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Contents

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Event and Comment.

The Call for Increased Production.

MATTERS of great importance to Queensland, as well as to the Commonwealth, in relation to production objectives were discussed at the February meeting of the Australian Agricultural Council in Sydney. Referring to the proceedings on his return to Brisbane, the Minister for Agriculture and Stock (Hon. T. L. Williams) said that much of the discussion had centred on the food position in Britain and on the ways and means by which both the Commonwealth and States could further assist in its amelioration. Not only had he urged a more intensive drive for increased production of wheat, meat, butter and cheese for export to Britain, but had expressed the opinion that with their wider range of nutritious substitutes Australians might be asked to do with less of those commodities so that the food requirements of the needy nations might be more fully supplied.

Expansion of Citriculture.

On the question of the proposed extension of the area under citrus fruits in Australia, Mr. Williams said that he had stressed the fact that Queensland was in every way entitled to consideration for inclusion in the contemplated expansion programme. In many parts of this State citrus fruits of excellent quality were produced and in many more districts soil and other factors were highly favourable for citriculture, whether under irrigation or natural rainfall conditions. If any proposed

expansion had a particular relation to the needs of soldier settlement, Queensland would welcome a share in the allocation of the additional acreage in view.

Soy Bean Production.

Regarding the proposal of the Commonwealth to foster the growing of soy beans on a more extensive scale, Mr. Williams stated that this was unanimously approved by the Council. It was accordingly decided that a number of officers from State Departments of Agriculture—including one from Queensland—should be sent to America at an early date to gain first-hand information relative to the planting and harvesting and processing of this particular crop, for which there is apparently a big future in Australia.

Tobacco-growing.

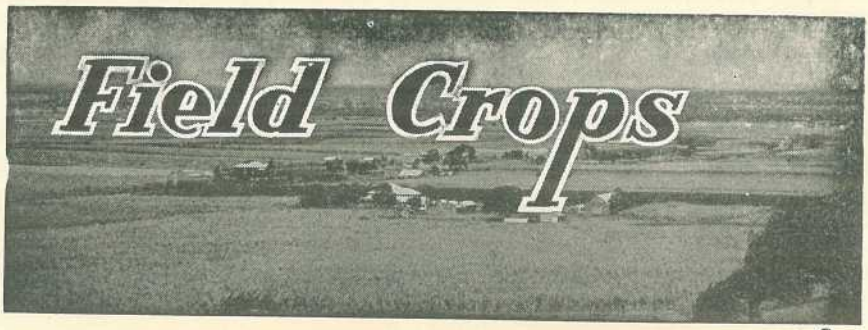
Production of tobacco of improved quality was a matter on which all State Ministers were agreed, added Mr. Williams, who again voiced the dissatisfaction of Queensland growers with present appraisal methods. He pressed for consideration of the setting up of a central marketing authority under the provisions of existing regulations. This he regarded as essential if guaranteed stabilized prices were to be obtained. He also impressed on other members of the Council that in Queensland, particularly in the northern tobacco-growing areas, high-grade leaf of first-class quality was being produced, and that if given the necessary encouragement large areas of very suitable land could be made available for the production, especially under irrigation, of practically unlimited quantities of tobacco of top grade and quality.

Farm Mechanization.

Speaking of farm mechanization schemes, Mr. Williams said he had again pointed out that on the smaller-sized farms machinery could only be used economically if centrally owned and operated. It was necessary also, he added, that much more should be done by all the Governments concerned to foster the introduction, development and testing of new types of farm machinery and contended further that there should be a closer liaison between the Commonwealth and State Governments in these matters if the success of farm mechanization projects were to be attained.

The future of district war agricultural committees also was considered by the Council, and it was decided that, having served their great war-time purpose, they should cease to function as from the end of this month, except where their retention for longer periods was found necessary. It was agreed, too, that the valuable services of these district committees to the Commonwealth, and to the primary industries in particular, during the difficult war years would be suitably recognized.

A proposal to arrange periodical interchanges of graduates in agriculture with other countries also was approved at the February meeting of the Australian Council of Agriculture.



Flue-curing Tobacco.

A. HAMILTON, Senior Adviser in Agriculture.

IN the production of bright tobacco, considerable experience is necessary, for there is no operation of greater importance than the curing of the leaf. The process demands the greatest care and attention to all details, and on the success of the curing depends very largely the monetary return which may be expected from the crop. Good leaf can be completely spoilt or considerably lowered in value by neglect in the curing process; while leaf of apparently poor quality can be much improved in value by skilful treatment.

To obtain the best results, it is essential that the leaf is picked at the proper stage of ripeness, carefully handled to minimise bruising, and cured with due regard to its body and texture.

Tobacco leaf which is under-ripe cannot be cured a bright colour and when it is saleable realises the lowest price of all grades. If leaf is over-ripe, or if through one cause or another has been allowed to remain on the plant beyond the stage of ripeness at which it should have been picked, an unsatisfactory cure will result. Depending on the degree of over-ripeness, all such leaf will cure an uneven colour and "brittle" in parts, faults which reduce considerably the value of the leaf.

As far as it is practicable to do so, leaves of the same body and texture should be cured together; provided always that the degree of ripeness is uniform throughout the barn. It is impossible to regulate the curing process to cure satisfactorily leaves of varying body and texture, and where a middle course is attempted in an endeavour to cure a barn of mixed leaf, all the leaf will be lowered in value.

Although it is impossible to lay down any hard and fast rule which will prove satisfactory in the curing of any number of barns, descriptively the process can be divided into three stages, namely:—

(1) Colouring of the leaf;

(2) Fixing the colour and killing the leaf;

(3) Drying the leaf right out.

The colouring stage may be aptly termed the artificial ripening of the leaf under favourable atmospheric conditions within the barn, the leaf remaining alive. During the second stage of fixing the colour and killing the leaf, atmospheric conditions within the barn are regulated to allow of more or less uniform colour being attained over the leaf. When practically full colour in the leaf has been assured the leaf is killed by drying out the last of the moisture from the blade of the leaf. The final stage is the simple evaporation of the moisture remaining in the veins and mid-ribs by increasing the temperature.

Colouring.

In commencing the first stage of the cure, both top and bottom ventilators should be tightly closed. Colouring of the leaf will progress most rapidly in a warm and humid atmosphere. The humidity within the barn at this early stage of the cure can usually be gauged by the experienced grower, but the use of a hygrometer will be found most helpful. During the colouring process the wet bulb should show a reading of from 3 to 4 degrees below that of the dry bulb. A greater difference between the two readings will indicate that the atmosphere of the barn is too dry, and moisture will have to be added. Additional moisture can usually be supplied by placing wet bags on the floor of the barn. Direct wetting of the floor of the barn by hosing is not recommended, as this added moisture often proves troublesome later on in the cure when efforts are being made to drive off excess moisture from the barn.

No definite length of time can be given for the colouring period, as this will depend largely on the type of leaf, the soil and climatic conditions under which the crop was grown and the time of the year in which the leaf is being cured.

As a guide, however, the temperature in the barn should be kept between 90 and 100 deg. Fahr. until the colour has spread from the tips and sides of the leaves toward the mid-rib. At this stage the leaf should show roughly two-thirds colour: this degree of colour should be based on the bulk of the leaf in the barn and not on individual sticks placed on tiers low down in the barn.

Fixing the Colour and Killing the Leaf.

When the desired degree of colour has been obtained in the barn, both top and bottom ventilators should be opened to no more than one-quarter of their capacity. At the same time, the temperature should be gradually raised to 105 deg. Fahr. and held there until the tips of the leaves dry out and become firm to the touch. During this period of the cure, the wet bulb should show a reading of 8 degrees below that of the dry bulb. At this stage very little green should be showing in the leaf. When all leaf tips have become dry and firm to the touch the top ventilation is increased to about half capacity, allowing the bottom ventilation to remain at one-quarter capacity, and the temperature is gradually increased to 110 deg. Fahr. The temperature in the barn should be held at this level until the tips of the leaves begin to turn upwards and inwards toward the mid-rib. As a useful guide at this stage of the cure, the wet bulb should show 10 degrees below that of the dry bulb. Should some green still remain in the leaves at this

stage the barn may be held at 110 deg. Fahr., but care should be taken to see that no "sponging" of the full coloured leaf in the barn is occurring. Should "sponging" of the leaf occur, both top and bottom ventilation should be immediately increased and the temperature raised about 10 degrees until all free moisture has disappeared from the leaf surfaces. When this free moisture has been driven off the temperature is allowed to fall back to 110 deg. Fahr. and the ventilation gradually reduced to one-half top and one-quarter bottom.

To fix the colour in the barn the temperature should be increased gradually to 115 deg. Fahr. and at the same time full ventilation both top and bottom given. The temperature is held at 115 deg. Fahr. until the edges of the leaves begin to curl inwards, then raised gradually to 120 degrees with full ventilation, and held until the web of the leaf has completely dried out.

When the web has been fully dried out the temperature can be raised more rapidly than previously—at the rate of 5 degrees an hour—to 130 deg. Fahr., while at the same time the bottom and top ventilation should be reduced to about half capacity.

The leaf is held at 130 degrees until the veins have dried out completely before attempting to raise the temperature sufficiently to drive all moisture from the barn.

Drying the Leaf Right Out.

The final stage of the cure is simply one of increasing temperatures and reducing ventilation to a minimum to permit of all moisture being expelled from the barn.

A rate of 5 degrees an hour should be employed in raising the temperatures from 130 degrees to 160 degrees while the top and bottom ventilation are gradually reduced until only a slight crack is allowed in the top ventilation and the bottom ventilation is completely closed.

With large, heavy-bodied leaf it may be found necessary to raise the temperature above 160 deg. Fahr., but in no instance should it exceed 180 deg. Fahr.

All moisture will have been driven from the leaf when the mid-ribs are dry and can be snapped between the fingers without bending.

The final stage of the cure, when all moisture has been expelled, is to draw the fire, open top and bottom ventilators, and throw open the door.

Pointers for Curing.

1. Endeavour to harvest leaf of the same degree of ripeness and maturity.

2. Endeavour, as far as is practicable, to fill the barn with leaf of even body and texture.

3. Do not string the sticks too heavily, especially if the crop is one of heavy-bodied leaf.

4. Do not overcrowd the sticks on the tier poles.

5. Never allow the temperature to rise above 100 deg. Fahr. when all ventilators are closed.

6. In cool weather use lower temperatures.

7. In wet weather start ventilation earlier, reducing bottom ventilation and increasing top ventilation.

8. Should hot, dry weather conditions prevail during curing, decrease top ventilation and increase bottom ventilation.

9. Do not raise temperature above 110 degrees until the tips of the leaves have all curled up.

10. Make sure that all stems and mid-ribs are thoroughly dried out, as moisture remaining in the stems will cause mould to develop in the bulks.

11. Opening of the barn door during curing operations should be reduced to a minimum. Avoid using a naked light in the barn whilst the leaf is drying out.

12. During the whole of the curing process avoid too rapid changes in temperature and endeavour to carry the cure through its various stages evenly and without undue haste in any one phase.

QUEENSLAND SHOW DATES.

Queensland Agricultural Show Societies are quickly moving again into active organization, and appended is a list of show dates, registered up to 10th January by the Queensland Chamber of Agricultural Societies, for 1946:—

MARCH.

Goombungee	16th
Pittsworth	19th and 20th
Millmerran	22nd
Oakey	27th and 28th

APRIL.

Toowoomba	2nd to 4th
Dalby	9th and 10th
Chinchilla	11th and 12th
Miles (Show and Bushmen's Carnival)	17th and 18th
Mount Perry	27th
Nanango	26th and 27th
Roma	30th, and 1st and 2nd May

MAY.

Monto	1st and 2nd
Kingaroy	1st, 2nd, and 3rd
Eidsvold	6th and 7th
Murgon	9th, 10th, and 11th
Beaudesert	8th and 9th
(Camp Draft 10th and 11th)	
Kilkivan	17th and 18th
Esk	17th and 18th
Gympie	22nd and 23rd
Biloela	23rd and 24th
Laidley	24th and 25th
Blackbutt	24th and 25th

JUNE.

Kalbar	1st
Boonah	7th and 8th
Childers	10th and 11th
Lowood	14th, 15th, and 17th
Gin Gin	17th and 18th
Rockhampton	19th to 22nd
Mackay	24th to 27th
Toogoolawah	28th and 29th

JULY.

Proserpine	5th and 6th
Rosewood	12th and 13th
Gatton	19th and 20th
Cairns	23rd, 24th, and 25th
Yarraman	26th and 27th
Ipswich	30th and 31st, and 1st and 2nd August

AUGUST.

Lawnton	2nd and 3rd
R.N.A.	12th to 17th

SEPTEMBER.

Canungra	7th
Beenleigh	20th and 21st

OCTOBER.

Nerang	4th and 5th

PLANT PROTECTION

Pests of Cucurbit Crops.

A. W. S. MAY, Assistant Entomologist.

A NUMBER of insect pests attack cucumber, melon, pumpkin and other cucurbit crops, and sometimes they seriously interfere with the yields obtained from them. Only the pumpkin beetles and the leaf-eating ladybird, however, are likely to attain pest proportions each year in all parts of the State but outbreaks of other species tend to occur at frequent intervals and may be confined to a few farms in a district.

Cucurbit pests can be grouped according to the parts of the plant with which they are more commonly associated. The following key should simplify their identification in the field:—

I. FOLIAGE AND FLOWER PESTS:

1. Active, elongate beetles about one-quarter of an inch long; feeding on surfaces of young leaves and on the flowers, sometimes in swarms.
   (a) Orange-yellow in colour with two large black spots on each wing cover .. .. **Banded Pumpkin Beetle.**
   (b) Uniformly yellow-brown in colour .. **Plain Pumpkin Beetle.**
2. Sluggish, oval, yellow-brown beetles on upper surfaces of leaves, each about one-quarter of an inch long, and covered with black spots; yellowish, spiny larvae on the lower surfaces of the leaves .. .. **Leaf-eating Ladybird.**
3. Soft-bodied, greenish-black to black insects about one-tenth of an inch long, in dense colonies on under surfaces of leaves and the tips of runners; infested leaves curled and stunted .. **Melon Aphid.**
4. Yellow, fringe-winged insects, about one-sixteenth of an inch long, feeding on lower surfaces of leaves, which are silvery and distorted; plants sometimes stunted .. .. **Onion Thrips.**
5. Minute, greenish-brown to reddish mites feeding on the under surface of leaves, which are yellowish and mottled .. .. **Red Spider.**
6. Yellowish-green caterpillars, feeding on the under surfaces of the leaves, about one inch long when full grown .. **Cucumber Moth.**

II. STEM AND FRUIT PESTS:

1. Cream-coloured grub tunnelling inside, and producing a swelling of the stem; about half an inch long when full grown .. .. .. **Cucurbit Stem Borer.**
2. Green, shield-shaped bug, about half an inch long .. .. **Green Vegetable Bug.**
3. Pale-brown to brownish-black, shield-shaped bug, about half an inch long .. .. **Cucurbit Shield Bug.**
4. Dull-black, elongate bugs with a red band behind the head and reddish spots on under-side of body; about three-quarters of an inch long .. .. **Black Passion Bug.**
5. Yellowish maggots inside ripe or ripening fruit .. **Cucumber Fly.**

PUMPKIN BEETLES.

Two insects, the banded pumpkin beetle* and the plain pumpkin beetle†, are commonly referred to by farmers as pumpkin beetles.

* *Ceratia hilaris* Bd.
† *Rhapidopalpa abdominalis* Fabr.

Although they differ markedly in colour, they frequently occur together on the same host plant and have very similar habits. Pumpkin beetles are particularly injurious to the seedlings, flowers and small fruit of cucurbit crops. Spring plantings of rock melons, squashes, marrows and pumpkins are often attacked shortly after germination when a relatively small number of beetles on each plant can defoliate and destroy the seedlings. Once runners are formed, the crop can be considered safe from this particular danger. The growth of established plants, however, may be severely checked by the beetles feeding on the leaves, flowers and newly formed fruit. The insects show a distinct preference for the younger leaves and tendrils on the terminals, and often cluster together when feeding. The latter habit is so characteristic that on infested plants some leaves may be completely destroyed except for the main veins

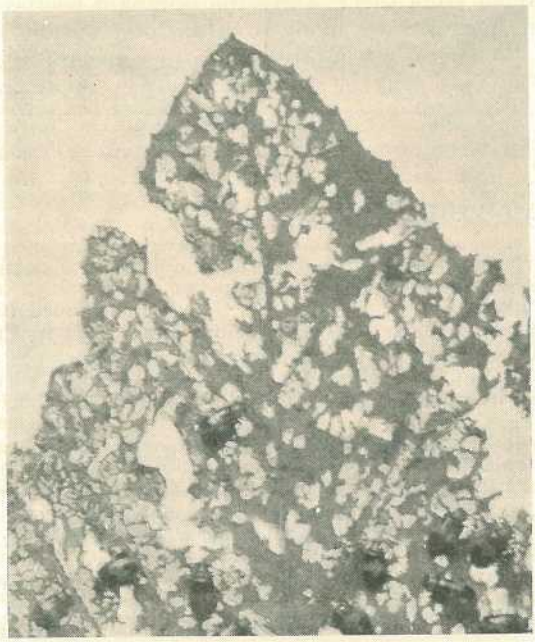


Plate 38.

