater can be strongly advocated.

The Function of Science.

The truth is that there never was a time when one man could know all that was known about his world, writes Dr. Charles Singer in the first number of "The Realist." In this respect our age is even as other ages were, and it is sheer illusion to suppose that it differs from them in this regard. Nor is the advance of science to be measured by the vast accumulation of observations, but by the degree to which these observations are brought under general laws. The function of science is to classify, which is to simplify and ultimately to unify. It is just by its success in unifying our conceptions that the state of a science must be judged.

Where are the Great Men?

Apart from mere contemporary celebrity, which may be a very transient affair, nothing is more hazardous than to nominate claimants to greatness. The people who make most noise in the world are seldom the people who get the permanent crown. Copernicus changes the whole thought of mankind about the universe and man's place in it, and goes his way like an unknown straggler from the stage. Shakespeare dies at Stratford without anyone suspecting that the very age would be known as his, and would owe its transcendent glory to him. And it is quite on the cards that when our posterity of 2029 look back to our days it will discover that we "entertained angels unawares" in poets, thinkers, scientists, whose greatness has to be seen in perspective before it can be recognised.—A. G. Gardiner, in the "Star" (London).

Care of Tomato Seedlings.

After tomato seedlings have reached about 1½ inches in height they should be thinned out in the rows to at least 1½ inches apart. This gives the plants ample room to develop sturdy roots and leaves, and prevents their growing too high. Thinning out also allows good circulation of air between the plants. All weeds should be removed during all stages of growth.

In the hot-bed, with its high humidity, there is always danger of late blight developing. This can be prevented by spraying with Bordeaux mixture. In the case of seedlings a very weak spray (1-1-20) is used, as a stronger mixture may injure the foliage at this young stage. Spray injury may also be caused by the spray having an acid reaction. This can be tested with blue litmus paper, and the defect can be corrected by adding more lime.

Next to blight, the most important disease to combat is spotted wilt. This disease has been proved to be due to the action of a parasitic virus. The infection is present in the sap of diseased plants, and is transferred to other plants by insects, such as thrips and aphides. Any diseased plants should be destroyed, and regular spraying with a nicotine solution is recommended to control the insects. Other contact killers, such as soap and kerosene emulsion, can also be used for this purpose.

Points in Handling Citrus Fruits.

It is not sufficient to grow good fruit—it must be so harvested, handled, and packed that it is still good when it reaches the consumer. The rot organisms that gain access through a broken skin quickly cause decomposition. Following are some precautions it will pay the citrus grower to keep in mind:—

1. Clipping of the fruit is advisable, but it must be carefully done so as not to leave a stem, which in the course of a few days dries and punctures the adjacent fruit.

2. Do not drop the fruit into the picking bag, but place it carefully, and pour it carefully from picking bags to boxes. A properly designed picking bag or "apron" should be used, which can be filled and emptied with the minimum of damage to the fruit. The boxes should be carefully examined, and all grit and protruding nails removed.

3. Do not jolt the fruit over rough roads.

4. Grade carefully for quality, and market in strict accordance with the grading regulations.

5. See that the sizing machine is working properly, and that none of the fruit is too tightly squeezed or jambed.

6. Use a good clean case.

7. Pack neatly and tightly and fairly high, thus ensuring a full case when the buyer receives it.

8. Stack cases on their sides.

No Shorter Hours for Leaders.

The higher men climb, the longer their working day. And any young man with a streak of idleness in him might better make up his mind at the beginning that mediocrity is to be his lot. Without immense, sustained effort he will not climb high. And even though fortune or chance were to lift him high he would not stay there. For to keep at the top is harder, almost, than to get there. There are no office hours for leaders.—Cardinal Gibbons.

Sheep Classing—Points for Small Flock Owners.

The grading of the breeding flock and selection of the sires for use in mating is a regular part of the practice on large properties. Better flocks mean bigger returns, and even the small flock owner is recommended to class his ewes at least to the extent of culling out all the low-grade animals.

The best time to class the flock is just prior to shearing, as the sheep are then carrying full evidence of their value as producers of wool. In flocks which are used primarily for fat-lamb production, size of frame, roominess in girth and hindquarters, good milk-producing qualities, and early maturity are points of importance, and all ewes lacking these qualities to any extent should be eliminated from the breeding flock. At the same time, these being days of good wool prices, the wool side must not be lost sight of, as a ewe can raise a satisfactory fat lamb and still produce a payable fleece of wool.

The small flock owner who is breeding for wool should have in view the sheep that will grow the type of wool most payable and best suited to the district, and in this connection he will find the views of those with longer local experience helpful. Having fixed a certain ideal in his mind he should strive each year when classing his sheep to bring the flock a little nearer to it by culling out all ewes that vary greatly in any of the essential qualities. The important qualities to consider are a well-shaped frame, considering the type and breed, good legs (not crooked), and wool of the desired quality (fineness) and as even and dense as possible all over the body. With regard to frame, shapeliness of carcase is not quite so important in the Merino as in the mutton breeds.

The most common faults are small, undersized, or weedy frame, a dip behind the shoulders called "devils grip" (a sign of weak constitution), narrow shoulders or hips, and crooked legs or feet. Common faults in the wool growth which should also be avoided are unevenness over the body, lack of density or length, and dulness or dinginess in colour due to too much condition or to an undesirable type of yolk.

As soon as the teeth become faulty it is as well to cull such sheep out on account of age. The class of country and the amount of risk the owner is prepared to run if a dry season follows will decide at what stage it is wise to cull for age—aged ewes, especially if in lamb, are naturally the first to feel the pinch under dry conditions.

Each year the ewe hoggets will come up for inspection, and here judgment is required. As many as one-third of the ewe hoggets are culled each year on numbers of station properties. This keeps the flock at a high standard and allows for a percentage of the cull hoggets to be fairly attractive and worth good prices in the market as breeders.

The fact that the ewes are rearing lambs must be considered when classing; ewes with lambs at foot cannot be expected to be in the pink of condition, and should not be culled because of lack of condition alone. If hoggets have encountered severe conditions after being weaned they may not be well grown, and it may be advisable to hold them for a while before passing judgment. When ewes are culled for any reason except for age, a distinguishing mark should be put in the plain ear so that they can be easily recognised in the yards and on no account should they be bred from, as their faults are likely to be intensified in the progeny. The wisest plan is to try to fatten all the culls and dispose of them to the butcher at the earliest opportunity.