BANDED PUMPKIN BEETLE.—Portion of infested rockmelon leaf.

(Plate 38) while others show little or no sign of injury. Beetles feeding on the flowers interfere with fruit setting and young fruit eroded on the surface by the pest may wither and eventually fall from the plant. The latter type of damage is particularly common in chokos. In the early stages of fruit formation, the damage to the flowers and newly formed fruit may ruin any prospects of an early crop.

The larvae feed on the roots which become swollen, discoloured and misshapen to such an extent that the growth of the plant may be checked. They also penetrate the lower surfaces of fruits in contact with the ground and produce rind blemishes through which secondary rot fungi can enter the tissues when the fruit ripens.

Life History and Habits.

The banded pumpkin beetle is orange-yellow in colour with two large black spots on each wing cover. It measures a quarter of an inch in length and is about twice as long as it is broad. The plain pumpkin beetle is slightly larger and more slender than the former species and can readily be distinguished from it by its uniform yellowish-brown colour.

Though the adults of the two pumpkin beetles differ a great deal in their appearance, their respective life histories and habits are very similar. The small, oval, yellow eggs are laid singly or in small groups on dead leaves or small clods under the food plants. After approximately ten days, the cream-coloured larvae hatch from the eggs and attack both the main root system and any subsidiary roots arising from the lower part of the stems. The long, narrow larvae only penetrate a short distance into the root and the greater part of the body remains outside the surface where it is easily seen when infested roots are examined. Fruits resting on the ground are also attacked, the larvae tunnelling into the rind for distances up to one-quarter of an inch; they also protrude from the surface. After approximately five weeks, the larvae, then one-half inch in length and full-grown, pupate in the soil at depths varying from 1 to 3 inches. The adult beetles later emerge from the pupae.

During hot weather, pumpkin beetles are very active and readily leave the plants when disturbed but they are relatively sluggish during cloudy or cool weather. At night they shelter in any dense foliage in, or near, their food plants. In winter, the beetles congregate among dead vegetation or under the bark of standing trees until warm weather in spring induces them to emerge.

Control.

Pumpkin beetles are particularly troublesome during the early life of the plant, and protective measures should be applied immediately after the seedlings appear above the ground. A dust containing 25 per cent. of arsenate of lead in a hydrated lime or kaolin carrier kills many of the beetles feeding on the leaves and at the same time acts as a deterrent against reinfestation either by adults disturbed during treatment or migrating into the field from outside. The seedlings should be dusted when the air is still, preferably in the early morning when dew is present on the plants. Arsenate of lead may also be used as a spray at a strength of 1½ lb. of the powder to 50 gallons of water; the spray, however, does not possess the deterrent properties of the dust and may prove inefficient for the protection of seedlings. It should be used therefore only after the crop has reached the flowering stage.

In order to maintain a protective coating of the insecticide on fast-growing seedlings, treatments should be applied at intervals of five to seven days, and as soon as practicable after rain has fallen. The time interval between applications may be increased to ten days when beetle populations are relatively low. The possibility of plants being killed decreases as the seedlings grow and is relatively slight when the main runners are about 12 inches long, i.e., approximately four to five weeks after germination. The beetles then tend to confine their attention to the rapidly developing flowers and young fruit. The luxuriant foliage present on the plants at later stages of growth interferes with the

application of insecticides and reduces their effectiveness. However, if the dust has been properly applied during the seedling stages, vigorously growing plants should not suffer a great deal from the surviving beetle population. Treatment should be continued, if the pests are troublesome, though care must be taken to prevent the accumulation of poisonous residues on the fruit as it approaches maturity. The adoption of cultural practices which ensure continuous, vigorous plant growth are obviously desirable for they do much to offset the damage caused by the pest.

LEAF-EATING LADYBIRD.

Most ladybird beetles are predatory on other insects but one, the leaf-eating ladybird*, feeds on the foliage of pumpkins and related crops, potatoes, and several weeds. Migrations from weed hosts are often responsible for outbreaks in cultivated crops.

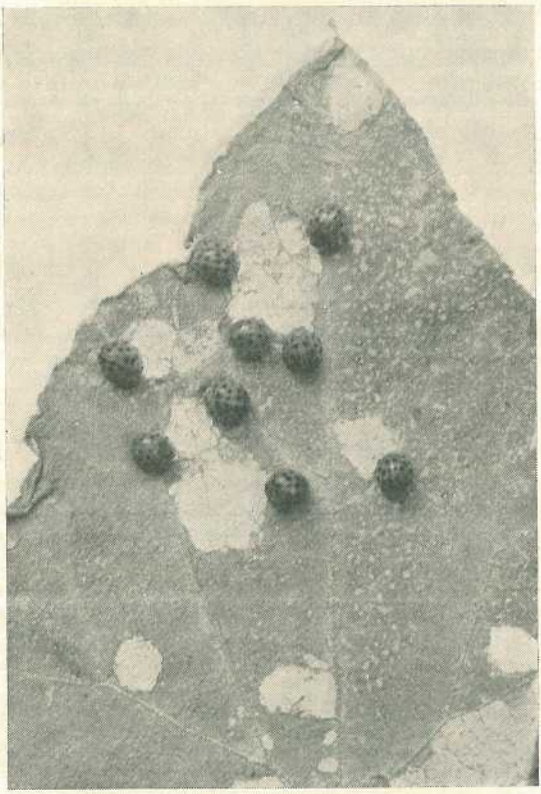


Plate 39.

LEAF-EATING LADYBIRD.—Portion of infested rockmelon leaf.

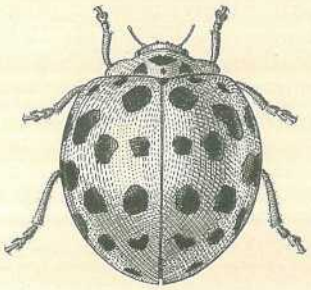
All stages of the insect occur on the above-ground portions of the host plant, the larvae and the adults feeding principally on the foliage, though the flowers and developing fruit may also be injured. Unlike the pumpkin beetles, adults of the leaf-eating ladybird do not "swarm" and seedling damage is seldom as severe as that caused by the former pests. The adults feed mainly on the upper surfaces of the leaves

* *Epilachna 28 punctata* Fabr.

(Plate 39) but the sluggish larvae are confined to the under sides of the leaves where they destroy the green tissues and leave the veins linked together with a grid-like, almost colourless film. In severe outbreaks the majority of the older leaves may be almost completely destroyed and the injury not only lowers the yield but also exposes the maturing fruit to the sun and thus induces scald. The larvae also injure the rind of the fruit.

Life History and Habits.

The leaf-eating ladybird (Plate 40, fig. 1) is oval in shape, approximately a quarter of an inch in length, and yellowish-brown in colour, but the wing covers are marked with from 24 to 28 conspicuous black spots. The movements of the beetle are rather sluggish, and it does not



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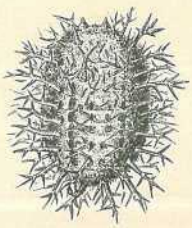

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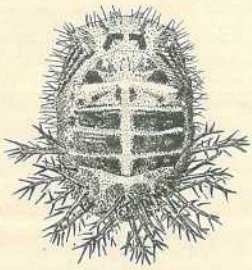

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Plate 40. [*Drawings by William Manley.*

LEAF-EATING LADYBIRD: Fig. 1.—Adult beetle × 5. Fig. 2.—Egg mass × 5. Fig. 3.—Larva × 5. Fig. 4.—Pupa × 5.

fly readily. The elongate-oval, yellowish eggs (Plate 40, fig. 2) are laid in clusters on the under-surface of the foliage or developing fruit. From the eggs, the yellowish larvae emerge and feed on the nearby leaves. After about three weeks they are full grown, and measure one-third of an inch in length, the body being profusely covered with dark many-branched spines which give them a hairy appearance (Plate 40, fig. 3). Pupation (Plate 40, fig. 4) occurs on the host plant or in any adjacent trash. The whole life cycle is completed in about four weeks and all stages of the pest may be present on the food plant at the same time.

Control.

Though the seedling destruction caused by the leaf-eating ladybird is normally not important, any infestation during the early life of a crop should be controlled; otherwise the pest may get out of hand during the later stages of crop growth. Routine applications of an arsenate of lead dust or spray, such as those prescribed for the control of the pumpkin beetles, will also keep the leaf-eating ladybird in check if the insecticide is applied thoroughly and both the upper and lower leaf surfaces are covered with the poison. Once fruiting commences, arsenical dusts or sprays must be used with considerable care in order to avoid the accumulation of residues on the fruit. Sprays containing 0·1 per cent. D.D.T. or dusts containing 2 per cent. D.D.T., however, may be used for the control of the pest until three weeks before harvesting begins.

MELON APHID.

Colonies of the melon aphid*, a small greenish-black to black insect about one-tenth of an inch in length, are nearly always present in cucurbit crops at some stage of their development (Plate 41). Predators, such as hover fly larvae and ladybird beetles, together with a number of wasp parasites, normally keep the aphid under control but occasionally the pest increases very rapidly and causes considerable injury to the

Plate 41.
MELON APHID.—Portion of infested squash leaf.

crop. Should outbreaks occur when plants are in the seedling stages, the leaves curl and growth is checked. In older crops, vine development is retarded and yields may be reduced. These aphids, like most other species, secrete a sticky substance known as honey dew on which sooty mould fungi grow. The honey dew accumulates on the lower parts of the plant and sometimes makes the crop very objectionable to handle.

* *Aphis gossypii* Glov.

Control.

Rapid growth is desirable in young cucurbit plants and control measures should therefore be applied in the early stages of growth if the pest is at all abundant. A nicotine sulphate spray, prepared by adding one-half pint of nicotine sulphate to 50 gallons of water in which 2 lb. of soft soap have been dissolved, or a nicotine dust containing 3 per cent. nicotine, may be used. Two applications of the insecticide are usually needed to control the pest, the second being applied one week after the first.

ONION THRIPS.

Onion thrips* are small, yellow, fringe-winged insects which are commonly found on cucurbit crops, more particularly cucumbers. They are about one-sixteenth of an inch in length and both adult and nymphal stages occur together in colonies on the under surfaces of the leaves where they feed on and destroy the green tissues. The infested parts of the leaves assume a silvered appearance but this is frequently accompanied by both leaf distortion and delayed development of the plants. Severe attacks may be fatal to seedlings and young plants.

Control.

Nicotine dusts or sprays such as those used for the control of the melon aphid will keep the onion thrips in check. Regular treatment of the young plants is essential in some parts of southern Queensland where cucumbers are grown extensively.

RED SPIDER.

Red spider† may attack all cultivated plants in the cucurbit family. Infested plants exhibit an unthrifty appearance with pale spots on the foliage. As the infestation spreads from the vicinity of the main veins

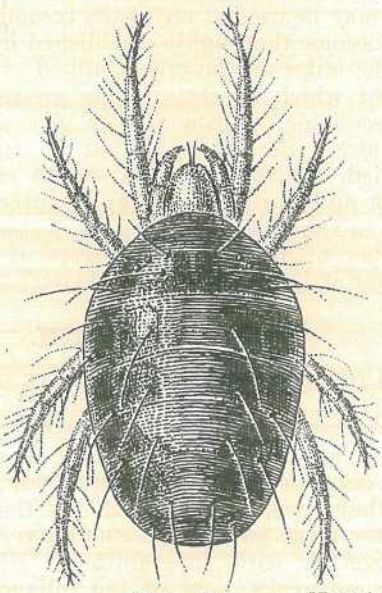

Plate 42. [*Drawing by William Manley.*
RED SPIDER × 100.

* *Thrips tabaci* Lind.
† *Tetranychus urticae* Koch.

where it usually begins, the whole leaf acquires a yellowish colour and eventually withers. The consequent loss of leaf retards growth, exposes the fruit to the sun, and weakens the plants. When the under surface of an infested leaf is examined, the small mites (Plate 42) may be seen as minute greenish-brown or reddish spots moving over the surface and, if the outbreak is severe, the cast skins give the surface of the older leaves a dusted appearance. Red spider attacks reach their greatest intensity in cucurbit crops during spring and early summer; heavy rain or prolonged low temperatures usually reduce the numbers on the plants very rapidly.

Life History and Habits.

The small, spherical, almost transparent eggs of the red spider are laid on the under surface of the leaves, usually alongside the veins. Hatching occurs in four or five days, the young mites being almost colourless at first though they later acquire a greenish-brown tinge, which becomes more distinctive as they approach maturity. The adult females vary in colour, both greenish-brown and reddish individuals being found on the same plant. They possess four pairs of legs, a short, rounded body, and measure approximately one-sixtieth of an inch in length. The adult male is somewhat smaller than the female, is less rounded, and is usually salmon coloured. During summer, the life cycle of the pest is completed in less than two weeks.

Control.

Red spider outbreaks can be controlled by the use of dusts or sprays containing sulphur provided treatment is thorough and the insecticide reaches the under surfaces of the leaves where the mites occur. The dusts should contain at least 30 per cent. of sulphur; lime sulphur sprays may be applied at a dilution of 1 in 60, while commercial wettable and colloidal sulphurs may be used at strengths recommended by the makers. Once the pest has become thoroughly established in the crop it is difficult to eradicate, for the mites are largely confined to the under surfaces of the leaves, many of which lie close to the ground and are difficult to cover with the insecticide. Dusts usually give a better coverage than sprays and are more generally used, but no matter what method of treatment is applied, control measures should commence in the early stages of an attack and continue at regular intervals of approximately two weeks, at least in valuable crops such as cucumbers. Since red spider breeds on a number of weeds, such sources of infestation should be eliminated whenever it is practicable to do so.

CUCUMBER MOTH.

In spite of its common name, the cucumber moth* is not an important pest of cucumbers; watermelons are much more commonly attacked. The insect, however, has been reared from most cucurbit crops, including the guada bean, which is actually a type of marrow. On damaged plants, the larvae occur in considerable numbers on the under sides of the leaves, where they normally feed. At first the surfaces of the leaves are eroded, but later large gaps appear and pieces of the ragged leaves may be bound together with frass-cluttered silk spun by the older larvae. In severe outbreaks, most of the foliage is destroyed and the larvae may then enter the stem and burrow inside it. Sometimes,

* *Phaecllura indica* Saund.

irregular shaped holes are gouged out of the fruit, particularly at the stem end, by several larvae working close together. Attacks are apparently most common after heavy rain and sometimes coincide with those of the leaf-eating ladybird.

Life History and Habits.

The parent moth measures approximately one inch across the outstretched wings, which are translucent white in colour and fringed with a blackish-brown border (Plate 43). The abdomen characteristically ends

Plate 43.
Cucumber Moth × 3.

in a brush of long golden-yellow scales. Small, round eggs are laid singly by the parent moths on the under surfaces of the leaves and from them emerge larvae which are at first almost white in colour, but later become yellowish-green. They reach maturity in approximately three weeks and are then almost one inch in length. Pupation takes place in light, silken cocoons spun by the larvae inside shelters of tied leaves or leaf fragments. Approximately five days after the commencement of pupation, the adult moths emerge from the light-brown pupae and escape to the open, where they mate and commence another generation.

Control.

When insecticides are regularly used for the control of other cucurbit pests such as the pumpkin beetles and the leaf-eating ladybird, little trouble should be experienced with the cucumber moth. A dust containing 25 per cent. of arsenate of lead, or a spray containing 1 lb. of arsenate of lead in 50 gallons of water gives good control of the pest if the under surfaces of the leaves are covered with the insecticide. More than one application may be needed when leaf webbing is extensive. Sprays containing 0·1 per cent. D.D.T. and dusts containing at least 1 per cent. D.D.T. should also give good control of the pest.

CUCURBIT STEM BORER.

The cucurbit stem borer* is a common pest of melons and some related plants, the stems of which are attacked by the immature stages of the insect. Infested plants show no conspicuous symptoms. An odd

* *Apomecyna histrio* Fabr.

leaf, usually a lower leaf, on young plants may collapse owing to the activity of the grub in the leaf stalk. In older plants, scars on the stem indicate points of larval entry into the tissues. Normally, cucurbits make such rapid growth when they are grown under favourable conditions that they flower and bear a crop even when the stem borer attacks are very heavy. In rock melon crops, larvae may be found in the stems of most plants at the end of the cropping period and it is therefore assumed that both the life of the crop and the yields obtained from it are then reduced by the pest.

Life History and Habits.

The stem borer is the larval stage of a longicorn beetle which is about one half-inch in length, and slaty-grey in colour with a number of white spots arranged in three evenly shaped V markings across the wing covers (Plate 44). The antennae, like those of most insects of this kind, are long. The eggs are laid singly in growth cracks or other scars along the stem of the host plant. The newly emerged larva tunnels within

Plate 44.
CUCURBIT STEM BORER × 5.

the stem and works steadily downwards toward a node. Feeding induces a swelling in the stem and this becomes more pronounced as the larva approaches maturity within the feeding tunnel which is packed with glutinous waste material. The full-grown, cream-coloured larva is approximately three-quarters of an inch in length, elongate, with distinct grooves between the segments. Before pupating, it constructs a fibrous cocoon inside the stem in which it turns to the pupa from which the adult beetle later emerges. The habits of the insect are not fully known, but there may be two or three generations each year.

The adult beetles occur on most cucurbit crops and have been reared from larvae in melons, pumpkins, and marrows. They may erode the bark of the growing plant, but this type of injury is seldom important.