In a flock of comebacks, if breeding for wool, the procedure would be similar to that described, except that care should be taken that the size of frame necessary in a sheep of this type is not sacrificed to the production of a superfine class of wool. If the comeback flock is used for lamb-raising, the points mentioned earlier (roominess of frame, milk production and early maturity) need to be considered.

These remarks concerning frame and conformation apply also to a crossbred flock, but to a lesser degree. The main consideration in regard to the wool is to make the flock as even as possible; but because of the greater value attaching to the finer classes of crossbred wool, it is advisable to cull the coarser-woolled animals.—A. and P. Notes, N.S.W. Department of Agriculture.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of increasing their health and happiness and decreasing the number of avoidable cases of infant mortality.

HOW TO KEEP BABY HEALTHY IN WINTER.

In the year 1927 there occurred in Queensland during the first year of life 111 deaths from respiratory infections, chiefly bronchitis and pneumonia. These deaths were preventable. Most, if not all, of them followed on a "common cold."

The number of births in Queensland every year is very nearly 20,000. Probably thousands of these babies suffer from "common colds" during the first year of life. Usually these "colds" are slight though troublesome ailments in babyhood, but in babies they are followed more frequently by serious or fatal complications than at other ages. What can be done to diminish the present mortality from this cause?

A "Common Cold" an Infectious Disease.

(1) A "common cold" is an infectious disease. The baby always gets it from some other person. Usually this other person is suffering from a "cold," but not always. The infective germs may be present in persons who are apparently quite well. They are "carriers" of the disease. Or these persons may have been nursing or fondling some other child who has a cold and may carry the germs in their clothing. Obviously the more persons are allowed to handle, fondle, or kiss the baby the more likely he is to be infected. The baby with many relatives, more sentimental than wise, and the baby whose proud mother likes to hand him round to visitors for admiration runs extra risks. Taking a baby into a crowded room or hall, often unventilated—a picture show, for example—is a fairly sure method of insuring infection. No sensible, well-instructed mother, who loves her baby, would do such a thing.

While these sources of infection should certainly be avoided, there are others in which prevention is not so easy. The older children often catch "colds" at school, and it is not easy then to keep them away from the baby, but it should be done. The father also, when so suffering, should keep at a distance. But if the mother gets a "cold," the baby's chance of escaping infection is much smaller. Therefore nursing mothers should be particularly careful not to catch "colds" from other people. Should they get one they should not kiss or cough over the baby. They should hold a handkerchief over their mouths when coughing, and carefully wash their infected hands before touching the baby. It would be a wise precaution to wear a gauze mask or tie a handkerchief over face and nose while suckling. There are some bad habits that actually force the germs which may be present in the mother's mouth into the baby's mouth—for instance, blowing on the baby's food to cool it, or tasting it from a cup or spoon, which is afterwards used by the baby. We have even seen mothers put the baby's dummy into their own mouths, and then into the mouths of their helpless babies.

A Kiss, a Cup, or a Cough may mean Death to the Baby.

(2) If a strong, healthy baby catches a "cold" it is not usually a serious matter. A healthy, breast-fed baby will probably shake off a "cold" more quickly than a healthy-looking, bottle-fed baby. A poorly-nourished baby finds it still more difficult to do this, and is more likely to develop complications. Therefore the mortality from respiratory infections would be less if all babies were breast-fed. Let every mother keep her baby as strong as possible. It is the weakly, under-nourished, or new-born babe who most easily dies from a simple infection. The danger rises to its greatest height in premature babies, these frail beginnings of life. For them death may lurk in a kiss, a cup, a cough.

Prevention Better than Cure.

(3) A baby with a "cold" may not appear seriously ill, but he is not well. Take care of him. He may be a little feverish and thirsty; then give him plenty of boiled water to drink, but less milk or other food. Unless you do this he will probably

suffer from indigestion and loose motions. Let him have plenty of fresh air, but keep him sufficiently covered. Babies suffering from "colds" are susceptible to chills, which may bring on bronchitis or pneumonia. If he is not feverish he may be taken out into the sunshine, provided he is sufficiently clothed and not exposed to a cold wind. One complication of a "cold" is earache. Suspect this if the baby cries from pain and puts his hand up to his head. For earache, bronchitis, and pneumonia medical treatment is necessary; but prevention is far better.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

FLOWERING SHRUBS.

Lagerstræmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana;* the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 ft.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine coloured variety and the canary yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

PLATE 41.—A COOKERY CLASS IN A TRAVELLING DOMESTIC SCIENCE SCHOOL.

To provide the advantages of vocational training to Queensland children in isolated centres far beyond the influence of Technical Colleges and Rural Schools, fully equipped schools on wheels have been constructed, and this is a typical interior.

Photo.: Dept. of Public Instruction.]

PLATE 42.—SWIMMING IS TAUGHT REGULARLY IN QUEENSLAND SCHOOLS BY EXPERT SWIMMERS.

This pool at a country school is a popular corner of the playground. Other baths, particularly in the cities, are far more elaborately constructed and appointed, but none could give greater enjoyment to these healthy young Queenslanders.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practically nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been "clean." The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as "between growths."—GEO. WILLIAMS, Director of Fruit Culture.

TWELVE BEST GARDEN ROSES.

(Continued from the June Journal.)

Following is the continuation (abridged) and conclusion of the paper read by Mr. B. Watkins, M.Sc., president of the Horticultural Society of Queensland, before a recent meeting of that body:—

The Maman Cochet.

In a review of this kind it would be unkind to omit to mention that once famous and even now popular tea rose, Maman Cochet, which appeared in 1893. It constituted a milestone in rose progress in its day, and was looked upon as an epoch-making variety. Its ability to grow and flower under the most adverse conditions without care or cultivation is a strong point in its favour; in fact, too much attention results in coarse, double-centred blooms. Left to itself, it produces blooms of ideal exhibition form of a deep flesh colour with a suffusion of light rose.

I venture to say there is no variety to-day with more first prizes to its credit than this rose. It still continues a prominent variety on the show tables, together with the white sport of later date. Occasionally, owing to its thin petals, it does not open well. The climber is an exceptionally vigorous grower, and abundantly free in bloom.

Pink Varieties.

Among the vigorous pink varieties there is one more rose of distinction, Countess of Gosford, a beautiful salmon, practically the first rose sent out by the now well-known firm of S. McGredy (1906). This is a variety not grown by everyone, but it merits this distinction. Had it a few more petals, resulting in a little more fulness, and consequently increased lasting powers, it would be in universal demand. Nevertheless, owing to its free and continuous blooming propensities, its strong, branching growth, and disease-resistant powers, it can be strongly recommended. If one can catch it at the right moment it is valuable for exhibition purposes, but owing to its rapid opening it usually disappoints the exhibitor. A fine bud in the morning is a full-blown rose by evening, even if gathered and put in water. As a decorative bush for the garden it is excellent. Further, it is the most satisfactory rose to grow as a standard in Brisbane. This type of rose is not considered to be a success here, but to those who desire a really good rose on a standard stock I recommend this variety. It makes a wonderful head, bushy and symmetrically round, and blooms just as well in this form as in the dwarf form.

The pink varieties already discussed are vigorous growers suitable for back row positions, but there are several meritorious pinks which demand attention, though not such tall growers as those already discussed. I call to mind the following:—Ethel Somerset, the best of these; Madam Butterfly and her sports; Madam Jules Grolez; Mrs. Bryce Allen; Una Wallace; Rose Marie; and Madam Segond Weber.

In concluding the review of the pink varieties, I should like to bring before you the claims of a rose which I have often exhibited here with success. This rose is Priscilla, a deep pink of faultless exhibition shape, and is known to a few of our members. It was sent to me for certain tests by Hazlewood Bros., but is considered by that well-known firm to blue so badly as to remain unlisted. Whatever may be its tendency to blue under southern conditions, the same does not seriously affect it here, and I make bold in saying that were it known here it would be in everyone's garden, and one of the chosen twelve. However, I do not intend to elevate it to that distinction at present.

Yellows and Apricot Shades.

The third colour class to discuss are the yellows and apricot shades. There is no deficiency of roses in this colour class, but there is a deficiency of really good garden yellows for Brisbane conditions. The greatest fault to be found with this class is the tendency to fade, and in fading to spoil and turn dirty. A yellow rose which fades evenly is not so bad, but when such roses blotch and become dirty in patches they are far from æsthetic. We have had many yellows in past times, it being a common enough colour among tea roses. Madam Constant Soupert (peach and yellow), Lady Plymouth, Alexander Hill Grey, Lady Hillingdon, are all yellow teas which have some or other serious fault. The first three ball badly and bleach unevenly. The last, Lady Hillingdon, an exceedingly popular rose, must give way to others. Its greatest fault is that it hangs its head, and although reluctant to see it displaced, I am of the opinion that it is.

There is no question that the premier yellow to date is Souvenir de H. A. Verschuren, which appeared in 1922. It is related to the popular Sunburst, but is a far better rose. I secured it as a novelty, and the identical plant is still a wonder. Colour is deep cadmium yellow passing to lighter shade in outer petals. Fine form, fine perfume, upright growth, disease-resistant properties, and blooms carried on long stems above solid green foliage combine to give us a rose of great merit. It is a particularly free flowerer, and the flowers have solid petals, and last a long time. Just as I do not hesitate about the premier place among the yellows, so too I do not hesitate about second place. In my opinion this belongs to Elegante. This rose appeared in 1918 from the nursery of Pernet Ducher. In colour it is not as deep as Verschuren, being nearer to a clear light yellow self, but it has this advantage—that it fades evenly, and holds its charm in spite of a slight petal deficiency. It is always growing, always in bud and flower. The buds are very long, and when opening give a perfect high-pointed well-formed flower. It is vigorous and disease resistant. I recommend this variety to those who have not grown it.

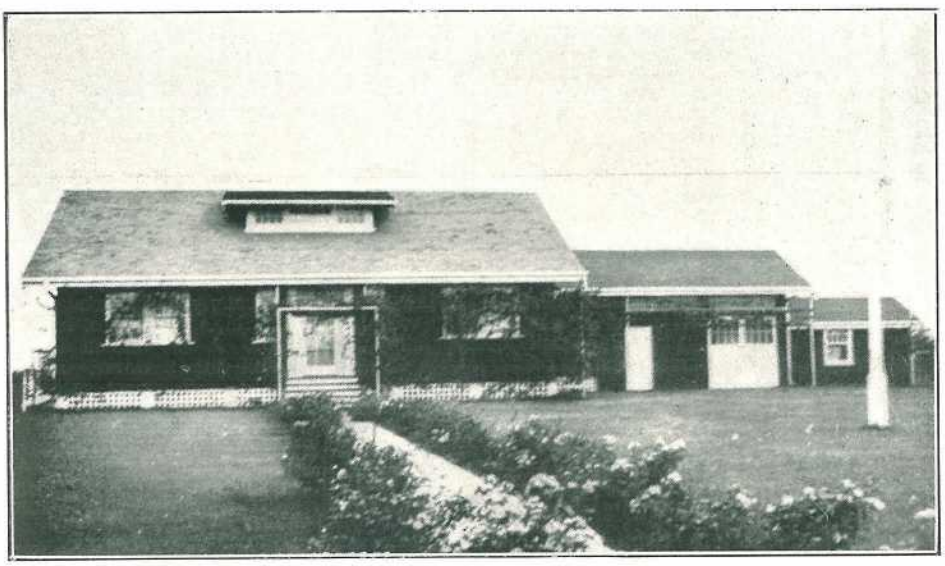

PLATE 43.—A COUNTRY HOME IN QUEENSLAND.

Dr. J. H. Dalrymple's bungalow, "Homefield," on the Nebo Road, Mackay.

One of the brightest scenes in a district noted for natural beauty is this comfortable home on the outskirts of Mackay. Roofed with green shingles with appropriately toned outlines, standing well back from the roadway, and set in velvety lawns backed with fields of sugar-cane, it represents a type of farm home that we hope to see more common in Queensland. Though complete with every modern convenience, it is yet well within the financial reach of the farmer. Its interior is replete with the latest labour-saving "gadgets," and its design and general layout shows what can be accomplished in the making of a comparatively inexpensive modern country home. Beef cattle and cane are the owner's main interests.

The third rose of note in this section is Mrs. Dunlop Best, a reddish apricot to yellow variety, which, owing to great freedom in growth and bloom disease resistance, makes a valuable garden rose, particularly in a colour class deficient in numbers. This is easily the best rose in its class, and although it is not as full as one would wish, yet the constant blooming ability of this variety assures the grower that he will always have a supply of roses. The above three roses represent the best in each grade of yellow.