Control.

Insecticides cannot at present be recommended for the control of the pest, but the risk of infestation may be lessened by rooting out and

burning the remains of cucurbit crops when the fruit has been harvested. Any larvae or pupae in the stems will then be destroyed and the chances of the insect becoming numerous should be reduced.

SHIELD BUGS AND FRUIT BUGS.

A number of bugs are well-known pests of cucurbit crops. They include the green vegetable bug*, the cucurbit shield bug†, and the black passion bug‡. All possess sucking mouth parts with which they pierce the plant tissue and suck out the juice. At these punctures, water-soaked lesions develop which later cause malformations in the growth of the part of the plant attacked. If the infestation is heavy the vigour of the plant and its ability to bear fruit may be affected.

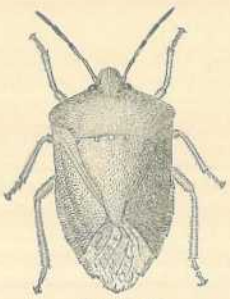

Plate 45.
GREEN VEGETABLE BUG
× 2.
[Drawing by William Manley.

Life Histories and Habits.

The green vegetable bug (Plate 45) is pale green in colour, shield shaped, and measures approximately half an inch in length. The cream-coloured, barrel-shaped eggs are laid in neatly arranged groups on the under surfaces of the leaves. From the eggs, bright-orange nymphs emerge within a week and remain clustered together for a few days before dispersing over the plants. The nymphal stages are flattish-oval and often vividly coloured with black, green, white, yellow and red markings which change to softer shades before the insect reaches the green adult stage. Several generations occur during the year and the pest overwinters in the adult stage. Beans and tomatoes are the principal host plants of the green vegetable bug, but cucurbits are sometimes infested. Both the main stem and the fruits of rock melons, cucumbers, and related plants may be attacked.

Plate 46.
CUCURBIT SHIELD BUG × 3.

* *Nezara viridula* L.
† *Megymenum insulare* Wwd.
‡ *Leptoglossus bidentatus* Montr.

Cucurbit shield bugs (Plate 46) vary in colour from pale brown to brownish-black, and measure half an inch in length. They are sluggish insects which often congregate in large numbers among the dead leaves and under the fruit. The pearly-white eggs are oval in shape, from three to twelve being laid side by side in a continuous chain on the under surfaces of the leaves and fruit, or on the dead leaves lying below the plant. The nymphs are generally greyish-blue with faint yellowish markings, but shades of brown are not uncommon. Cucurbits are the main hosts of the cucurbit shield bug which first appears in the young crop as isolated individuals feeding on the stems and leaf stalks of the plants. Later in the season, large populations sometimes infest the plants, frequently in only part of the field.

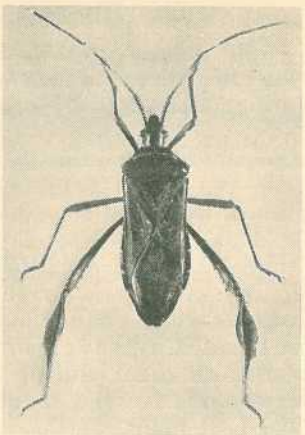

Plate 47.
BLACK PASSION BUG × 1½.

The black passion bug (Plate 47) is a dull-black, rather elongate insect measuring three-quarters of an inch in length, the prevailing colour being broken by a transverse red band just behind the head and several reddish spots on the under side of the body. The insect feeds on many plants, including passion fruit, citrus and cucurbits such as cucumbers and melons. In coastal areas where outbreaks usually occur, large numbers of both adult and nymphal stages cluster on the fruit, damaging the rind and the underlying flesh.

Control.

Control of plant and fruit bugs on cucurbit crops is difficult, mainly because the dense foliage of well-grown vines gives a great deal of protection to the insects. Liberal applications of a 5 per cent. nicotine dust act as a deterrent against the adult shield bugs, and kill some of the nymphs, but frequent applications are necessary to achieve reasonable control. Recent work suggests that a spray containing 0·1 per cent. D.D.T. will be more effective in controlling shield and other bugs than the insecticides formerly used for this purpose.

CUCUMBER FLY.

The cucumber fly*, which is the common fruit fly attacking the fruit of cucumbers, melons, squashes, chokos and pumpkins, is somewhat larger and lighter in colour than the better known Queensland

* *Austrodacus cucumis* Fr.

fruit fly*. Tomatoes are also sometimes infested by the maggots of the insect. The flies may become numerous during the mid- and late-summer months and eggs are laid in mature, sunburnt or damaged fruits. If populations are high, eggs may also be laid in fruit which is still immature. These eggs, unlike those laid in ripe fruit, seldom hatch, but calloused areas appear in the rind at each egg-laying puncture and involve the adjacent tissues. Such calloused areas in the young fruit are later associated with deformities. Normally, however, the injury is limited to fruits which are close to, or have reached maturity, and the pest therefore attracts attention during and after harvesting.

Life History and Habits.

The life history of this pest is much the same as that of the Queensland fruit fly. The elongate-oval eggs are laid in groups beneath the rind and the cream-coloured maggots emerging from them tunnel through the tissues of the fruit. Larval development is completed in approximately one week and pupation then takes place in the soil. Later, the adult cucumber flies force their way to the surface of the soil and take to the wing. The whole life cycle may be completed in as short a period as two weeks and populations therefore increase rapidly when conditions are suitable for the pest.

Control.

Only hygienic control measures can be used against this fruit fly. All material in which the pest can breed should be eliminated as far as possible, damaged, sunburnt, over-mature and infested fruit being collected at weekly intervals and fed to stock or otherwise destroyed.

ROUTINE CONTROL MEASURES.

The severity of insect attacks on cucurbit crops can be somewhat lessened by careful attention to the following cultural practices which promote healthy and vigorous growth of the vines:—

(*a*) The land should be worked to a fine tilth before planting and, later, weed growth developing in the rows should be checked.

(*b*) Vigorous growth of the vines should be maintained by frequent cultivation, the use of suitable fertilizers, and judicious watering if irrigation facilities are available.

(*c*) Insecticides should be applied at regular intervals after the seedlings appear above the ground, at least in valuable crops such as cucumbers and melons.

(*d*) All damaged, over-ripe and sunburnt fruits should be removed and destroyed at weekly intervals after the commencement of harvesting.

(*e*) Crop residues should be burned as soon as the fruit has been harvested.

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* *Strumeta tryoni* Frogg.

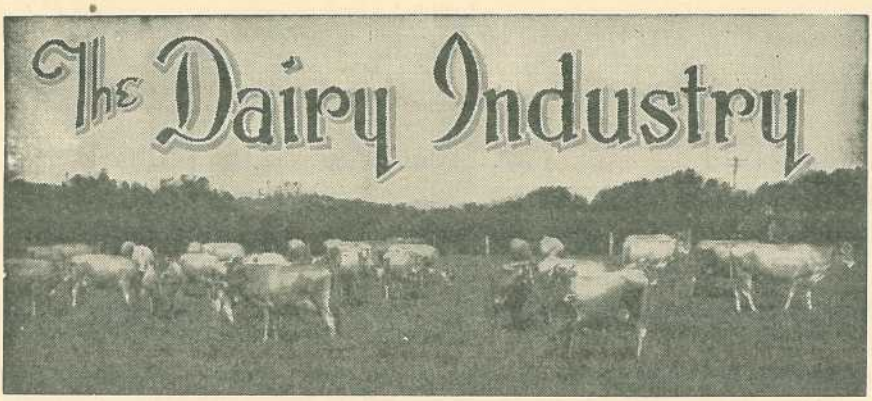
Growers of cucurbit crops are seldom faced with the simple problem of controlling a single pest, for two or more species, such as the onion thrips and red spider or pumpkin beetles and the leaf-eating ladybird, are often active at the same time. A relatively unimportant pest in one district, such as the cucumber moth, may cause considerable damage in another. Such peculiarities in the insect pest position on cucurbit crops can be dealt with most satisfactorily by a basic control programme which will cope with those species normally encountered within a particular district, applications of special insecticides being reserved for pests which occur less frequently.

For economy of labour and materials, insecticides can sometimes be applied together with fungicides in a combined dust or spray. Commencing soon after the seedlings appear above the ground, weekly dustings with a mixture containing five parts of arsenate of lead, three parts of copper carbonate, six parts of sulphur and six parts of kaolin will ensure seedling growth free from leaf-eating insects and red spider, and afford protection against downy mildew infection. A proprietary dust of this kind would carry the following analysis on the label:—7·75 per cent. arsenic pentoxide (As_2O_5) as arsenate of lead, 7·5 per cent. copper (Cu) as copper carbonate, and 30 per cent. sulphur as powdered sulphur. A combination spray containing cuprous oxide mixture (3 in 40), or one of its commercial equivalents, with lead arsenate (1½ lb. to 40 gallons) and colloidal or wettable sulphur at the strength recommended by the manufacturer may also be used, but it is not as satisfactory as the dust for insect control purposes. The copper fungicide must be included in dusts and sprays applied to rock melons and cucumbers, both of which are very susceptible to downy mildew; they may, however, be omitted in other cucurbit crops. If aphids or thrips appear in the crop they may be checked with a 3 per cent. nicotine dust or a nicotine spray (½ pint nicotine sulphate, 2 lb. soap, and 50 gallons water).

The above formulae, containing sulphur, are particularly suited to areas where red spider outbreaks are common. However, in those districts where red spider attacks are unusual, sulphur can be omitted from the dust or spray. The alternative dust, in such cases, would contain five parts arsenate of lead, three parts of copper carbonate and twelve parts of kaolin. A proprietary dust of this kind would carry an analysis as follows:—7·75 per cent. arsenic pentoxide (As_2O_5) as arsenate of lead, and 7·5 per cent. copper (Cu) as copper carbonate. Supplementary applications of a sulphur dust may be needed if and when red spider or powdery mildew are seen on the vines.

As the fruit develops and approaches maturity, arsenate of lead should be omitted from both dusts and sprays. However, regular applications of a copper fungicide may be continued as a protection against downy mildew infection, and sulphur dusts or sprays may still be needed to control outbreaks of powdery mildew and red spider.

Although growers can mix their own dusts to the above formulae, such a practice is only feasible where facilities for accurately weighing and thoroughly mixing the ingredients are available. Generally, it is more convenient for growers to purchase the ready-mixed dusts marketed by many proprietary firms for the control of pests and diseases in cucurbit crops.



Water and Salt Control in Butter-making.

L. A. BURGESS, Dairy Technologist.

THE method of purchasing cream for butter-making as "commercial butter" is based on the quantity of butter which specified tables show should be obtained from it. It is unfortunate that this method of payment has distracted the attention of a large number of those engaged in the butter industry from the fact that it is really butter-fat which is bought. This is the only constituent which is of any importance so far as butter-making is concerned, the process of churning consisting of obtaining the fat in a granular form so that the remainder of the cream—that is, the buttermilk—can be removed. The grains of fat are then consolidated, usually with the addition of salt as a flavouring agent and mild preservative, and the resultant product is the butter of commerce. Legal standards strictly limit the percentages of the non-fatty constituents and most countries have set a minimum percentage of fat which butter shall contain. It is therefore quite obvious that the fat is the real basis on which cream is purchased and butter is sold. This being so, it is surely equally obvious that an efficiently managed factory should make as much butter as possible from the fat received. This involves keeping the fat losses down to a minimum.

Sources of Fat Losses.

Careless handling of cream can cause much spillage; churning at a high temperature or shortly after pasteurization raises the fat losses; incomplete churning, such as churning to an unnecessarily small grain, results in many fat globules not attaining grain size; coarse or broken strainers allow much grain butter to be lost; inefficient moisture and salt control results in much fat being given away for no extra return; inefficient packing means that extra butter is given away for which no payment is received. These are the major sources of fat losses in butter factories, the most extensive losses being due to (*a*) the fat lost in the buttermilk, normally amounting to 1 to 1½ per cent. of all fat received, and (*b*) inefficient moisture and salt control. The former loss cannot be avoided or appreciably reduced, but carelessness can increase it considerably. The latter losses are definitely avoidable, because efficient moisture and salt control are under the direct control of the butter-maker.

TABLE 1.

SHOWING HOW WATER AND SALT AFFECT THE COMPOSITION OF BUTTER AND FACTORY RETURNS FROM BUTTER SALES.

Analysis of Butter.				Annual Output.		Gross Receipts from Butter Sales.		Receipts per lb. Fat.	
Water.	Salt.	Curd.	Fat.	Fat.	Butter.	@165/- cwt.	@ 200/- cwt.	@ 165/- cwt.	@ 200/- cwt.
%	%	%	%	Tons.	Tons.	£	£	Pence.	Pence.
15·7	1·5	0·8	82·0	820	1,000	165,000	200,000	21·56	26·13
15·2	1·0	0·8	83·0	820	987·95	163,012	197,590	21·30	25·82
14·5	0·7	0·8	84·0	820	976·19	161,071	195,238	21·05	25·51

Table 1 has been prepared to illustrate the way in which inefficient water and salt control can cause serious fat losses. The first section of the table shows how low percentages of water and salt cause the percentage of fat in the butter to rise. While the position has markedly improved in the course of the last three or four years it is unfortunately true that butters containing over 83 per cent.—sometimes as much as 84 per cent.—of fat are still being marketed. The second section of the table shows the quantity of butter which would be manufactured in each case, the basic figure being 820 tons of fat. It will be noted here that when butter containing 84 per cent. of fat is produced, the quantity of butter made is 24 tons less than if it contained 82 per cent. of fat. The effect of this on the gross receipts from butter sales is shown in the third section, which shows that at the basic equalization price of 165s. cwt. the monetary loss amounts to £3,928, while at 200s. cwt. (the gross returns from sales and subsidies) the loss amounts to £4,762. The fourth section of the table shows the figures from the third section reduced to receipts per lb. of fat sold. On this basis, the loss amounts to one half-penny per lb. of fat at 165s. cwt., and three-fifths of a penny per lb. at 200s. cwt. Such losses are more than an important industry such as the butter industry should be expected to stand. The remedy is in the hands of the shareholders and directors of the dairy companies, who can insist on complete efficiency in moisture and salt control in their factories.

Methods of Control.

Many charts have been published to assist butter-makers to control the water and salt content of butter. They may differ in minor details, but all have the same basic principles. The quantity of butter which the particular churn of cream will produce should be known fairly accurately, i.e., to within 56 lb., or 1 box. This is best done by actual measurement and a fat test of the cream which is run into the churn. The cream can be measured in various ways, the use of a graduated dip rod in the cream vat being the most satisfactory. The fat test of the cream in the vat may be done at any time prior to churning, the important points being that the cream be thoroughly mixed before the sample is taken and the fat test accurately performed. From these figures it is easy to calculate the quantity of butter which the churn will yield, the commercial butter tables being very convenient for the purpose. Knowing this, it is equally simple to calculate the weight of salt which should be incorporated to give any desired percentage and to calculate the quantity of water required to raise the percentage in the butter by any desired amount. It should be noted

that the salt which is calculated in this way should be *incorporated* in the butter. This means that the salt should be weighed accurately and every ounce of salt added should be worked into the butter. There is no logical reason why salt should be added to the churn and an unknown proportion of it then drained or "washed" out. That results not only in a failure to attain the salt objective, but in waste of salt. Admittedly salt is fairly cheap, but the cumulative losses of salt over a year in a butter factory can amount to a very considerable sum. For example, take a factory producing 1,000 tons of butter a year. If salt is added at the rate of 2 per cent. of the butter, 20 tons of salt would be used. But if a quarter of this salt were lost the loss would be 5 tons a year, with an approximate value of £50, nearly £1 a week which is being thrown away. Cases are known where factories are using as much as 4 per cent. of salt, but only incorporating about 1 per cent. On a 1,000-ton basis the loss in these factories amounts to 30 tons of salt, or £300 a year. Surely this is worth saving; it is equivalent to a man's wages.

TABLE 2.

CHART SHOWING THE APPROXIMATE NUMBER OF 56 LB. BOXES OF BUTTER OBTAINABLE FROM VARIOUS QUANTITIES OF CREAM.

Cream. Imp. Gallons.	Fat Test of Cream.											Cream. Pounds.
	30%.	31%.	32%.	33%.	34%.	35%.	36%.	37%.	38%.	39%.	34%.	
200	13	13	14	14	15	15	16	16	17	17	17	2,000
220	14	15	15	16	16	17	17	18	18	19	19	2,200
240	16	16	17	17	18	18	19	19	20	20	21	2,400
260	17	17	18	19	19	20	20	21	22	22	23	2,600
280	18	19	19	20	21	21	22	23	23	24	24	2,800
300	19	20	21	21	22	23	24	24	25	26	26	3,000
320	21	21	22	23	24	24	25	26	26	27	28	3,200
340	22	23	23	24	25	26	27	27	28	29	30	3,400
360	23	24	25	26	27	27	28	29	30	31	32	3,600
380	25	25	26	27	28	29	30	31	31	32	33	3,800
400	26	27	28	29	30	30	31	32	33	34	35	4,000
420	27	28	29	30	31	32	33	34	35	36	37	4,200
440	29	30	31	32	32	33	34	35	36	37	38	4,400
460	30	31	32	33	34	35	36	37	38	39	40	4,600
480	31	32	33	34	35	37	38	39	40	41	42	4,800
500	32	34	35	36	37	38	39	40	41	43	44	5,000
520	34	35	36	37	38	40	41	42	43	44	45	5,200
540	35	36	37	39	40	41	42	43	45	46	47	5,400
560	36	38	39	40	41	43	44	45	46	48	49	5,600
580	38	39	40	41	43	44	45	47	48	49	51	5,800
600	39	40	41	43	44	46	47	48	50	51	52	6,000

Moisture control is dependent on accurate factory tests. For this purpose, the best possible balance should be provided and it should be placed on a rock-firm bench in a situation free from draughts and where it will not be affected by radiated heat, steam or water. Tests accurate to within 0.1 per cent. are required and this accuracy is easily attainable. The initial or first moisture test should be done before the butter is completely worked, yet the churn should be "dry" so that no unforeseen and unknown rise will be experienced from a wet churn.