In reviewing the remainder one finds that exquisitely coloured and perfectly shaped gem, Rev. F. Page Roberts, which takes all by storm. Had it a little more vigour and less tendency to die back it would sweep all before it. I would advise those who grow it to refrain from pruning, and let the cutting of the flowers be all the pruning it gets, also to give it a well-balanced fertiliser, making sure that

potash is not lacking. Even wood which appears old and spent has the habit of sending out vigorous growth in an unexpected manner. So I say let well alone and you may succeed with it. Strange to say, this variety shows more brilliant colouring in full summer than winter. The rich deep copper of the outside of the petal contrasts in an amazing manner with the fine deep yellow inside. Finally, as to yellows, Souvenir de Madam Boullet, from the nursery of Pernet Ducher, in 1921, will very soon occupy a high position with rose growers. It is certainly an improved Hillingdon in shape and carriage and colour, and if its growth continues good, then it will outclass its rival. I am very impressed by this variety.

I do not think it is too early to predict that the most popular yellow rose a few years hence has arrived amongst us in the Golden Dawn. If such proves to be the case, then Mr. P. Grant, of New South Wales rose-growing fame, will have reason to be proud, and Australian rose-growers will do likewise. Mr. Grant has not withheld the pedigree of his new rose. It is a seedling raised from Elegante and Ethel Somerset. I have already spoken in favourable terms of both these roses, and the progeny is said to combine the virtues to each, to be vigorous, with clean, distinctive foliage and splendid branching habit, so essential to free and continuous blooming. The colour is described as rich sun-yellow, heavily flushed deep old rose.

Lighter Shades and Whites.

There is one colour class remaining to be discussed, the light shades and whites. I am not partial towards whites nor light shades, yet I promised to treat each variety on its merits, and consider the following are worthy of attention:—Mrs. Herbert Stevens, Frau Karl Druschki, White Maman Cochet, W. R. Smith, Mrs. Harold Brocklebank, White Ensign, Antoine Revoire, Madam Jules Bouche, K. A. Victoria. Of the above list the best known are Frau Karl Druschki, Mrs. Herbert Stevens, and White Maman Cochet. The first two deserve a place in any plebiscite, and White Maman Cochet, though subject to discoloration and at times coarseness, maintains a high position among rose growers. It is even more vigorous than Maman Cochet, from which it is sported. The climbing form of White Maman Cochet is the most vigorous rose among climbers, and a particularly free flowerer.

Frau Karl Druschki is one of the best known roses in existence. It was sent out in 1900 by Lambert. The story goes that it was rescued from the garbage heap during the annual clean-up of nursery seedlings. Whether such is the case or otherwise, the fact remains that it is grown by everyone, and is a variety which is not over particular as to attention. It has the hybrid perpetual type of growth, sending out long, vigorous canes which need to be tied down to a horizontal position or cut back somewhat. It is the second growth from these canes which develops the flowers, and it is, when once established, a very free bloomer, giving large, pure white, faultless blooms of exceptional exhibition quality. Although it is usually considered to be a hybrid perpetual rose, some authorities consider it among the hybrid teas, owing to its great freedom in flower. It has two drawbacks: It is scentless, and it opens rather rapidly. Yet its virtues are such that it commands well-earned attention on all sides.

Mrs. Herbert Stevens, a tea rose sent out in 1910 by McGreedy, is the most popular white commercial variety to-day. It gives a superabundance of very well fashioned white blooms, with a faint perfume. It is especially free in bloom, every shoot carrying many buds, so judicious disbudding must be followed if exhibition quality is desired. Where such a practice is followed there results a great increase in size and substance, and the blooms are frequently shown on our tables. It has, however, a deficiency of petalage, and thus opens rather rapidly under ordinary garden conditions.

A climbing form is gaining in popularity, and eclipses that once-favoured climbing Niphetos of bygone gardens. Claimed as an improvement upon Mrs. Herbert Stevens, and sent out by the same firm in 1925, is the variety White Ensign. This claim remains in the testing period just now, but one local nurseryman and commercial grower prefers it to its rival, as it is a better bouquet variety, being fuller and lasting longer. I know specimen bushes of White Ensign which are all that could be desired, and my own plant improves month by month. At first it was small in shape and crowded in petalage, but marked improvement is now apparent. The colour in the centre is not white, but more of a lemon yellow.

W. R. Smith and Mrs. Harold Brocklebank always impress in a garden by reason of their powerful solid growth, thick disease-resistant foliage, and freedom in bloom, though each is deficient in perfume. The former, though a remarkably good rose, has a very serious fault, in that its spring blooms are always crippled, coarse, and discoloured, and have no value whatever. It is seen at its best during the

autumn, when it shows up to a wonderful degree with its light-coloured, well-formed, somewhat globular blooms, the outer petals of which carry a delicate blush-pink colour. I cannot urge its claims overmuch, as I consider its behaviour outside the autumn to constitute a serious drawback.

Mrs. Harold Brocklebank, on the other hand, is a consistently good bloomer, giving shapely light-straw, yellow, and pink suffused blossoms continuously, which can claim attention from an exhibition standpoint. It is a very favoured rose in the South, and one which Brisbane growers who like the lighter shades cannot omit. Last of the above colour class is Antoine Revoire and Madam Jules Bouche. The former is a rose which finds many adherents, and appears in the bud to full bloom class on many show occasions. The colour of this rose is exquisite, and as a good bush yields a creditable number of blooms, it is a fine garden rose. It opens out rather flat, but, in spite of this, does not lack charm. It is mildew resistant and upright in growth, though, at times, it disappoints one in this latter direction. It is an old rose, having appeared in 1896 from the nursery of Pernet Ducher, and can justly claim a warm place in the affections of rose growers, for it has been utilised in the production of many favourite roses of to-day—namely, Columbia, Pilgrim, Ophelia, Madam Butterfly, Golden Ophelia.

Madam Jules Bouche, a delightfully shaped, dainty rose of creamy white, suffused pink, is a very consistent bloomer, and a garden decoration at all times. It is of a strong branching habit, and sends up abundant stems from the ground, carrying heaps of characteristic blooms. The characteristic exclamation of people seeing this rose for the first time is, "How dainty!" and this fits the bill perfectly. I would not put it among the premier garden roses, but it is good.

This brings us to the end of our review, and it remains for me to give my lists in order of merit.

First twelve.—Etoile de Holland, Radiance, Red Radiance, Jonkeer, J. L. Mock, Madam Abel Chatenay, Mrs. C. J. Bell, Hadley, Souvenir de H. A. Verschuren, Elegante, Mrs. Herbert Stevens, Frau Karl Druschki, Countess of Gosford.

Second twelve.—Laurent Carle, Lord Charlemont, Star of Queensland, Ethel Somerset, Madam Jules Grolez, Columbia, Maman Cochet, Antoine Revoire, White Maman Cochet, Mrs. Harold Brocklebank, Una Wallace, Priscilla.

NOTES ON ROSE PLANTING.

To be a successful grower of roses it is essential to have some knowledge of pruning before planting. Much depends on the planting and pruning to obtain the best blooms.

It is necessary to prune both branches and roots before planting, and if this is not carried out carefully the best results can never be obtained. Some of the suppliers of stock send their plants pruned and ready for direct planting.

In all cases the ground should be well trenched and put into condition before the operations of planting. It is useless attempting to grow roses for the best result unless the work of trenching has been done in a thorough manner, and well-rotted manure has been worked into the ground. The ground must be thoroughly drained so that no stagnant water is allowed to accumulate.

Before the plants arrive from the nursery prepare the place for each variety. Do not mix the varieties. Some are slow growers; others are rampant growers; and it requires consideration in selecting places for the various roses. A general rule is to put the strong growers at the back of a bed and the weaker ones in the front.

The following suggestions may be useful for those who are not well versed in the art of growing roses:—

In the first place, see that you have your beds in the most open and sunny position possible. Rose plants must have space to develop; therefore plenty of room must be allowed for each plant. Many of the diseases of roses can be put down to insufficient sunlight, air, and space, rather than to cultivation faults.

As some roses require skilled treatment and cultivation, beginners, when making their selection of rose plants, should choose those which are easy to grow and which flower well. Tea roses stand ordinary garden cultivation better than any other class of rose.

Any time from now to the end of July is suitable for rose planting, but the earlier they are planted the better. The distance apart is the main consideration. Many growers never allow their rose plants to develop, and keep them on the stunted side. This is all right for the rose exhibitor but no good for the grower of decorative flowers or garden decoration.

In our climate most rose bushes grow into large plants, and such growth encourages greater wealth of flowering wood and consequently more flowers. To do this, the rose plants must not be less than 6 feet apart. Any nearer would be considered close planting, and under such conditions one must cut the heads off plants to keep them within bounds.

If quality and quantity are desired, room must be allowed the plants for root expansion. When planting, always have the union a little below ground, and I would advise 2 inches as a necessary depth under the ground. The advantage of planting the union below the ground is that new roots form from the union, and eventually these roots do all the sustaining of the plant.

Another advantage is that in the early stages of growth the plant has the use of two sets of roots on the one plant. Eventually the brier root dies out, and there is no chance of brier suckers appearing in later years.

In the bottom of the hole to receive the new plants make a small hillock for the even spreading of the roots, which will be with root terminals all down instead of flat or turned towards the surface. Long roots may be carefully cut to suit the size of the hole.

Make the soil firm around the base of the plant, spread soil slightly over the smaller roots, and fill in gradually. Trample firmly, and thoroughly water the plant before finally filling in the whole of the soil. When water has soaked away the balance of the soil can be filled in. No further watering will be necessary for a week.

All that is then required is to keep the ground well hoed. Water every other week, giving a good soaking at each watering.

VALUE OF EARTH WORMS.

It is evident that not every gardener can decide whether the common earth worm is a friend or foe. Who has not seen the gardener, when digging, industriously remove every worm found?

Now, speaking generally, these creatures are more friends than otherwise, although they are far too numerous in some gardens at certain periods of the year. As a rule, they do more good than harm by allowing water and air to pass through the soil more freely, and in other small ways assist the gardener.

They may do a little harm by working among the roots of seedlings, also, of course, on lawns, bowling and golf greens, where they may be regarded as pests, rendering the use of lime water necessary to eradicate them.

Slugs and Snails.

Slugs and snails are troublesome in many gardens—in some more so than in others, and if they are not dealt with in some way a good deal of damage may be done during the year.

The value of lime and soot is pretty well known, but both must be used carefully, or the plants it is intended to protect may be damaged. Ashes in a dry state are also effective in keeping them off. In using these insecticides they must be used in lines or around the plants in a dry, powdery form.

If the garden soil is regularly limed and kept sweet there is less chance of the slug increasing. Watering with alum water is also death to snails and slugs.

PROPAGATION BY CUTTINGS AND LEAVES.

The herbaceous character and free-growing nature of the majority of plants that are used for summer bedding renders their propagation easy. Large numbers of plants are required in as short a time as possible, and without the expenditure of much time or labour, and unless a plant is easily propagated it is of little value in the bedding department.

Autumn propagation is preferred for the more robust of these plants, cuttings at that time being both plentiful and vigorous and the season favourable for the quick production of roots. If the necessary preparation of beds, boxes, and soil has been attended to, the whole of the cuttings may be put in during autumn and rooted before the cold weather comes. It may be laid down as a general rule that all stout, free-growing cuttings prefer a strong loamy soil, while those of a more delicate nature and that have fewer roots are safest when planted in light sandy soil containing a large proportion of leaf mould.

The cuttings should be planted firmly, in rows about 6 inches apart, and should receive a good watering as soon as planted, after which they will require little attention beyond the removal of dead leaves and a sprinkling of water overhead should the weather be dry. As soon as rooted, or at least before the approach of the cold, wet weather, they should be placed in boxes, pans, or pots, in which they are to winter. For smaller quantities it will be found best to plant the cuttings in shallow boxes, in which they may be allowed to remain until the spring.

Pentstemons, phloxes, pinks, antirrhinums, and a host of other bedding plants of robust constitution may be increased in the autumn in this way. Boxes are most convenient for these purposes. The bottom should be pierced with several holes an inch or more in diameter, and covered with an inch of ashes or crocks as drainage, the box being then filled with sandy soil, using loam, leaf mould, or whatever mixture the nature of the cuttings would require.

Under certain conditions buds are formed on the leaves of a large number of plants, such buds being called adventitious, to distinguish them from the stem or normal buds, which are found on all plants, and which are borne in the axils of the leaves. It is supposed that the leaves of a very large proportion of plants possess this power to develop extraordinary buds, and that their failing to do so when tested by the gardener is due to improper treatment rather than to absolute impotence in the leaf itself.

It is, however, only in a few cases that leaf-cuttings are resorted to for purposes of propagation. Such plants as begonias, gloxinias, and a few others of more or less succulent nature are the only ones for the increase of which leaf-cuttings are employed. Numerous other plants have proved capable of propagation by this means, some of them being not at all succulent-leaved, while on the other hand, plants of excessive succulence have proved unable to form buds when tested in the same way. In some cases where leaf-cuttings have been tried, roots were freely developed but no bud was formed. Camellias may be mentioned as plants whose leaves root freely but do not develop buds, although left in the propagating house for several years.