At this point it is opportune to mention that churns which are not level, or are found to give butter of a higher water percentage at one point than another, are a menace and should not be tolerated. Modern churns properly installed are capable of turning out a remarkably uniform butter, and there should be little trouble from this cause if such churns are installed.

Having performed the initial test, the requisite quantity of water is *weighed* and added to the churn. The final working should be for at least 5 minutes, so that the water is completely incorporated. Any incompletely incorporated water will permit bacterial growth and cause streakiness in the butter. On no account should a second addition of water be made. Provided due care has been exercised, the butter will contain the desired salt and water percentages to within 0·1 per cent. It is unwise to strive for the ultimate in either water or salt control, as the experimental errors of sampling and testing amount to 0·1 per cent. It is suggested therefore that the objective for water content should be:

15·6 to 15·7 per cent. for churns of up to 20 boxes;

15·7 to 15·8 per cent. for churns of up to 30 boxes;

15·8 to 15.9 per cent. for churns of over 30 boxes.

The reason is that an error in calculation of 1 box in 20 will still permit the attainment of the desired percentage to within 0·1 per cent., but a greater error in calculation could result in a churn of "excess moisture" butter. The larger churns permit a greater margin for error without affecting the result by more than 0·1 per cent.

Tables 2, 3 and 4 have been prepared for the convenience of butter-makers, who usually have enough work to do without making extra calculations. Table 2 shows the quantity of butter in 56 lb. boxes which may be expected from various quantities of cream containing from 30 to 40 per cent. of fat. This chart may be found to slightly under-estimate the quantity of butter, a good "fault" as it is on the side of safety. Naturally, if more butter is expected than is actually obtained the danger of excess salt or excess moisture butter is increased, because more salt and water are added than should be the case. For this reason, the estimates in the chart are conservative.

Table 3 shows the weight of salt which should be incorporated to give any desired percentage of salt from 1·0 to 2·4. It will be noted that

TABLE 3.
SALT CONTROL CHART.

Boxes of Butter.	Pounds of Butter.	Pounds of salt to be incorporated to give—							
		1·0%.	1·2%.	1·4%.	1·6%.	1·8%.	2·0%.	2·2%.	2·4%.
10	560	6	7	8	9	10	11	12	14
12	672	7	8	10	11	12	14	15	16
14	784	8	10	11	13	14	16	17	19
16	896	9	11	13	14	16	18	20	22
18	1,008	10	12	14	16	18	20	22	24
20	1,120	11	14	16	18	20	23	25	27
22	1,232	12	15	17	20	22	25	27	30
24	1,344	13	16	19	22	24	27	30	32
26	1,456	15	18	21	24	26	29	32	35
28	1,568	16	19	22	25	28	32	35	38
30	1,680	17	20	24	27	30	34	37	41
32	1,792	18	22	25	29	32	36	39	43
34	1,904	19	23	27	30	34	38	42	46
36	2,016	20	24	28	32	36	40	44	48
38	2,128	21	26	30	34	38	43	47	51
40	2,240	22	27	31	36	40	45	49	54
42	2,352	24	28	33	38	42	47	52	56
44	2,464	25	30	35	39	44	49	54	59
46	2,576	26	31	36	41	46	52	57	62
48	2,688	27	32	38	43	48	54	59	65

1 lb. of salt per box will give 1·8 per cent. of salt. This figure may be taken as a basis for mental calculation, if an objective other than 1·8 per cent. is desired.

Table 4 is the moisture-control chart for use when the initial test ranges from 13·0 to 15·4 per cent. It is based on a final moisture of 15·7 to 15·8 per cent.

TABLE 4.
MOISTURE CONTROL CHART.

Boxes of Butter.	Pounds of Butter.	Pounds of water required to raise moisture to 15·7–15·8% when initial test is—												
		13·0.	13·2.	13·4.	13·6.	13·8.	14·0.	14·2.	14·4.	14·6.	14·8.	15·0.	15·2.	15·4.
10	560	15	14	13	12	11	10	8	7	6	5	4	3	2
12	672	18	17	16	14	13	12	10	9	8	6	5	4	2
14	784	22	20	18	17	15	14	12	10	9	7	6	4	3
16	896	25	23	21	19	17	16	14	12	10	8	7	5	3
18	1,008	28	26	24	22	20	18	16	14	12	10	8	6	4
20	1,120	31	29	26	24	22	20	17	15	13	11	8	6	4
22	1,232	34	32	29	27	24	22	19	17	14	12	9	7	4
24	1,344	37	34	32	29	26	24	21	18	16	13	10	8	5
26	1,456	41	38	35	32	29	26	23	20	17	14	11	8	5
28	1,568	43	40	37	34	31	28	25	21	18	15	12	9	6
30	1,680	47	43	40	36	33	30	26	23	20	16	13	10	6
32	1,792	50	46	43	39	35	32	28	25	21	17	14	10	7
34	1,904	53	49	45	41	38	34	30	26	22	19	15	11	7
36	2,016	56	52	48	44	40	36	32	28	24	20	16	12	8
38	2,128	59	55	51	46	42	38	34	29	25	21	17	12	8
40	2,240	62	58	53	49	44	40	35	31	26	22	17	13	8
42	2,352	65	61	56	51	47	42	37	32	28	23	18	14	9
44	2,464	69	64	59	54	49	44	39	34	29	24	19	14	9
46	2,576	72	66	61	56	51	46	41	36	30	25	20	15	10
48	2,688	75	69	64	59	53	48	43	37	32	26	21	16	10

A method of churning which has proved very satisfactory in some factories using these charts is outlined below. It is not suggested that these instructions are to be followed blindly, as certain makes of churn may be slower or faster working. In such cases, the times quoted should be modified in the light of experience, but on no account should the final working be less than 4 minutes; preferably, it should be longer than 5 minutes.

Butter-making Procedure.

The quantity of butter to be obtained from the churn should be known to within 1 box. Table 2, showing the number of boxes of butter obtainable from various quantities of cream, may be used for this purpose. It is better to slightly under-estimate the quantity of butter than over-estimate it.

Cream and wash water temperatures should be such as to allow at least 15 minutes' working. The times quoted in the following outline of procedure are based on 15 minutes' working and may therefore require modification.

Churn to a grain size which allows rapid and complete draining, using break water if desired.

Drain the grain butter *thoroughly*.

Close the drain cocks and add the quantity of salt obtained from the Salt Control Chart (Table 3). *Weigh* the salt.

Close the churn doors tightly and work for 8 minutes.

Drain off the brine, if any.

Work for 2 minutes to dry the churn and thus avoid an indefinite increase in moisture during the final working. A better and more representative sample of butter is also obtained for the initial test.

Take a representative sample of butter and test accurately for moisture (initial test).

From the Moisture Control Chart find the quantity of water required. *Weigh* out the required quantity of water and add to the churn.

Close the churn doors tightly and work for 5 minutes, or longer if necessary to finish.

Washing Dairy Utensils.

P. McCALLUM, Dairy Officer.

WHEN visiting farms it is surprising how often it is observed that the correct method of washing dairy utensils is not practised. One of the most common faults noticed is that dairymen wash up in very warm water only without first rinsing the utensils in cold water. The water used to start with is as hot as can be comfortably borne by the hands. This method of washing dairy utensils is entirely wrong, as hot water tends to form a film on the surface of the utensils, especially when provision is made for a final sterilization with steam or boiling water.

The principles underlying the proper cleansing of dairy utensils are very simple and easily understood. In the first place, it is necessary to know something of the nature and composition of milk. Milk is a very complex secretion consisting of at least 70 different substances, the chief of which are water, butterfat, lactose (or milk sugar), casein, albumin, and mineral salts.

The milk fat, casein, and some of the salts are held in suspension in the milk, while the albumin, lactose, and most of the salts are held in solution in the water.

The lactose and most of the salts are almost entirely rinsed away in the cold water, which will also remove part of the fat and proteins. Butterfat occurs in the form of very minute globules, and some of these adhere to the surface of the utensils and require heat and an emulsifying agent (such as washing soda or caustic soda) before they can be washed away. Of the two proteins (casein and albumin) albumin, which is practically identical with the white of an egg, is readily and permanently solidified by the action of heat. Casein is in suspension in fresh milk and gives milk its white appearance, but it can be coagulated by the action of acid or rennet to form a solid curd, the hardness of which is increased by heating. Both these milk proteins possess considerable adhesive properties (casein is used in the manufacture of paints and glues), and if the preliminary cold-water rinsing is omitted, they will stick firmly to dairy utensils where hot-water washing and steam sterilization will only harden them on to the surface. Once fixed on the surface, this film becomes the medium for bacterial growth, forming a protective

layer on which the sterilizing heat has no effect. Similar protection is given by a layer of fat in the form of grease. Another risk with greasy utensils is that if left out in the sun this grease or fat becomes oxidised and is capable of causing tallowy cream. Greasy utensils also are a perfect base for dust particles which are usually present around the separator rooms and bails.

No Short Cut to Cleanliness.

There is no short cut in thorough cleansing of dairy utensils. Cleansing may be divided into three distinct stages:—

1. *Cold-water rinsing.* All utensils should be well rinsed with cold water as soon as possible after use. This is very important, because milk once it is allowed to dry is much harder to remove.

2. *Warm water and Soda washing.* Washing soda or any of the commercial cleansers may be used. The main purpose of a cleanser is to emulsify the fat so that it can be washed away. A good stiff brush (NOT cloths) should be used on each part to remove any traces of milk or cream. The warm water used need be only warm enough to be comfortable for the person washing up. For milking machines, caustic soda at the rate of one heaped teaspoonful to four gallons of water may be used instead of washing soda.

3. *Sterilization.* The utensils are then ready for sterilization. Where a steam sterilizer is installed, sterilization is easily and effectively done. If no steam sterilizer is available, a twelve-gallon copper boiler (as prescribed in the Regulations) is very satisfactory for near-sterilizing the equipment, and the best way to achieve this is by immersing the utensils in the boiling water.

After-care of the utensils is necessary, of course, to prevent recontamination. All utensils and containers should be allowed to dry on a metal draining rack, which should be in a dust-free place; if practicable, the rack can be in a sunny position.

TO TELL THE AGE OF A HORSE.

To tell the age of any horse, inspect the lower jaw, of course; the six front teeth the tale will tell, and every doubt and fear dispel. Two middle "nippers" you behold before the colt is two weeks old, before eight weeks two more will come; eight months the "corners" cut the gum. The outside grooves will disappear from middle two in just one year; in two years, from the second pair; in three, the corners too, are bare. At two the middle "nippers"' drop; at three, the second pair can't stop; when four years old the third pair goes, at five a full new set he shows. The deep black spots will pass from view at six years from the middle two; the second pair at seven years; at eight the spot each "corner" clears. From middle "nippers" upper jaw, at nine the black spot will withdraw; the second pair at ten are white; eleven finds the "'corners" light. As time goes on, the horsemen know the oval teeth three-sided grow; the longer get, project before, till twenty, when he knows no more.

—*From the Live Stock Journal (England).*

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which qualified for entry into the Advanced Register of the Herd Books of the A.I.S., Jersey, Ayrshire, and Guernsey Societies, production records for which have been compiled during the months of December, 1945, and January, 1946 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.).				
College Raceme	Queensland Agricultural High School and College, Lawes	9,243·1	396·782	Dulcimah Disraeli
White Park Polly 19th	W. T. Savage, Barnesmore	9,884·4	391·141	White Park Ronald
White Park Victoria 2nd	W. T. Savage, Barnesmore	8,932·45	387·202	White Park Ronald
Euroa Streamline 2nd	P. R. Emery, Dallarnil	8,694·75	363·346	Railway View Fussy's Banker
Rhodesview Beauty 20th	W. Gierke and Sons, Helidon	7,483·7	357·334	Fairvale Major
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Trevor Hill Una 2nd	Sullivan Bros., Pittsworth	11,980·79	503·476	Rosenthal Musketeer
Fairvale Minerva	W. Henschell, Yarranlea	11,825·84	498·032	Fairvale Czar
Fairvale Ethel 6th	W. Henschell, Yarranlea	10,428·39	468·227	Corunna Supreme
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
College Kitty 6th	Queensland Agricultural High School and College, Lawes	6,959·55	338·909	Dulcimah Disraeli
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Eiroa Princess 6th	P. R. Emery, Dallarnil	7,761·	329·598	Dnalwon Sceptre
Valera Bonny 7th	Sullivan Bros., Pittsworth	7,898·91	306·391	Valera Daphne's Prince
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Alfa Vale Laura 6th (365 days)	W. H. Thompson, Nanango	16,528·05	731·761	Penrhos Pansy's Pride
Alfa Vale Lovely 17th (365 days)	W. H. Thompson, Nanango	15,135·2	560·125	Penrhos Pansy's Pride
Jamberoo Daisy 6th	A. H. Webster, Helidon	6,977·5	303·158	Murray's Bridge Florrie's Prince
Penrhos Maggie 13th	A. H. Webster, Helidon	6,465·65	289·529	Penrhos Pansy's Prince
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Trevor Hill Primrose 6th	G. Gwynne, Umbiram	7,775·65	326·618	Alfa Vale Reflex
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Alfa Vale Queenie (365 days)	W. H. Thompson, Nanango	10,293·25	421·882	Reward of Fairfield
Jamberoo Reddie 11th	W. Henschell, Yarranlea	7,591·5	334·741	Murray's Bridge Florrie's Prince
Ardilea Nellie 4th	W. Hinrichsen, Clifton	7,575·	312·052	Newstead Reliance
Navillus Daphney 5th	Dr. A. D. McKenzie, Kaimkillenbun	7,227·5	260·383	Greyleigh Eros
Sunbridge Lady Myrtle	A. Bradford, Yangan	5,951·7	249·729	Sunbridge Umpire

JERSEY.

Mature Cow (Standard 350 lb.).

Glengariffe Cunning Flora	J. J. Ahern, Conondale	7,290·7	412·249	Glengariffe Cunning Fenian
The Meadows Golden Columbine (251 days)	A. L. Semgreen, Coolabunia	7,884·55	404·342	Woodside Golden Count
Ashview Eva	C. Huey, Sabine	6,893·15	384·87	Trecarne Butter Queen's Officer

Junior, 4 Years (Standard 310 lb.).

Westbrook Tulip 115th	Farm Home for Boys, Westbrook	9,839·1	477·995	Orphanage Count
Brookland Cunning Drop	W. S. Conochie, Sherwood	8,770·	427·53	Englorie Cunning Victor

Senior, 3 Years (Standard 290 lb.).

Lawn View Hopeful	W. A. Berderow, Fairney View	7,401·69	412·512	Oxford Buttercup Peer
Woodview Joybell	P. H. Schull, Oakey	5,962·15	314·823	Lermont Victory

Junior, 3 Years (Standard 270 lb.).

Westbrook Tulip 122nd	E. Harmer, Beaudesert	8,441·3	393·289	Selsey Royal Standard
Navua Elfa's Victorine	C. A. Edwards, Alderley	7,918·21	370·721	Navua Victores Ruler
Boree Cute Lily	W. and C. E. Tudor, Branch Creek	5,657·04	318·939	Trinity Cute Commodore

Senior, 2 Years (Standard 250 lb.).

Oxford Marionette	Burton Bros., Wanora	7,450·	422·14	Oxford Brulad
Rosalie Midget	G. V. Tilley, Beaudesert	6,293·85	307·665	Rosalie Repulses's Dreamer
Oxford Jill	Burton Bros., Wanora	6,940·04	293·612	Oxford Ajax

Junior, 2 Years (Standard 230 lb.).

Romsey Duchess 2nd	J. Wilton, Killarney	6,315·9	332·975	Oxford Pixie's Victor
Peeramon Pretty Bloom	N. Harris, Ravenshoe	6,708·8	332·394	Trinity Popcorn 2nd's Pioneer
Glenrandle Butter Queen	P. Kerlin, Killarney	5,428·1	299·422	Bellgarth Stylish
Lermont Madeira 2nd	G. Tilley, Beaudesert	6,122·15	289·252	Selsey Samare's Hallmark
Glenrandle Goldenette	P. Kerlin, Killarney	5,267·3	285·013	Bellgarth Stylish
Navua April Dawn	C. A. Edwards, Alderley	5,565·3	274·963	Dreamer's Hampton Star
Glenrandle Leda	P. Kerlin, Killarney	7,679·25	260·135	Bellgarth Stylish
Peeramon May	N. Harris, Ravenshoe	4,570·35	259·01	Trinity Segunda's Prince
Woodview Safety	P. H. Schull, Oakey	4,372·15	252·354	Lermont Commander

AYRSHIRE.