Where it is desirable that a new plant should be propagated as abundantly and as rapidly as possible, it will be found often advantageous to place the leaves that are removed from stem cuttings in the propagating frame and treat as advised below. To anyone acquainted with the nature of the following list of plants, it will be apparent that no rule can be laid down for the guidance of the cultivator, either when based on the texture of the leaves or the nature of the plants. Begonias, clianthus, gesnera, gloxinia, hoya, lilium, watercress, and many others may be propagated by means of leaves or portions of leaves.

Turning now to the plants that are usually increased from cuttings made of leaves, a word may be said on the treatment such leaves require, and the best time of the year for the operation. Gloxinias may be dealt with all times of the year when leaves are available, the most favourable period being autumn. Well-matured leaves should be selected, avoiding those in which the yellowness of decay has appeared. The leaf-stalk may be severed at any point, it being unnecessary to secure them with heel or portion of the stem. The blade may then be divided longitudinally, so that a large leaf would form about half a dozen cuttings. It is, however, better when the blade is cut into sections, each section having a portion of the midrib attached to its base.

Some prefer severing the midrib into about a dozen pieces, leaving the blade intact. In this way a plant is obtained from each portion of the midrib, bulbils being developed on the lower end of each. Where the latter plan is adopted the whole leaf must be pegged on to a pan of sandy soil. If the leaf is divided up into smaller pieces, pots may be used, filling the pots half-full of drainage, and the other half with a light sandy soil. Into this the cuttings must be placed obliquely, so that whilst held firmly in the soil their bases are only a little below the surface. A frame in a propagating house will be the most suitable place for the cuttings till rooted. In a small bush-house a position on a shelf would answer equally well for gloxinia cuttings.

Begonias may be treated as suggested for gloxinias; or, if to be propagated on a large scale, a frame containing cocoanut fibre may be used, pegging the begonia leaves on to the fibre.

Reference may be made to the reproductive nature of some fern fronds, especially the aspleniums, nephrodiums, aspidiums, the fronds of which usually bear buds, which eventually form plants. The requirements of such leaves, when wanted for propagating purposes, are very much the same as those of the plants themselves.

The scales which form lilium bulbs may be used for propagation, as if fresh when gathered and placed in sandy soil they root and form small bulbs capable of growing into large plants.

All these exceptional ways of obtaining a stock of plants are only resorted to in exceptional cases; they are chiefly of physiological interest, showing as they do how nature has provided plants with auxiliary powers for their reproduction, which are held in reserve till called upon by the failure of the normal proper means to fulfil the functions of increase or reproduction.

HORTICULTURE IN THE SOUTH.

The following notes have been extracted from a letter from Mr. J. F. Bailey, Director of the Adelaide Botanic Gardens, who was formerly on the staff of the Queensland Department of Agriculture and Stock as Curator of the Brisbane Botanic Gardens:—

Our dahlia display is almost expended, and, as usual, attracted thousands of visitors. Further proof has been given that either for garden decoration or for the show tables the type termed "decorative" outdistances those of any other class. We, of course, had representatives of all the classes, and the dainty collarettes had hosts of admirers.

Several slight variations have recently crept in among the two types of decorative we standardised here for guidance in the framing of show schedules. We thought, therefore, it advisable to reclassify them; and at a meeting recently held, at which were representatives of six societies, definitions to suit the respective types were drawn up. These will be placed before the members of the societies concerned, and when finalised I hope to send you particulars. Without such a guide it is very difficult for judges to make correct class awards.

Some of our local growers have raised excellent seedlings quite equal to many of the high-priced varieties from overseas. Our nurserymen who specialise in this flower are alive to its importance, and keep up to date with the latest American and European novelties as well as those to be obtained within the Commonwealth. I frequently receive inquiries as to the names of a "few" good decorative varieties, and find it difficult to keep down such a list, there being so many of equal merit.

While a good percentage of our recent importations upheld their catalogue descriptions, some of those obtained at a high price were inferior to many of our local seedlings. As some of your friends may like to know the names of those which attracted attention a list is given. Among those new to our collection to deserve mention were:—

Charles Stratton, gold, shaded rose; Renown, purplish maroon, a variety that holds well; Mordella, apricot buff, suffused pink; Grace Curling, lilac pink; Couronne d'Or, colour as suggested by name; King Tut, crimson; Zante, deep gold; Jersey Beacon, scarlet; Bockenhage, pink, with orange centre; Robert Treat, rosy red; Elinor Vandeveer, pink; Leviathan, orange; Emma Groot, rosy mauve; J. L. Crowther, buff apricot; Rookwood, deep mauve; Pinkie, a garden variety, with medium-sized blooms, excellent for cutting; Rapallo, a garden variety with blooms of a striking colour, crimson-bordered yellow; Border Perfection, a dwarf grower producing large blooms of a dark red colour. A bloom of this gained championship honours at one of the local shows.

The following varieties in the collection last year maintained their good qualities during the past season:—Mrs. C. G. Hood, bright rose, some excellent seedlings of which have been raised from this by the local growers who favour it as a parent; H. D. Cartwright, orange, which followed up its last year's successes at the shows; Sheila Ward, yellow, tipped white; Beau Brummell, royal purple; Evelyn Winter, white; Earl Williams, crimson, tipped white; Shudow's lavender; Porthos, violet purple; Bordeaux, red; Berengaria, gold; Cadiz, orange and chrome yellow, a most profuse bloomer; Ivy de ver Warner, pink; Jersey Beauty, pink; Mabel Lawrence, crimson scarlet; Kitty Dunlap, rosy mauve; Katherine, mulberry; Mrs. Carl Salbach, pink; Amun Ra, copper and gold; Golden Fleece; and Lady Stonehaven, an Australian-raised variety, quite the best yellow either for show or garden.

During the last three weeks we have had a glorious show of chrysanthemums, and a couple of beds of Lilian Bird have been a great sight. This is a pink variety that is grown extensively for the market here, and there is nothing more dainty for vase work.

This has been the driest season on record, but as we have a good water supply there are no restrictions placed on its use. Lately we have had wintry conditions with touches of frost, and salvias, bedding begonias, amaranthus, iresines, and the like have not been able to stand it.

Orchard Notes for August.

THE COASTAL DISTRICTS.

The bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin which in coastal lands is invariably disposed to produce a profusion of branches with consequent overproduction and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where it almost invariably makes its first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application of paradichlor, buried a few inches under the soil in circles around the tree and the surface tamped firm is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back, in fact, the whole of the top removed, leaving only a few selected "arms" of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 ft. according to the size of the tree, will form the future head of the tree and from these numerous shoots will originate; these shoots in turn are reduced according to circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for re-infestation is available throughout the orchard.

Working the land is essential and disc implements give best results. Before ploughing it is advisable to apply the necessary fertiliser, not just around the trees beneath their branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams that fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken, the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertiliser or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The planting of citrus trees this season has been inextensive, but there is a much better outlook for orange production than has been previously offered, and attention should be confined mainly to good varieties of this class—viz., Jaffa and Siletta with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour, also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lay about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent, a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis, at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted, deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock. In earlier years citrus planters were much dissatisfied with Southern supplies, which led to the establishment of local nurseries and later to bud selection. There is certainly sufficient enterprise and energy in the Stanthorpe district to make a similar attempt. Its application only is required.

Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before re-bagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this months in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

DEPARTMENTAL PUBLICATIONS.

AVAILABLE FOR DISTRIBUTION.

All the publications on this list are available for exchange with Agricultural Departments, Universities, Agricultural Colleges, Experiment Stations, and similar institutions.

"Queensland Agricultural Journal"—Subscription to farmers, 1s. per annum. (Some back numbers available for free distribution.)

BOOKS.

Catalogue of Queensland Plants. Price 15s.
Chemistry for the Farm, Dairy, and Household (Elementary). Price, 2s. 6d.
Market Gardening, 1s.
Queensland Flora (Bailey), 6 vols., 30s.
Pests and Diseases of Queensland Fruits and Vegetables. Price, 2s. 6d. (Free to orchardists and market gardeners in Queensland.)

BULLETINS.

Economic Dairy Bulletins, 1D, 2D, and 3D.
Economic Sugar Bulletin, 5SC.
Economic Cotton Bulletin, 4C.
Pig Raising Bulletin, 6P.
Poultry Raising Bulletin, 7P.

Bulletins on the Sugar Industry:—

Division of Entomology.

No. 3. Notes on Insects Damaging Sugar Cane in Queensland. (2nd Edition, Revised.)
No. 4. On the Value of Poison Bait for Controlling Cane Grubs.
No. 5. Notes on the Habits and Metamorphosis of *Lepidiota frenchi*, Black.
No. 10. Monthly Notes on Grubs and other Cane Pests (3rd Series).
No. 11. An Account of a New Moth Borer of Sugar Cane.
No. 12. A Study of Natural Methods of Control for White Grubs.
No. 13. Natural Enemies of Sugar Cane Beetles in Queensland.
No. 14. The Linear Bug: A New Pest of Sugar Cane in Queensland.
No. 16. Australian Sugar Cane Beetles and their Allies.
No. 17. Notes on Queensland Cane Insects and their Control (1st Series).
No. 18. Notes on Queensland Cane Insects and their Control (2nd Series).
No. 19. Notes on Queensland Cane Insects and their Control (3rd Series).
No. 20. Some Notes on the Economy of Cockchafer Beetles.

General Series.

No. 2. Varieties of Sugar Cane in Queensland.
No. 3. Cultivation of Sugar Cane in Queensland.
No. 4. Summary of Some Experiment with Sugar Cane and Chemical Analyses.

Division of Pathology.

No. 2. A Key for the Field Identification of Sugar Cane Diseases.

The Orange-tree Bug.
The Banana Thrips Rust.
Ear Rot of Maize.
The Banana Weevil Borer.

PAMPHLETS.

Pineapple Culture.
Bananas in Queensland.
Banana Packing and Grading.
Citrus Culture.
Advice on the Routine of a Dairy.
Cotton Growing in Queensland.
Annual Reports of Experimental Work on Cotton.
Stock Foods.
Phosphorus in the Livestock Industry.
Paralysis of the Hindquarters in Pigs.
Castration of Pigs.
Trade Classification of Pigs.
Self-feeders for Pigs.
A Ton of Pork in Six Months from One Litter.
The Gloucester Old Spot Breed of Pig.
Feeding the Pig.
Selecting the Breeding Sow.
Menace of the Poultry Tick.
Some External Parasites of Poultry.
Parasitic Worms of Poultry.
Rearing and Feeding of Chickens.
Poultry Club Handbook (Section I.).
Broom Millet.
Complete Fertilisers.
Contagious Abortion in Cows.
Dairy Produce Acts and Regulations.
Fruit Tree Propagation.
Silage.
Tick Fever and Redwater.
Cotton Classing.
Cotton Growing in Queensland (Parts 1 and 2).
Cotton Research Farm, Biloela—Annual Reports 1925-26 and 1926-27.
Pink Boll Worm.
Sheep Maggot Fly Pest.
Root-Bark Channeller of Citrus.
The Grasshopper Pest in the Springsure District.
Orange Piercing Moths.
Entomological Hints to Cotton Growers.
Mealy Bug Attacking Paspalum Grass in the Cooroy District.
Baiting for Banana Weevil Borer Control.
The Banana Weevil Borer in Java, with Notes on other Crop Pests.
Natural Enemies of the Potato and How to Fight Them.
Special Cattle Fatality in the Maranoa District and its Relation to the Larvæ of *Pterygophorus analis* Costa.
Pineapple Disease Investigations.
Records of Australian Thysanoptera (Thrips).
Records and Descriptions of Australian Ophioninæ.
A Systematic Note on an Imported Lucerne Pest with Description of two New Allied Species.
Some Hawaiian Experiments in the Biological Control of Insect Pests.
Progress Reports of Fruit Fly Investigations.
Sundry Notes on Injurious Insects of the Stanthorpe District.
Cheese Mites.
The Leaf-Eating Ladybird.
Miscellaneous Notes (Mites).
Notes on the Citrus Orange Bug.
Notes on the Blue Oat Mite.
Life History Notes on the Rutherglen Bug.
Plant Bugs Damage to Cotton Seed.
Cutworm Menace.

LEAFLETS.