Mature Cow (Standard 350 lb.).

Crescent Farm June	N. J. Mann, Broxburn	10,522·94	426·419	Crescent Farm Pride's Colin

Senior, 3 Years (Standard 290 lb.).

Crescent Farm Isobel 3rd	N. J. Mann, Broxburn	9,081·9	367·618	Myola Orphan Boy

Junior, 2 Years (Standard 230 lb.).

Leafmore Sophie's Gem	J. P. Ruhle, Motley	5,845·45	237·994	Leafmore Grischa

GUERNSEY.

Junior, 2 Years (Standard 230 lb.).

Laureldale Polly	W. A. K. Cooke, Witta	6,012·5	301·474	Minnamurra Topsy's Sequel

Identification of Pigs.

Contributed by the Pig Branch.

IN Queensland, the law compels the proper identification of all pigs offered for sale or for disposal in any other way; therefore every person interested in the sale or purchase of pigs should be conversant with the various systems of identification of pigs. In the *Regulations* under the *Pig Industry Act* of 1933 it is set out clearly that every pig offered for sale, barter or exchange shall be branded by the vendor with a body tattoo marking, or other approved method of branding. In the case of suckers, weaners, stores, or other pigs not intended for immediate slaughter, ear-tattooing, or ear-marking is an approved method of branding; but such branding must be done within seven days prior to the disposal of pigs by sale or otherwise.

MARKING SYSTEMS.

Among systems of identification of pigs in regular use in Queensland are:—

Firebranding;
Body-tattooing;
Earmarking (inclusive of use of ear tags) and ear buttons;
Ear-tattooing;
Paint and hair-clip marking (including cutting of hair on tail—i.e., bang-tail).

Firebranding.

For marking live pigs, firebranding has been in use throughout the world for many years and is used frequently by farmers here, especially by those who are not conversant with or in favour of other systems.

While there are many objections to identifying pigs by the use of a redhot iron brand, the system has its place and doubtless will continue to be used. Efficient firebranding has the advantage that it is a method of marking live animals as well as carcasses. In itself this method is effective if carefully applied with a suitable brand which is not overheated, or held too long, or pressed too deeply on the pig, as it results in a clear and legible skin and body mark. It is the abuse of firebranding which brings it into discredit, and it is often abused, as many otherwise suitable carcasses have to be degraded or rejected because of excessive and cruel firebrandng.

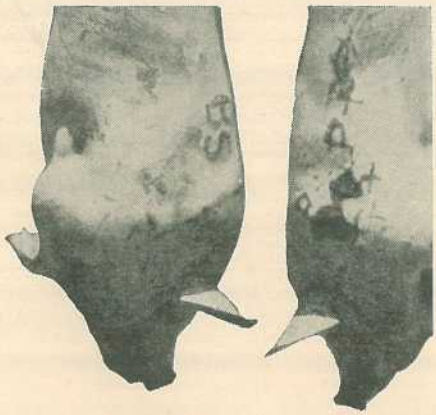


Plate 48.

A CLOSE-UP OF BACON PIG CARCASSES BRANDED IMPROPERLY AND MUCH REDUCED IN VALUE.—The use of a firebrand, an instrument which may be used in the identification of carcasses if properly heated and handled, may easily be nullified unless the work is carefully performed.

Plate 49.

It is an offence under the *Queensland Pig Industry Act* to illtreat a pig. Here is one result of excessive firebranding; also these brands have been placed in a most unsuitable position and are unnecessarily large.

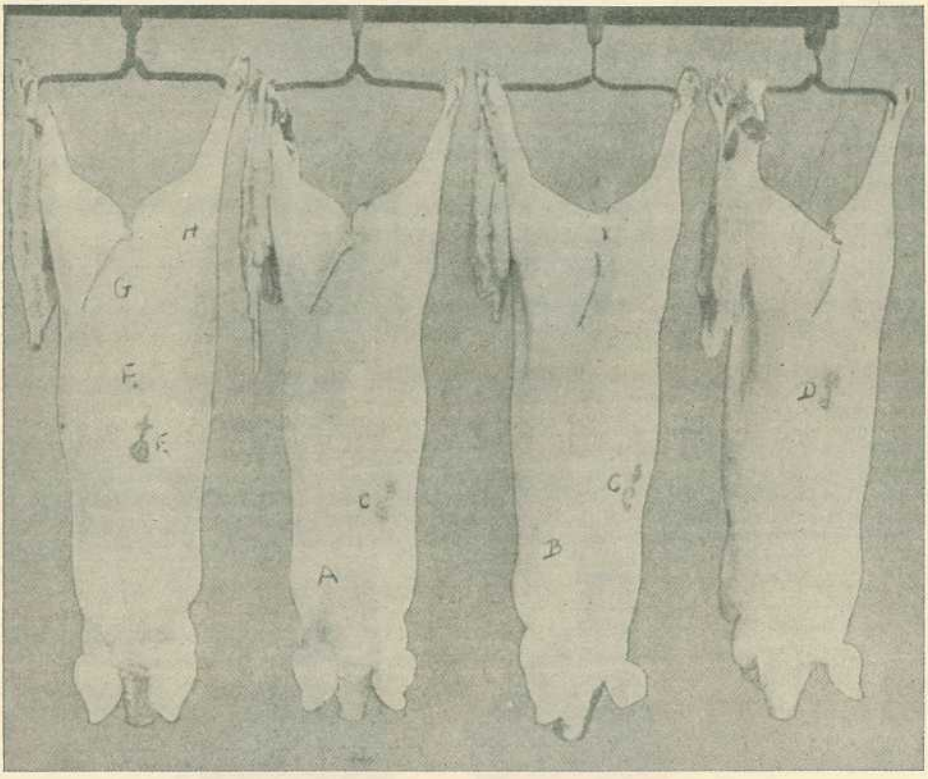


Plate 50.

AS IT IS IMPRACTICABLE TO ILLUSTRATE THE USE OF THE FIREBRAND ON A LIVE PIG THIS ILLUSTRATION IS USED TO INFORM FARMERS OF THE RELATIVE MERITS OF DIFFERENT POSITIONS FOR THE BRAND.—"A" is the position preferred by bacon curers, and is referred to as "off the top of the shoulder yet not too far down side." "B" also is a good position for firebrands or tattoo; there is a risk in this position, for if the animal moves quickly during branding the brand may slip and blur. "C" is not a good position, its situation along the centre line of the back results in the disfigurement of the mark in the process of dressing the carcass. "D" is decidedly objectionable. "E" is even more objectionable. The positions marked "G" and "H," or any other position on the loins or hindquarters, are also most objectionable and result in the carcass being degraded. Where pigs have a heavy coat of hair, it would be preferable and much more effective to clip the hair off the spot before applying the firebrand.

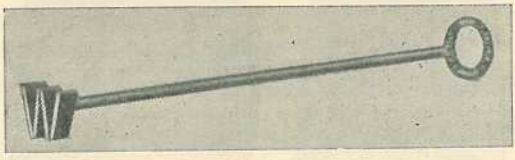


Plate 51.

FIREBRANDING OF PIGS, UNLESS DONE VERY CAREFULLY, IS AN OBJECTIONABLE METHOD OF IDENTIFICATION.—Where the firebrand used is of a suitable pattern its use in the identification of live pigs submitted for sale or on mature animals intended for slaughter after sale is permissible. This type of firebrand, manufactured especially for the purpose, is the only type recommended: it leaves a small, neat, and distinct mark if properly applied.

Suitable copper firebrands last longer than iron brands, although somewhat more expensive. The price varies according to design of letters or symbols. Only brands made specially for marking pigs should be used and of a size not exceeding $1\frac{3}{4}$ in. by $1\frac{1}{4}$ in. overall.

Firebranding has one special advantage in that it is used to identify live pigs belonging to various owners of mixed consignments to sale-yards and bacon factories, consignments in which the body-tattooing of carcasses would not be sufficient. In some instances, however, ear-marking of such pigs could be used to advantage and with less objection than firebranding.

Where properly applied, firebrands on pigs will be legible for about two months, but afterwards they become difficult to decipher either on the live animal or on the carcass.

Body Tattoo-marking.

Tattooing is the best and most practical way of marking for the identification of pork and bacon pig carcasses. In recent years this method has been generally adopted by bacon curers and pork exporters in Queensland. Correct identification of carcasses is, of course, necessary in the treatment of pigs by factories, especially where payment is made on a basis of official grading. Moreover, it is necessary to identify owners of pig carcasses in order that refunds or non-payments may be correctly adjusted where, on slaughter, carcasses or parts are condemned as unfit for human consumption. Body-tattooing is particularly valuable in thus identifying ownership, and also in providing necessary information in tracing disease to the place where it originated.

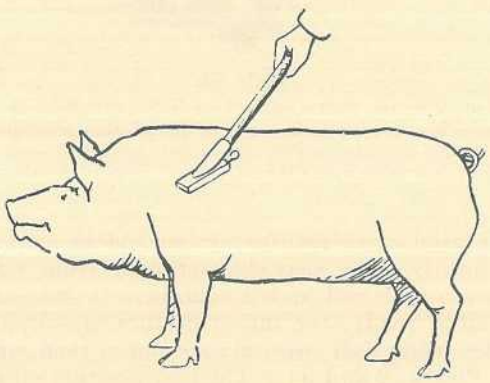


Plate 52.

THE PIG-BODY TATTOO SHOWING POSITION FAVOURED FOR THE IDENTIFICATION MARK ON THE CARCASS.—This instrument is supplied by manufacturers complete with nickel-plated headpiece and wooden handle. The numerals are mounted in polished aluminium blocks, the positions being altered in a few seconds by means of an adjusting screw. Spare numerals and dummy blocks may be ordered; tattoo ink or paste is supplied in quantities as required. If carefully handled, the one set of letters and numerals should be satisfactory for many years.

This method of identification has been thoroughly tested and has given general satisfaction, but the measure of efficiency is entirely dependent on the care used in handling the instrument and the provision

of enough suitable ink or paste. The quality of the paste or ink used is very important. Of several preparations which have been subjected to experiment in Queensland, four stand out as being superior to all others. They are:—

Indian marking ink (blue or black).—This pigment, while more expensive than the others, is probably the most efficient and adaptable, and in actual use is very easily applied.

"Zebra" stove polish in paste form has given excellent results, as has liquid stove polish sold under the trade name of "Zebo."

Sherwin-Williams' black paint in oil has been used extensively by the proprietary bacon factories with satisfactory results.

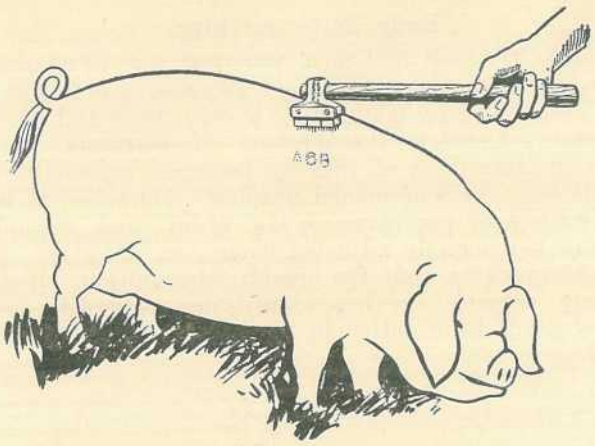


Plate 53.

THE "TWO-WAY TATTOO PIGMARKER," IS CONSTRUCTED TO WITHSTAND HARD AND CONSTANT USE.—The headpiece is made of aluminium with steel-pointed needles, the wooden handle being adjustable for use in two positions—one permitting use in hammer fashion, the other with spear-thrust action. The illustration portrays position for branding.

These preparations are readily procurable in country centres. If not obtainable locally, they may be obtained from city firms. It is necessary to have a soft pad and a container to hold the paste, paint, or ink. When all is ready, the tattoo needles are dipped in the paste or ink, the needles being well covered; the pig is then struck firmly with the marker (*see* Plates 52 and 53). The best position on the body for the tattoo mark is on the shoulder just off the top and slightly below top of neck. A sharp blow is required in order that the needles will penetrate the skin, and after each pig is marked the needles should be again covered with paste or ink. Actually, although the needles are sharp and the blow heavy, the pig does not feel much pain and apparently does not suffer injury, for it is very rarely that even a slight bruise is noticeable after slaughter if tattooing is done properly.

It is stressed again that this system of body-tattooing is not recommended as a means of identification of live pigs—not even of white-skinned pigs. Its value lies in the legibility of the tattoo mark on the

carcass, the ease with which the tattoo mark may be read and the fact that its application does not result in disfiguration or other injury. It also is stressed again that the efficiency of tattooing as a means of identification depends on—

(1) The effective use of the tattooing instrument;
(2) The use of an instrument of a reliable type with strong, sharp needles;
(3) Taking time to do the job properly; and
(4) The use of a reliable brand of ink, paste, or paint.

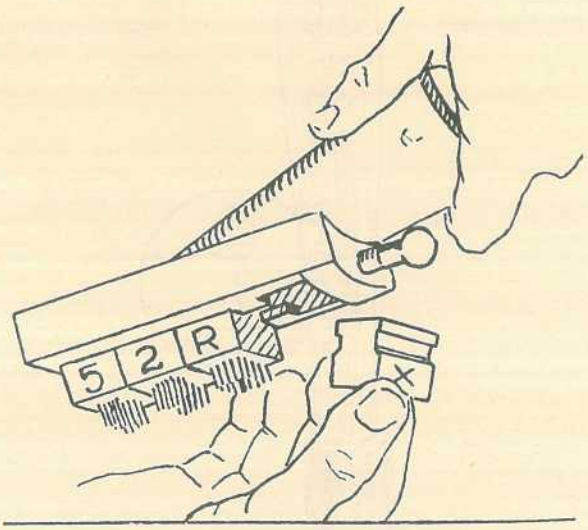


Plate 54.

ILLUSTRATES METHOD OF INSERTING NUMERALS OR LETTERS IN BODY-TATTOO INSTRUMENT; ALSO SHOWS METAL SCREW FOR ADJUSTING POSITION OF BLOCKS.

When Marking should be Done.

As the law places the responsibility of identification on the vendor, whether he be farmer, agent, dealer, or manufacturer's representative, it is essential that the pigs be identified before sale or delivery. Therefore, the pigs should be marked on the farm prior to despatch or be identified by the agent (1) when being weighed over the scales at the railway siding or loading-place, (2) when being penned for sale, or (3) when received for consignment direct to factories. The law also makes it compulsory for persons who handle pigs to keep proper records.

This is prescribed by the *Pig Industry Act* as follows:—

> Every agent, auctioneer, dealer, factory, or butcher shall keep a record in respect to every transaction in pigs with which he is concerned.
>
> Such record shall include the date, the number, description, and distinguishing marks of such pigs, the name and address of the vendor, and the name and address of the purchaser, and such other particulars as may be prescribed.

Such information shall be made available to an inspector upon request by the inspector to the auctioneer, agent, or dealer, as the case may be.

Plate 55.

SHOWING HANDLE OF "TWO-WAY TATTOO PIGMARKER" IN POSITION FOR USE WHERE PIGS ARE CRATED OR IN A POSITION UNSUITED FOR USE OF THE INSTRUMENT, AS ILLUSTRATED IN PLATES 52 AND 53.

Where Marks should be Placed.

In all systems of identification it is essential that while being marked pigs should be confined in a small pen or race, or that they should be marked in the vehicle—if such vehicle is convenient for the purpose—in which they are to be transported. Where there are no conveniences and the person identifying the pigs is inexperienced, it should be practicable, in order to avoid duplication of tattoos, to attach a small pad soaked in ink or paste to that portion of the hammer head of instrument not fully occupied by letters or numerals, this merely to leave a paint mark on hair of the pigs as they are marked, for on black pigs in particular, the animal may be marked twice in the same position unless some such precaution is taken.

After pigs have been slaughtered and de-haired the tattoo letters or numerals show clearly in the form of black dots, such tattoo marks being legible even if the pigs had been tattooed several weeks beforehand. In the body-marking of pigs with tattoos there is no necessity for any preparatory treatment of area on which the tattoo is to be applied, except that the area should be clean and free from accumulations of mud. The instrument should be kept clean, and sufficient ink or paste should be used, otherwise the results will be unsatisfactory. Farmers not conversant with this method should attend at pig sales where tattooing is carried out. When visiting a bacon factory or meatworks, inquiry should be made from the management as to results of these several systems of identification.

Plate 56.

SHOWING OPERATOR USING THE BODY-TATTOO INSTRUMENT; NOTE POSITION APPROVED FOR MARKING PIGS.

EARMARKING.

The branding or marking of individual pigs in a herd is of great importance to the farmer, more particularly where the animals graze and roam over large areas, or if there is a risk of their becoming "boxed" with a neighbouring herd.

No system of identification is perfect, but for the identification of live animals both earmarking and ear-tattooing are practical and readily applied. It is obviously very important that the brand or earmark be recorded in a suitable record book at the time that the marking is done, otherwise the reliability of any system is weakened.

The earliest age at which an identification mark becomes necessary in pig breeding is between one and two months. Where sows and litters have individual pens, two months is about the right age. Earmarking may also be done when the litter is weaned, or where the castration of male pigs is carried out at six weeks. Every litter should be marked and correct records kept in the sow's farrowing and stock sales record book. Earmarking is probably the commonest and the most satisfactory method of marking for stud stock, but it has the disadvantage that when pigs fight or tear their ears on wire fences, or where the ears are damaged in dehairing machines at the factory, this identification mark may be marred or destroyed. The operation of earmarking is performed with earmarking pliers, of which there are numerous designs.

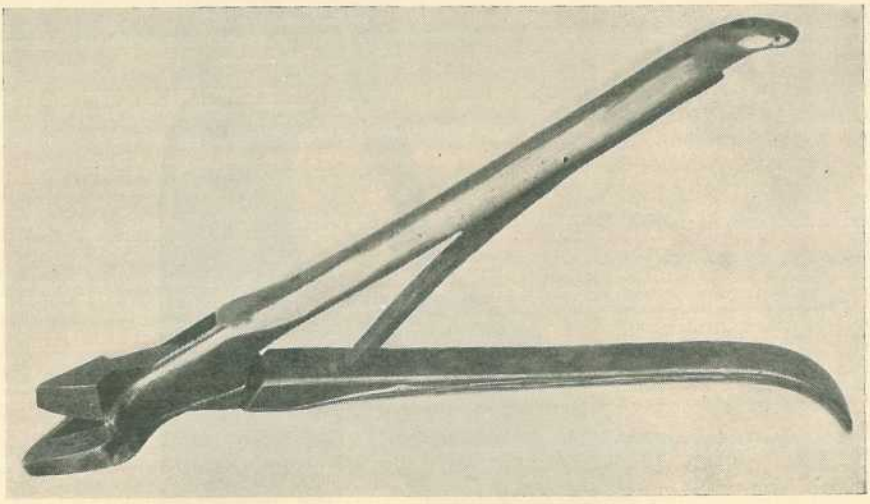


Plate 57.

TYPE OF EAR PLIERS USED IN THE EARMARKING OF PIGS.—These metal pliers, if carefully handled, last for many years.

Pigs of all ages may be earmarked but, as stated, it is preferable to mark while pigs are very young. Stud pigs should always be marked so that their breeding and ownership can be readily determined. Newly purchased pigs should be marked immediately they are brought into a stud, to avoid confusion if they should become mixed with other stock.

In Queensland, no provision is made for registration of pig brands or earmarks, but it is compulsory to identify animals before sale.

Stud pig breeders whose stock are registered in the Australian Stud Pig Herd Book should mark their animals as required by the rules of the Australian Stud Pig Breeders' Society. So long as the pigs are identified satisfactorily and are marked with an approved brand or mark, legal requirements would be satisfied.

Care should be taken in using ear pliers in marking pigs—first, to see that the pliers have been properly cleansed in a disinfectant solution; secondly, to see that the ear has similarly been cleansed, and also to avoid cutting into the larger blood-vessels near the edge of and towards the back of the ear. It is wise also to avoid cutting too close to the tip of the ear, especially in stud pigs, as the shape and carriage of the ears may be disfigured. In young pigs a small cut only is necessary.

A word of caution is necessary about earmarking pigs, for at times sows, especially, become savage and may tear the ears of other pigs—young pigs particularly. Such sows should be separated from the herd and be finished for slaughter, as they cause unnecessary loss, damage, and confusion. It is wise also to confer with the manager of the bacon factory or pork export works before deciding on an earmark for factory pigs, as there is a risk of duplication of marks. The factories would probably prefer body tattooing or firebranding instead of earmarking or ear tattooing.

When breeding sows are being marked, the mark should be recorded with the pedigree or record of purchase or birth. Additional particulars as to age, colour, any particular markings, or other details, should be recorded at the same time to assist in identification if necessary.

A Satisfactory System of Earmarking Pigs by Notches in the Ears.

For this system of ear marking unit numbers 1 to 9 are placed in right or off ear, and tens (10 to 90) in the left or near ear.

As the position of the notch on the ear determines its value, it is important that positions 1 and 10 and 4 and 40 be kept well towards the bottom and the tip of the ear respectively, to prevent confusion with the positions 2 and 20 in the middle of the ear.

KEY.

Right Ear—Units. Left Ear—Tens.

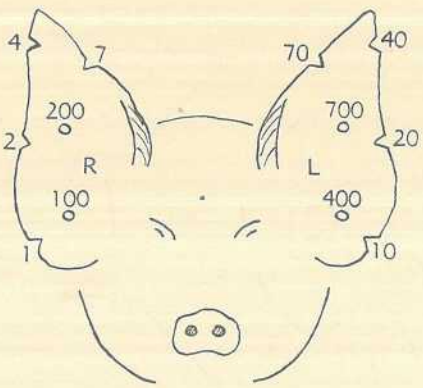


Plate 58.

The Key or Guide of Ear-Marking System.

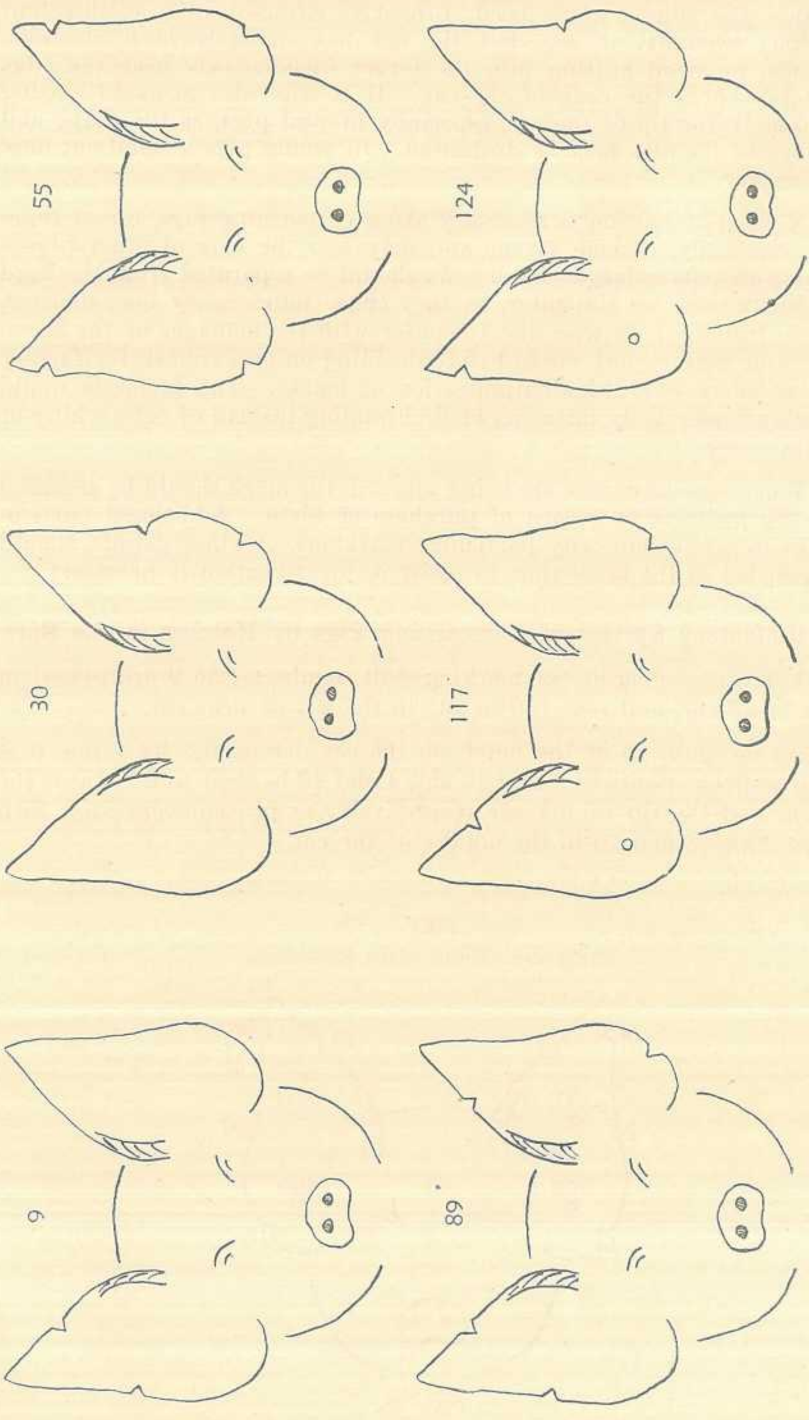


Plate 59.
ILLUSTRATIONS TAKEN AT RANDOM.

Ear-tattooing.

Members of the Australian Stud Pig Breeders' Society who breed Large or Middle White pigs are compelled by that organisation to use the ear tattoo for the identification of their stud pigs, this method having proved to be reasonably reliable for that purpose in white-skinned breeds. As with the body-tattooing, the secret of success lies in the careful application of the tattoo marks, and use of good quality ink or paste.

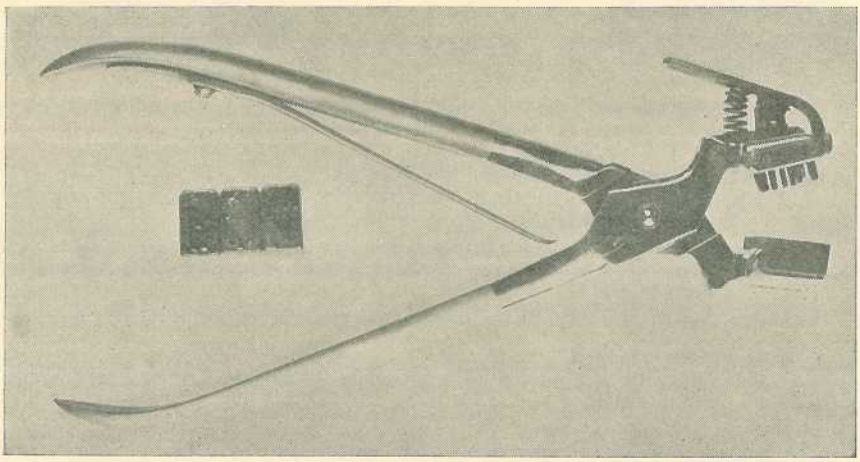


Plate 60.

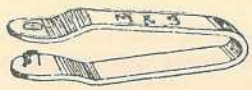
TYPE OF EAR-TATTOO INSTRUMENT HOLDING THREE INITIALS, ⅜-INCH, SUPPLIED WITH ONE SET OF NUMERALS.—It is recommended that initials should be used in one ear and numerals in the other. The smaller type needles are preferred in marking very young pigs, a larger type being more suitable for pigs over six months of age.

Tattooing has the advantage that it is practically indelible. Only the inefficiency of the person using the instrument, or the ears being torn or disfigured, can reduce this advantage. In the case of stud pigs, it may be necessary to re-tattoo the ears, as required, if the mark becomes too faint. Care should be taken in tattooing the ears to see that both the ear and the instrument are perfectly clean before the operation is performed, otherwise septic trouble may result and a fibrous wart growth set up around the mark. Next to cleanliness, it is important that the needle blocks be firmly placed in the jaw of the pliers, as the animal may pull back suddenly when pressure is applied. The area to be punctured should first be cleansed by wiping over with a cloth soaked in methylated spirits (this removes grease); then the marking ink or paste should be rubbed on, and, after piercing the ear with the tattoo instrument, the ink or paste should again be rubbed into the perforations made by the needles. If pigs are to be tattooed with the owner's initials as well as a stud number, one mark should be placed in each ear. The year in which the animal was born may also be placed in the form of a letter; thus in pigs the right ear may carry the owner's initials, and the left ear may show the year symbol and number, thus: A 365—i.e., pig born in 1946 number 365. In animals with a very heavy coat of hair on the ears, it may simplify the marking to first clip off the hair and then clean and apply the mark.

The necessity for quick and efficient work in tattooing and the use and application of reliable brands of ink or paste is stressed.

Ear Tags or Buttons.

The use of ear tags or buttons on stud animals to be transported by road or rail or shipped from place to place is to avoid risk of their being lost in transit, misdelivered, or overcarried. The tags, made of



Open.

Locked.

Plate 61.

METAL EAR TAG OPEN AND CLOSED.

Advantages claimed for aluminium ear tags are:—

Suitability for any class of stock, simplicity of design, ease of insertion, and durability.

Aluminium, being a non-corrosive metal, will not rust, hence there is little risk of any infection of that portion of the ear into which they are inserted.

Space for both initials as well as numerals.

Disadvantages are:—

Liability to be pulled or torn out when the animal fights or rubs against wire netting, and consequent unreliability as a permanent identification.

Their special use is for identifying stud animals in transit or in research work for identifying different members of a group or litter.

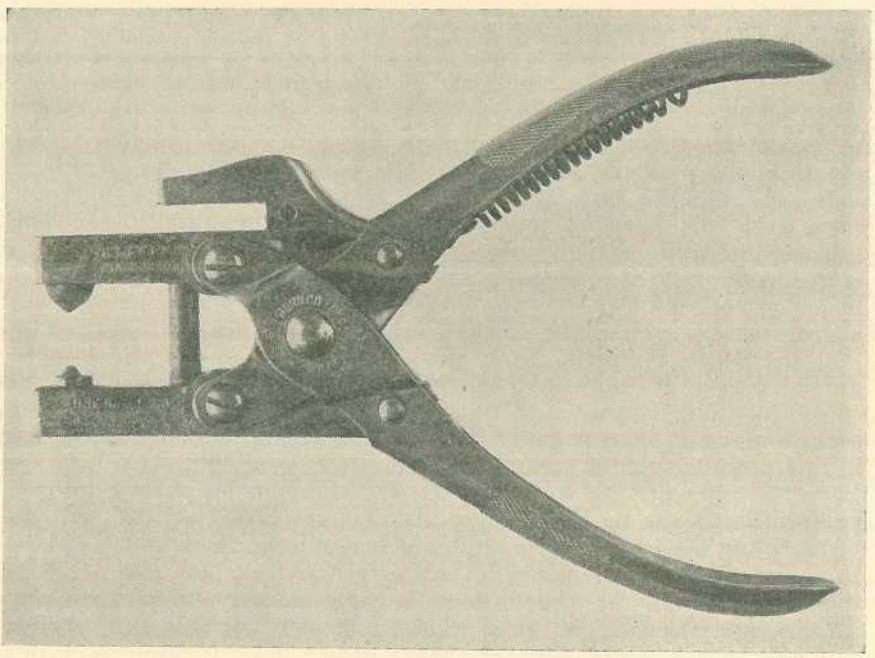


Plate 62.

COMBINATION PLIERS.—For piercing ear and sealing aluminium ear buttons or ribbon tags.

aluminium, may be initialled on one side with the name, initials, or symbol of owner, and numbered on the other. An objection to the use of ear tags is that they may be lost or, in the case of theft, replaced by another of the same type but with different lettering. All tags are subject to being pulled or torn out or to be crushed, mutilated, or disfigured to such an extent as to be unreliable as a means of identification. If not properly inserted, the ear tag may disfigure the ear, and may even cause a festering wound around the tag hole. This is especially the case if the hole into which the tag is inserted is too small or is jagged or if unclean pliers or unclean tags or buttons are used. The method of applying the ear tag by use of combination pliers is that one portion of the instrument is used to punch a hole in the ear into which the tag fits. The other portion of the pliers is to seal the tag.

Hair-clip Marking.

Marking pigs by clipping away the hair on any particular portion of the body is at best merely a temporary sale mark; so also is paint-marking and the cutting of hair on the tail (bang-tailing). Paint-marks are useful once pigs are penned in a saleyard in order to differentiate between the animals and for reference purposes, but they cannot be regarded as an approved method of branding under the *Pig Industry Act*. Both systems are useful in the hands of honest people, but a very strong objection to their use lies in the fact that an unscrupulous person could readily disfigure the mark and thus cause confusion and annoyance.

The aim is to ensure reliable methods of identification; hence as paint-marks, hair-clipping, and banging tails are unreliable as a permanent method of identification, they cannot be recommended. They are not legally acceptable under the *Pig Industry Act*, but if pigs are so marked at sale time the salesman should keep a strict record of them as provided for by law.

Conclusion.

Summarizing these notes it is emphasized that it would be advantageous to all concerned if all live pigs are branded by the vendor prior to the disposal of the animals. It is essential that whatever mark is used it should be used effectively, so that the animals are clearly and evenly branded. The next important thing to do is to advise the agent, dealer, buyer, or factory manager of the exact number, age, and condition of pigs, the marks given to each animal, and any other description which may be necessary to facilitate identification, and to ensure that the person concerned receives this information in ample time to enable identification to be observed and recorded expeditiously on delivery of the pigs at their destination.

Incubation—Importance of Nutrition.

P. RUMBALL, Officer in Charge, Poultry Branch.

DURING the war period many enquiries were made by hatchery owners and others as to the cause of poor hatching. The experience of many during the 1945 hatching season was so serious that it was decided to make a survey of as many hatcheries as possible in the Brisbane area.

The survey extended over the operations of 38 hatcheries. Enquiries were directed along the following lines:—

(1) Percentage of chickens from all eggs set;

(2) The nutrition of the parent stock.

Temperatures and humidity were not taken into consideration, as all hatchery owners are experienced and had operated their plants successfully in previous years.

The survey indicated that in many instances where highly satisfactory hatches were being obtained from the eggs of the flock associated with a hatchery, the hatches from eggs that were being custom-hatched were exceptionally poor. Again, with hatcheries which were experiencing poor hatches from the eggs from the associated flock, particularly good results were being obtained from some eggs that were being custom-hatched.