Breeding and Selection of Dairy Stock.
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Custard Apples.
Orange Packing.
Tomato Culture.
Tomato Preserves.
Phosphorus Deficiency in Stock.
Malnutrition.
Bee-keeping.
Rations for Dairy Cows.
Dairy Fodder Plots.
Water for Irrigation and Stock.
The Cult of the Colt.
Killing Weeds with Arsenical Poison.
Killing Trees with Arsenical Poison.
Cultivation of the Peanut.
To Repair a Leaky Galvanised Tank.
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Notes on the Cultivation of Lucerne.
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Some Notes on Growing Flax (Linseed).
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Construction of Concrete Dips.
Inkweed Eradication.
Arrowroot.
Production of New Varieties of Wheat.
Dry Season Safeguard for the Grazier.
Notes on Tanking Maize.
Specifications for Lining Silos with Portland Cement.
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Paradichlor for Combating Cane Grubs.
Sugar Cane Diseases.
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Gestation Chart for Breeding Sows.
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The Chester White Breed of Pig.
Weaning the Pig.
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Poultry Raising.
Turkey Rearing.
Judging Utility Poultry.
Eye Worm of Poultry.
Caponizing Poultry.
The Value of Postmortem Examination in Detecting Diseases and Disorders in Poultry.
Coccidiosis of Chickens.
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Sheep Stomach Worm.

Entomological Leaflets.

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No. 2. The Queensland Fruit Fly.
No. 3. The Woolly Aphis Parasite.
No. 4. The Codling Moth.
No. 5. The Banana Weevil Borer.
No. 6. Insects and Their Relatives.
No. 7. The Banana Thrips.
No. 8. The San José Scale.
No. 9. Root Knot or Nematode Root Gall.
No. 10. The Corn Ear Worm on Tomatoes.
No. 11. Cutworms and Armyworms.
No. 12. Insect Anatomy.
No. 13. The Control of Meat Ants.
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No. 15. Insecticides.

Pathological Leaflets.

No. 1. Spotted Wilt of Tomatoes.
No. 2. Irish Blight of Tomatoes.
No. 3. Diseases of the Banana in Queensland.
No. 4. Flag Smut of Wheat.
No. 5. Fungi and Bacteria.
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Please address all requests for copies of these publications to The Under Secretary, Department of Agriculture and Stock, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July, 1929.		August, 1929.		MOONRISE. July, 1929.	Aug. 1929.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.47	5.5	6.37	5.19	12.18	2.22
2	6.47	5.5	6.37	5.19	1.18	3.28
3	6 47	5.5	6.36	5.20	2.22	4.37
4	6.47	5.6	6.35	5.21	3.30	5.41
5	6.47	5.6	6 34	5.22	4.39	6.38
6	6.47	5.6	6.34	5.23	5.49	7.26
7	6 47	5.7	6.33	5.23	6.58	8.6
8	6.47	5.7	6.32	5.24	8.0	8.42
9	6.46	5.7	6.31	5.24	8.51	9.13
10	6.46	5.8	6.30	5.25	9.35	9 46
11	6.46	5.8	6.29	5.25	10.12	10.16
12	6 46	5.8	6.28	5.26	10.58	10.51
13	6.46	5.9	6.27	5.26	11.17	11.26
						p.m.
14	6.46	5.9	6.26	5.27	11.47	12.5
					p.m.	
15	6.46	5.9	6.25	5.27	12.18	12.49
16	6.46	5.10	6.24	5.28	12.51	1.39
17	6 45	5.10	6.24	5.28	1.27	2.31
18	6.45	5.11	6.23	5.29	2.7	3.14
19	6.44	5.11	6.22	5.29	2.54	4.19
20	6.44	5.12	6.21	5.29	3.44	5.20
21	6.43	5.12	6.20	5.30	4.37	6.15
22	6.43	5.13	6.19	5.30	5.31	7.11
23	6.42	5.13	6 18	5.31	6.27	8.8
24	6.42	5.14	6.17	5.31	7.25	9.5
25	6.41	5.14	6.16	5.31	8.18	10.3
26	6.41	5.15	6.15	5.32	9.15	11.4
27	6.40	5.15	6.14	5.32	10.11	...
						a.m.
28	6.40	5.16	6.13	5.33	11.10	12.10
29	6.39	5.16	6.12	5.33	...	1.16
					a.m.	
30	6.39	5.17	6.11	5.34	12.9	2.22
31	6.38	5.18	6.10	5.34	1.14	3 26

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

7 July	●	New Moon	6 47 a.m.
14 ,,	☾	First Quarter	2 5 a.m.
22 ,,	○	Full Moon	5 20 p.m.
29 ,,	☽	Last Quarter	10 55 a.m.

Perigee, 6th July, at 11.0 p.m.
Apogee, 20th July, at 2·24 a.m.

On the 4th the Earth will be at its greatest distance from the sun, about 94,450,000 miles.

The apparent nearness of Venus and Jupiter, about the middle of the month, will be noticeable in the early mornings, though Jupiter, being on the far side of its orbit and Venus rather on this side, a distance of 500,050,000 miles must intervene between the two planets.

At 1 o'clock in the morning of the 27th the Moon will be passing Uranus, which will require a telescope or binoculars to be seen. This occasion will afford an opportunity to locate Uranus in the constellation Pisces, about twice the length of the Southern Cross to the south-eastward of the Great Square of Pegasus.

Near the middle of the month the zodiacal constellation Sagittarius will be over the eastern horizon at 6 p.m., Capricornus at 8 p.m., and Aquarius at 10 p.m. Markab and Scheat, the stars which mark the western side of the Great Square of Pegasus, will be just coming into view, and an hour later the whole Square will be visible.

The Southern Cross will be upright about 6 p.m. near the beginning of the month, and lying on its side, 30 degrees west of the South Celestial Pole, at midnight. At that time the brilliant star Achernar will be about as far on the eastern side of the Pole as the head of the Cross is on the western, but somewhat higher up.

5 Aug.	●	New Moon	1 40 p.m.
12 ,,	☾	First Quarter	4 0 p.m.
20 ,,	○	Full Moon	7 42 p.m.
28 ,,	☽	Last Quarter	6 0 a.m.

Perigee, 4th August, at 7.12 a.m.
Apogee, 16th August, at 1.0 p.m.

The conjunction of the Moon with Jupiter on the night of the 1st will take place below the horizon; when they rise about 2 a.m. the Moon will be a few degrees eastward of the planet.

The conjunction of Venus with the Moon on the 2nd, about 1 p.m., will be an interesting daylight phenomenon when the Moon in crescent shape is passing to the northward and below Venus, at a distance nearly as great as the length of the Southern Cross. Of course it will be necessary to have the sun shaded from view by a building or some opaque body. The position of Venus and the Moon will be about 45 degrees east of the Sun, but only about 15 degrees from the meridian.