The foregoing points very definitely to a weakness in the eggs of the parent stock. This could be due either to poor stock, or to stock not receiving a ration carrying the necessary nutrients for the production of eggs which, when fertile, will permit of the proper development of the embryo and hatching of a sound chicken.

In order to impress on poultry raisers the importance of correct nutrition, the following table has been prepared. In its preparation only the results from flocks associated with hatcheries have been taken into consideration:—

Average per cent. Hatch of all Eggs Set.	Classification of Hatching Results.	Number of Hatcheries.	Total Capacity of Hatcheries per 3 Weeks.	Value Chicks at £3 per 100.	Value of Chicks Lost as compared with Hatcheries Classed as Good.
				£	£
72	Good ..	17	188,400	4,068	..
59	Medium ..	12	140,000	2,478	546
45	Poor ..	9	106,200	1,434	858

The table shows that in the medium group twelve hatcheries each lost chickens to the value of £45 per three weeks when compared with those classed as good, and the group classed as poor, £95 each per three weeks.

The nutrition of flocks varied in all cases and because of the difficulty in obtaining feeding material was not constant in any instance over a sufficiently long period to make any comparison. The prospect of having a plentiful supply of various types of feeding material this year is not bright; therefore the usual practice of feeding a wide variety of foodstuffs, which is a general safeguard against faulty nutrition, is not possible. Considerable research has been made in relation to poultry nutrition and advantage has to be taken of this work to assure that the rations supplied carry all the essential ingredients for good hatchability.

The effect of diet on the chemical composition, nutritive value and hatchability of the egg has been the subject of recent investigation. It was formerly considered that the composition of eggs was nearly constant, but it is now realized that one egg may differ from another in both physical and chemical properties. From the commercial standpoint, it has been shown that variations in such physical characteristics as strength of shell and ratio of thick to thin white will determine the transport and storage capacity of the egg.

The fact has long been recognised that satisfactory hatching cannot be obtained from eggs of birds whose only source of protein is of vegetable origin, but as meat meals are used to build up the protein levels of rations, and not protein-rich foods of vegetable origin, the shortage of proteins of animal origin should give no concern to the hatcheryman. Vitamins A, B1, D, E, and G, plus minerals, are of outstanding importance, and for satisfactory results must be fed in sufficient quantities. It has been established by investigators that, although it is possible to obtain good egg production with smaller quantities of vitamins than are recommended here, satisfactory hatching results would not be obtained from these lesser quantities.

Vitamins.

Vitamin A.—In recent years the vitamin A requirements of poultry have been extensively studied, and it is possible to state both the approximate minimum requirements and the approximate optimum level intake. The minimum requirements are about 700 international units per lb., and the optimum level is about 1,450. More than this can be fed without any harmful results, and when this can be done without increasing the cost of feeding it is recommended. Turkeys require from 2 to 2½ times as much as growing chickens, therefore the requirements of turkeys are 3,630 international units per lb. of feed, but one authority recommends feeding a ration containing 4,720 international units per lb. of feed for the production of eggs that will give a good hatchability.

Vitamin B1.—Research workers generally conclude that a deficiency of vitamin B1 will reduce hatchability, but as a rule enough of this vitamin is present in most diets fed to breeding stock. In ordinary practice, it has been found that when ground whole grains and grain offals are fed to breeding stock, eggs are probably supplied with enough of vitamin B1 to assure reasonable hatchability. The deficiency of this vitamin has been pronounced during recent years in the rations supplied to chickens and growing stock. This is doubtless due to a shortage of

mill offals, and breeders who are preparing their own mashes should conserve as much offal as possible for baby chickens.

Vitamin D.—Vitamin D is essential to hatchability. This vitamin can be provided by allowing the birds direct access to sunlight, or supplying them with fish oils.

Vitamin D aids the assimilation and utilization of calcium and phosphorus, thereby improving the quality of the shell of eggs. It is essential to good hatchability. If fowls have sufficient exposure to sunlight, there is little likelihood of trouble developing from the lack of this vitamin as the ultra-violet rays of the sun penetrate the exposed layers of the skin, enabling the bird to manufacture enough vitamin D for ordinary requirements. Cloudy conditions make the supply of this vitamin uncertain, and in winter the ultra-violet rays from the sunshine are not as effective as in summer. If available, it is considered that breeders should be supplied with some supplementary source of this vitamin.

It is interesting to note that some investigators have found that, while 67 international units of vitamin D per 100 grams of food are sufficient for good egg production, 135 units of vitamin D per 100 grams are required for good hatchability. One authority, however, recommends 540 international units per lb. of feed.

Vitamin E.—Although vitamin E is essential for hatchability, and embryonic mortality in the first week might be attributed to its deficiency, there is no reliable data on the quantity of vitamin E necessary, and on the available evidence most poultry diets contain enough to support good hatchability. In the event of embryonic mortality during the early hatching period, wheat germ meal or mill offals would be the most fruitful source of supply.

Vitamin G (Riboflavin).—Many research workers have observed a direct relationship between the riboflavin content of the diet and that of the egg, and it has been established that the hatchability has a direct relationship to the amount of riboflavin within the egg. It has been ascertained that in a period of three weeks a ration in which the riboflavin content is decreased below the essential level, hatchability has decreased accordingly. Riboflavin deficiency in young chickens has been somewhat prevalent during recent years. It manifests itself by the chicken moving on its hocks with the toe turned inward—"curled toe."

The best sources of riboflavin are milk products, liver, and green-food. Of this vitamin, 1,110 microgrammes per lb. are required to obtain satisfactory reproduction.

Minerals.

Calcium and Phosphoric Acid.—Although calcium carbonate is essential for the maintenance of hatchability, it has been found that too much calcium may adversely affect hatchability, and that there should be a correct ratio between the phosphate and calcium content. A satisfactory level of phosphorus intake is ·7 per cent., but many rations contain more than this, and one authority recommends that rations should contain not less than ·7 per cent. of phosphorus, and that the calcium content should be adjusted so that there is about 1·6 times as much calcium as phosphorus. (This figure is approximate if bone is the source of lime.)

Manganese.—The optimum quantity of manganese in a diet is about 50 parts per million. Many diets commonly fed do not contain this amount of manganese, and a deficiency should be guarded against. It is recommended as a safeguard against manganese deficiency that in all mash diets ½ per cent. of a mixture of 100 parts of salt and 1·7 parts of anhydrous manganous-sulphate or ½ per cent. of a mixture of 100 lb. salt and 2½ lb. manganese sulphate tetrahydrate be included, but where a laying mash or a growing mash is fed in conjunction with grain, 1 per cent. of either mixture should be used. This mixture also supplies the salt requirements of poultry.

Comparison of Rations.

In the survey in the Brisbane area referred to, it was pointed out that enquiry was made as to the rations fed, but that they were not sufficiently constant to make any large scale comparison. It is, however, possible to compare one from the group classified "good" and one from the group classified as "poor."

A comparison of the rations, with respect to vitamin A and riboflavin only, discloses that without green feed both rations were deficient. One hatchery owner, however, had plenty and could make up the deficiency, but such was not the case with the hatchery owner who was getting poor results.

Ration which gave good Hatches.

Ingredient.	Amount lb.	Units of Vitamin A.	Microgrammes of Riboflavin.
Pollard	28	3,360	25,200
Bran	10	1,500	10,000
Lucerne Chaff ..	5	65,000	25,000
Meat Meal	4½	..	12,150
Krafco	2½	?	?
Linseed	2	400	1,800
Maize (Yellow) ..	24	76,320	10,800
Wheat	24	3,360	9,600
Totals	100	149,940	94,550
Total per lb. ..	..	1,499	945
Short of optimum level per lb.	..	3,221	165

The deficiency could be overcome in the case of vitamin A by feeding 1 ounce of lucerne per 4 birds, but in the case of riboflavin, 1½ ounces per 4 birds would be necessary.

The farmer who was using this ration had a very good supply of Chinese cabbage—a good source of vitamin A and riboflavin.

Ration which gave poor Results.

Ingredient.	Amount lb.	Units of Vitamin A.	Microgrammes of Riboflavin.
Bran	9	1,350	9,000
Pollard	6	720	5,400
Wheat Meal	14	1,960	5,600
Maize	14	44,520	6,300
Meat Meal	4	..	10,800
Linseed	1	200	900
Lucerne Chaff ..	4	52,000	20,000
Wheat	48	6,720	19,200
Totals	100	107,470	77,200
Total per lb. ..	..	1,074	772
Short of optimum level per lb.	..	3,646	356

This farmer had no green feed supply. The richest source of vitamin A and riboflavin in his ration was lucerne chaff, although it should be remembered that lucerne chaff loses some of its vitamin A content with age. To make up the deficiency with this material he would have had to supply a little more than 1 ounce of lucerne chaff per bird to bring vitamin A up to the desired level, whereas it would have only taken a little more than ¼ of an ounce to lift the riboflavin to that level.

The supply of a sufficient quantity of lucerne chaff to bring the vitamin A content up to the optimum level would increase the fibre content beyond the capacity of the bird.

In the absence of green feed the most economic method of increasing the vitamin A content of the above ration was to have used a fish oil. A small percentage of liver meal would have corrected the riboflavin deficiency.

Vitamin and Mineral Tables.

From the following tables it will be possible for poultry raisers to examine the ration fed and correct any apparent weaknesses.

AVERAGE VITAMIN CONTENT OF SOME FEEDSTUFFS.

Kind.	Vitamin A. per lb. Inter. Unit.	Vitamin B1. per lb. Inter. Unit.	Vitamin D. per lb. A.O.A.C.	Vitamin E.	Vitamin G. (Riboflavin) Micrognammes per lb.
Barley	400	250	Trace	XX	400
Maize (Yellow)	3,180	270	†	XX	450
Maize (White)	0	270	†	XX	450
Cow Peas	1,360	450	†	*	350
Milo	250	*	†	*	400
Oats	80	270	†	XX	400
Peanut Meal	250	900	†	XX	1,200
Wheat	140	340	†	XX	400
Wheat Bran	150	450	†	XX	1,000
Wheat Germ Meal	1,900	1,930	†	XXXX	1,800
Wheat Middlings near Pollard	120	1,000	†	XXX	900
Cottonseed Meal	600	1,800	†	*	300
Linseed Meal	200	2,000	†	X	900
Buttermilk, Dried	200	400	Trace	X	9,000
Cod Liver Oil	340,190	0	45,360	0	0
Liver Meal	*	*	*	*	18,500
Meat Scrap	*	*	†	*	2,700
Skim Milk (Liquid)	15	40	†	X	1,000
Green Lucerne	63,560	225	†	XX	2,000
Lucerne Meal	13,000	400	†	XXX	5,000
Lucerne Leafmeal	32,000	400	14	XXX	7,000
Cabbage	200	100	†	*	100
Molasses	*	*	†	*	2,000
Kale	181,400	100	†	*	2,240

* Information on vitamin content is lacking.

† means that the feedstuff contains no appreciable quantity of Vit. D. Vitamin E. — Fair source of Vitamin E.; XX Good source; XXX Very good source; XXXX. Excellent source.

Extracted from the United States Department of Agriculture Year Book, 1939.

AVERAGE MINERAL CONTENT OF SOME FEEDSTUFFS.

Kind.	Calcium.	Phosphorus.	Manganese.
	Per cent.	Per cent.	Per Million.
Barley	·05	·36	16
Maize (Yellow)	·01	·29	5
Maize (White)	..	..	..
Cow Peas	·10	·46	30
Milo	·04	·32	15
Oats	·10	·44	20
Peanut Meal	·18	·56	Information Lacking
Wheat	·04	·39	39
Wheat Bran	·11	1·21	119
Wheat Germ Meal	·07	1·01	160
Wheat Middlings	·08	·93	119
Cottonseed Meal	·23	1·18	18
Linseed Meal	·33	·74	40
Buttermilk, Dried	1·56	1·05	·4
Cod Liver Oil	.	..	..
Liver Meal	·11	·90	4
Meat Scrap	8·25	4·00	18
Skim Milk Liquid	·13	·11	Trace
Green Lucerne	·42	·07	7
Lucerne Meal	1·44	·21	26
Lucerne Leaf Meal	1·90	·22	30
Cabbage	·07	·04	21
Molasses	·56	·06	Information lacking
Kale	·18	·07	ditto

Extracted from the United States Department of Agriculture Year Book, 1939.

Preparation of Silage.

Provision of green feed is one of the difficulties Queensland poultry raisers have to face. Silage is a good source of vitamin A and riboflavin, and it could be used by poultry raisers more extensively.

As silage for poultry should be made from young growths which are rich in protein, molasses is added. The material to be used should be cut while still fresh and succulent into lengths of about half an inch. If concrete silos are unavailable, barrels or drums of a capacity of about 40 gallons may be used. Immediately after cutting, the material should be packed tightly into the silo, which should be filled to the top. To each 40-gallon drum of material, 2 gallons of molasses thinned with water (usually about 2 gallons) are poured over the top. The quantity of water is largely governed by the wilting which has occurred before chaffing. A weight of about 150 lb. to 200 lb. should be applied to the top of the silage, and it should then be left to stand for some time.

Considerable settling down will occur, permitting of more material being added the next day after which the weight should be again applied. After a little more settling down of the material, the silo should be sealed. This is one of the most important points in the manufacture of silage. The most satisfactory procedure is to cover the silage with tarred paper or other waterproofed covering and place over

it puddled clay to a depth of 2 to 3 inches. This should be inspected after about two days and again at later intervals. Any cracks which appear on its surface or between the drum and the clay should be plastered with more clay. With properly sealed silage, the material used retains its colour, the juices are conserved and the development of moulds and insect larvae, which would make the use of the silage dangerous, is checked.

Method of Feeding.—Although they usually take to it readily, poultry may have to be accustomed to silage. The best method of introducing it to their ration is to mix it with the mash. Once they have become accustomed to it, silage may be fed as a green feed. It will be freely consumed, but 4 to 5 lb. per 100 birds will be found sufficient.

BARLEY AS A FOOD FOR FOWLS.

The nutritive value of barley is a little less than that of wheat. As a grain for feeding to fowls however, it has never been used much in Queensland, and nowhere else in Australia really, excepting probably, South Australia. Fowls do not take kindly to barley grain, for some reason or other. Perhaps its lack of palatability may be the explanation; but then, poultry never take kindly to any change in diet, that is why poultry farmers accustom their flocks gradually to any change from one type of grain to another, or from one system of feeding to another.

The cheapest grain available today is barley. As wheat cannot be got at the present time as fowl feed, for love or money, it is no good talking about a gradual change to barley for fowls which have been getting wheat. Therefore, to get fowls to pick up barley instead of their customary wheat or other grain ration, something has to be done to make the barley palatable to poultry. It has been found that, within a day or so after a change of grain, fowls will eat barley freely if the grain has been soaked for about 24 hours previously. It is not good practice, however, to scatter the soaked barley among the litter in the yard; it should be given to the fowls in troughs or dishes.

Although on analysis the nutritive value of barley is little less than that of wheat, for practical purposes, barley is just as good as wheat in food value if it is fed as a constituent of a scratch grain. Another finding by experiment is that barley may be substituted for yellow maize in a ration with plenty of lucerne meal, which makes up for any deficiency in the food value of yellow maize. That also applies to wheat, if it is used instead of yellow maize.

This season, poultry farmers have been using wheat almost exclusively although, as is well known, the feeding of one type of grain only is not the best fowl feeding practice. Now that the necessity of changing over has arisen it is suggested that, with barley, some maize should be used (if it is available of course), but unless maize makes up one-third of the whole ration with barley the fowls should be given plenty of green feed or a green feed substitute as green feed is essential to both the health and production of the poultry flock.,

Agricultural Chemistry

Feeding Oat Grain.

Supplied by the Biochemistry Section.

OAT grain has come on the Queensland market again, and in response to numerous requests some information on its use as a livestock food is given here.

Horses.

Of all horse feeds, oat grain is the best known. With many owners it is a fetish that no horse feed is complete without oats; yet the Arab horse, famed for stamina and spirit, rarely gets oats.

Numerous horse rations equal to or better than oat rations can be devised, frequently at a considerable saving. But they almost invariably involve more than two forms of concentrate, while chaff and oat grain is quite satisfactory without having any particular regard to quantities.

There is no need to crush oats, unless for foals and older animals with broken or worn teeth. Soaking is equally unnecessary.

The amount to be fed depends largely on how hard the horses have to work. It may be necessary for draughts at very heavy work to have over half their total intake as grain. Under such a high standard, it is preferable to use some other grain mixed with the oats. Corn and oats go well together. Corn supplies nearly half as much energy again as oats and consequently any substitution should be at the rate of 7 lb. of oats by 5 lb. of corn.

Pigs.

Oats contain more fibre than any of the other common cereals; consequently its use for growing pigs should be restricted. Milled or crushed oats may represent about one-quarter of the grain allowance for young pigs.

Old sows, until at least half way through the gestation period, have been shown to do well on equal parts of lucerne and oat grain, but this level is usually uneconomical in Queensland, which imports so much of its oat grain requirements.

Sheep.

Apart from stud animals, and in times of drought, handfeeding of concentrates to sheep is not practised in Queensland.

Oat grain is an excellent food in preparing animals for show or for supplementary feeding of top breeders. There is no need to grind or crush the grain.

Goats.

Milch goats capable of giving a quart or more may be kept in production over an extended period by allowing from ½ to 1 lb. of grain at the evening milking.

Calves.

Ground oats are well liked by calves. It is best to include other cereals and a little linseed for calves which are being weaned from separated milk. Two parts each of oats and maize meals, with 1 part linseed meal, is an excellent weaning mixture.

Dairy Cattle.

The grain-bran meal so commonly used among farmers providing milk for sale may safely be replaced by ground oats. Cattle take to this feed well and the risk of "going stale", which is commonly experienced with other small grains when not supplemented with bran, is avoided.

Beef Cattle.

The use of oats for stall-fed beef cattle is too well established to call for comment. There is a rather common tendency to keep the bran level high as the oat allowance is increased. This "loosens" the animal unnecessarily and results in loss of food through its non-digestion. It is better to crush the grain and reduce the bran as the oats is increased, until on full feed the bran is omitted.

Plate 63.

THE EDINGTON WATER HOLE, NEAR GILLIATT, N.W. QUEENSLAND.

GENERAL NOTES

Staff Changes and Appointments.

Mr. C. J. F. Swinburne, Senior Adviser in Sheep and Wool, has been transferred from Blackall to Dalby.

Mr. G. R. Morrison, Senior Adviser in Sheep and Wool, will take up duty at Barcaldine in the near future, and Messrs. H. C. Hall and J. H. Campbell, Advisers, will be stationed at St. George and Hughenden, respectively.

Lieut. A. F. Gurnett-Smith, B.Agr.Sc., at present with the 13th Australian Malaria Control Unit, A.I.F., has been appointed Assistant Bacteriologist in the Department of Agriculture and Stock, and will be stationed at the Animal Health Station, Yeerongpilly.

Mr. G. C. Simmons, B.Sc., Adelaide, has been appointed Assistant to Bacteriologist at the Animal Health Station, Yeerongpilly.

Mr. J. D. Lawson, recently appointed Dairy Officer, has been assigned to the Ipswich and Lowood districts, with headquarters at Ipswich.

Oats as Pig Food.

With the prospects of a record oat crop in Queensland, pig farmers should give consideration to the inclusion of this grain, if necessary, in the pig's rations. However, the price factor must be taken into account and with wheat at 4s. 6d. per bushel, oats would be good buying if not more than 2s. 6d. per bushel.

Because of the large percentage of husk, oats are not as a rule recommended as a food for pigs and are unsuitable as the only grain, also the price is usually too high.

However, up to 50 per cent. of the grain ration may be replaced with oats, without affecting the growth of the pigs and provided it is finely ground may be fed to pigs of all ages. Brood sows and boars are able to handle a bulkier ration than growing stock, therefore up to two-thirds of their grain ration may be made up with ground oats.

As with wheat and maize, mixtures containing oats and other grains must be supplemented with some protein-rich food, such as meat meal, if satisfactory results are to be obtained.

Wheat Stabilization.

The State Wheat Board discussed with the Minister for Agriculture and Stock (Hon. T. L. Williams) recently the proposed Commonwealth plan for post-war wheat stabilization. The Board expressed its viewpoint that any scheme of Commonwealth wheat stabilization should be so devised as to provide that the Queensland wheat marketing scheme under the *Wheat Pool Acts* should be fitted intact into the wider scheme, and the powers and functions of the State Wheat Board should not be impaired.

The Minister added that the wheat growing areas of Queensland are only in process of development and obviously any stabilization scheme to be acceptable to this State would need to be one which would permit of wheat taking its place in the normal development of these areas, at least up to a point whereby the State's domestic needs would be provided.

The Queensland scheme, which was temporarily superseded during the war years by the Commonwealth stabilization plan established under the *National Security Act*, has worked with great success for a quarter of a century, and the Board feels that its continuance is warranted, particularly as any post-war wheat stabilization scheme must be based partly on State legislation. The Board also is competent to administer any production control measures which may be an integral part in any stabilization scheme which may be acceptable to all of the Governments concerned.

Rural Topics

Bureau of Sugar Experiment Stations.

From the *Annual Report of the Bureau of Sugar Experiment Stations*:—

The staffing of the Bureau has undergone material adjustment during the period under review. Dr. H. W. Kerr, who had been engaged in wartime work in connection with processed food standards since January, 1943, tendered his resignation in April. His association with the industry since 1924 has been a continuous record of meritorious service, and it is greatly to be regretted that his outstanding ability and experience have been lost to the sugar industry and to the State.

A comprehensive reorganisation of the Department of Agriculture was approved by Cabinet during the year, and is now being put into effect. The Bureau of Sugar Experiment Stations has been incorporated within the Division of Plant Industry, but remains under the direction of the Advisory Board as to policy. Mr. A. F. Bell has been appointed Assistant Under Secretary in addition to being Director of Sugar Experiment Stations, and will be assisted in administration by Mr. Behne, who becomes Assistant Director and Chief Mill Technologist, and Mr. R. W. Mungomery, who comes to head office as the officer in charge of the Division of Entomology and Pathology.

Mr. C. R. von Stieglitz (Chemist) has severed his association with the Bureau after 31 years' service, and has taken over the plant nutrition laboratory of the Department of Agriculture. New appointees are Mr. J. H. Nicklin (Engineer), who has had some years of experience at Pleystowe Mill, Mr. L. G. Vallance (Chemist), and Mr. W. J. S. Sloan (Agronomist).

Mr. J. L. Clayton (Mill Technologist) has returned from his secondment to the Flax Committee, but Mr. N. G. Cassidy (Analyst) resigned to accept a position at the Irrigation Research Station at Griffith, New South Wales. Scholarships in mill technology were awarded to two students in the School of Applied Science in the University of Queensland—namely, Messrs. C. B. Venton and L. R. Brain. They will take up duties at the end of 1945 and 1946 respectively.

We are thankful to be able to record that all staff members who went on active service with the Army and Air Force are alive and well, and we look forward to their safe return in the near future.

The Future of Our Export Market—What the British Farmer is Thinking.

Now that the policy of imperial preference, which is so important to the Australian producer of export primary commodities—wool and sugar; meat and wheat; and butter and cheese—and which is now more or less under review, apparently, as a consequence of the ending of the wartime lend-lease arrangement with America, it's interesting to know what the British farmer is thinking.

The farmer in the Homeland hasn't forgotten his experience after the first world war, and when everyone now has a post-war plan up his sleeve, or in his hip pocket, he is wondering if he is going to be overlooked again. While the last war was on, he worked his land in accordance with a national pattern and fitted himself into the scheme of things as neatly as a piece of a jigsaw puzzle; but where he will come into the post-war picture is his immediate concern. Naturally, he would like to go on as he is going now under a Government guarantee of good prices. If foreign countries, whose supplies were regulated, are allowed to dump their farm produce onto the British markets, as they did before the war, what will happen to him? That's what the British farmer is thinking—and asking. Future prices, future imports—that's his bugbear at the moment. He doesn't want to fight any more losing battles, as he had to do after other wars. He has seen the transformation of his whole countryside during the war just ended. As our returning Air Force men tell us, "throughout the length and breadth of Britain once-neglected farms roll on and on like an endless, well-kept garden." Britain today is farmed by science and that is one of the results. The farmer has seen a new

system work, a system which put more money into his pocket, even though he had to give a lot of time to filling in forms, wondering, perhaps whether he was farming with a plough or with a fountain pen. Standing on the brink of to-morrow, he is turning over in his mind the poser whether the dawn of a new day will herald the end of a period of strenuously acquired prosperity.

Here are some facts which may affect the principle of Empire preference and the market for our own exportable surpluses: The British Government, as part of its rural programme, is promoting a vigorous live stock breeding policy as a peace-time carry-over. County livestock pools are buying pedigree bulls for the use of local farmers. Crop rotation—ploughland to grassland and grassland to ploughland—is an extending practice. The wartime-sponsored machinery pools have driven salient pointers into the most conservative farmer's mind. There is a growing conviction that farming with hand and horse is fine physical exercise, but poor economy. Before the war there was a 2,000-acre tract of country in one county with only one plough on it—and that plough was used to plug a hole in a fence! Such a thing, it is believed, will never happen again. Machinery pools have, apparently, come to stay in Britain.

One big farm, in what is called the Garden of England, is a profitable going concern run by a wholesale and retail co-operative society—thus the co-operative idea is catching on and cashing in. Machinery pools are no longer regarded as a fad, and from them has grown a system of contract service for the bigger farming jobs. Science is marching with mechanization. The farmer is giving up farming by guess. He knows that the research worker can tell him what is wrong with his soil, how he can protect his crops from pest attack and keep his land free from noxious weeds. The merging of the County War Agricultural Committees with Government advisory services is already foreseen, so that wartime compulsion may give way to peacetime friendly assistance.

Throughout Britain there is now a growing desire for a big, strong farming population. Science and machinery together, it is said can produce more per acre for the same work, and this will help to keep farm wages up and so make country life more attractive to the wages worker.

That, among other things, is what the British farmer is thinking. The implication is that we also should continue our thinking about the future of our export trade in primary products and the possible effects on Australian agriculture of changing imperial policies.

RURAL BROADCASTS.

The Country Hour.

On Monday, 3rd December, 1945, the Australian Broadcasting Commission inaugurated an Australia-wide agricultural session known as "The Country Hour." The Country Hour is presented daily over National Stations 4QG, 4QS, 4RK, 4QN, 4AT, and Short Wave VLQ3, at the following times:—

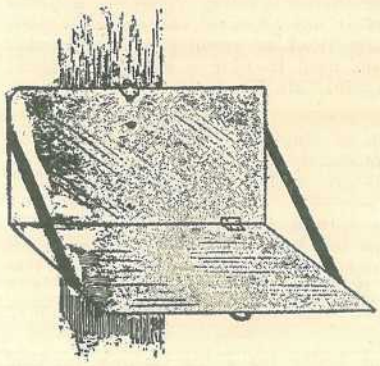
p.m.	
12.15	Opening announcements and highlights of rural interest.
12.18	Interstate market trends and prices.
12.21	Brisbane Market reports.
12.30	News.
12.45	Music
12.48	Agricultural talk or actuality broadcast.
1.00	"The Lawsons."
1.12	Closing announcements and music.
1.15	End of Country Hour.

The speakers for the agricultural talk or actuality broadcast at 12.48 p.m. on Mondays, Wednesdays, and Thursdays are selected from among agricultural advisers all over Australia. On Tuesdays, speakers broadcast over the State Network from Brisbane.

Other essential services for people on the land are broadcast Monday to Saturday at 6.20 p.m. from 4QG, Queensland Regionals and VLQ2, and at 6.30 a.m. Monday to Saturday, from 4QG, Queensland Regionals and VLQ.

On Saturdays at approximately 1 p.m. 4QR, Regionals and VLQ3 broadcast weather reports and interstate fruit train loadings.

GADGETS AND WRINKLES

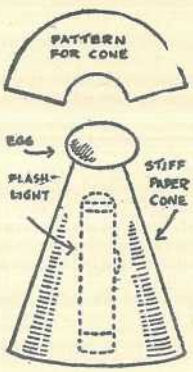


RECORD COVER.

A handy device for keeping milk record sheets or health and breeding record sheets clean and readable is to build a small cabinet for them. Take two pieces of board a little larger than the size of the sheets to be used, fasten together with a pair of small hinges, place straps or light chain as shown in the illustration, and attach one side of the cabinet firmly to the barn wall. This can be closed when not in use, and when open forms a handy shelf to write on.

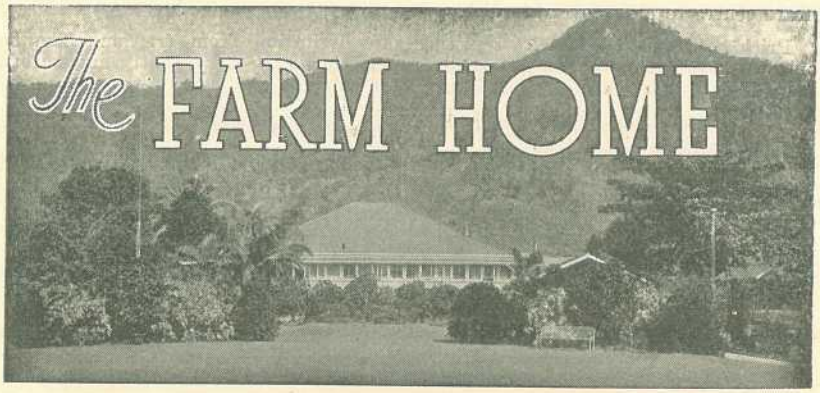
TO KEEP SACK OPEN.

When feeding livestock or poultry from sacks, waste of feed by spilling can be avoided by placing in the mouth of the sack a cut hoop from a small barrel. Compress the hoop to insert and when it is released it will keep the sack open for easy removal of the contents. The sack is quickly closed by twisting the hoop.



EGG CANDLER.

The material required to make this egg candler is paper for a stiff paper cone. It is cut according to the pattern shown. The top opening is large enough to hold an egg without permitting it to drop through. A two-cell torch provides the illumination.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BABY'S SKIN IN HOT WEATHER.

WEEKS of hot, humid weather have brought reports of babies suffering from prickly heat and other skin rashes from all welfare centres. Therefore some notes on skin care may be helpful to mothers whose children are affected in this way.

Knowing how to look after a baby's skin is very important both for his comfort and appearance. Every mother likes to see her baby with a clear healthy skin, and with good care, careful dieting and suitable clothing this should be possible for every baby.

Clothes, of course, are an important factor, especially in hot weather. Tight clothing quickly causes chafing under the arms and round the neck, and a baby's soft skin is very likely to become irritated by woollen garments. A loose cotton singlet, napkin and loose dress of cotton or art silk material provide quite enough clothing on hot days, with the addition of a little jacket if a cool breeze comes up.

Among the most important items in a baby's clothes are his napkins. Choose a soft material such as flannelette and remember that however soft the material, a napkin becomes a source of irritation as soon as it is wet. Therefore, regular changing is imperative. Waterproof panties should not be used, as the rubber acts as a poultice, keeping in the dampness and heat against the skin. Patterns of neat little pants to be made up with fine flannel are obtainable and these are quite sufficient protection for the mother's dress when carrying baby out. Napkins should be washed, boiled and rinsed in plain water, using a good brand of household soap. Patent washing powders, soda or blue should not be used, as all these chemicals irritate the skin.

In hot weather, the baby should have two baths a day, morning and evening, and a sponge in between whiles, if he seems fretful with the heat. Add 1 teaspoonful of salt and one teaspoonsful of soda to each pint of softened water for the bath. If tank water is not obtainable, a small handful of bran or oatmeal tied in a piece of old linen and left in the bath will soften the water. The same oatmeal may be used several times. A superfatted soap such as Castille is best—avoid highly scented varieties.

The baby's bed should not be too hot. A firm mattress with a cool chaff shakedown on top is best. A pillow is not neeessary, and will only make the baby perspire. Choose a cool room or verandah, provided the infant is screened from direct draught.

If the baby is troubled with skin rashes, ask a doctor or sister at the local welfare centre to check over his diet.

Prickly heat is caused by moisture plus irritation from friction. The baby should have an alkaline bath as previously mentioned, be very gently and carefully dried and a special powder dusted on to his skin, in addition to the care already suggested.

Everyone picks up some germs on to the skin, and when the skin is excessively moist, the germs will multiply and enter the skin through a chafed surface—thus the baby may develop an infected skin condition. So cleanliness and care should be the mother's watchword at any time, but especially in hot weather.

Any further advice on this or any other matter can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane,* or by addressing letters, *Baby Clinic, Brisbane.* These letters need not be stamped.

IN THE FARM KITCHEN.

French Pancakes.

Dissolve 2 tablespoons butter in 1 cup hot milk. Beat 1 egg well, add milk and butter, sift in slightly more than ½ cup self-raising flour and a pinch of salt. Beat till smooth, pour batter on hot greased girdle to form pancake 3 inches across, and cook both sides. Sprinkle with sugar and lemon juice and roll.

Flap Jacks.

Two cups flour, ½ teaspoon salt, 1½ teaspoons baking powder, 2 cups milk, 1 beaten egg, 2 tablespoons melted fat, ½ cup grated cheese. Mix and sift dry ingredients. Add egg, milk, fat. Mix well. Melt enough fat in skillet to cover bottom. Make six large thin pancakes about 5 inches across. Brown on both sides. Put meat filling (see below) in centre of each pancake. Lap pancakes into rolls. Sprinkle with cheese. Put rolls in hot oven (400 deg. Fah.), or in broiler, until cheese melts.

Meat Filling.—Blend 3 tablespoons of fat with 3 tablespoons flour. Slowly add 1 cup milk (or stock). Stir to keep smooth. Add 1½ cups chopped, cooked meat (veal or chicken). Add ½ cup diced celery. Cook slowly until celery is tender. Add ½ teaspoon salt and pepper mixed.

Potato Pancakes.

Required: Three medium size raw potatoes, 1 tablespoon of flour, 1 tablespoon of cream, 1 teaspoon of salt. Wash, peel, and grate the potatoes. Add other ingredients. Stir well. Cook by spoonfuls in a heavy frying pan in hot fat.

Pikelets.

Sift 1¼ cups self-raising flour and a pinch of salt into a basin. Make a well in centre and drop in 2 egg yolks and ¾ cup milk, gradually beat in all the flour. Mix to a smooth batter, then add 2 tablespoons melted butter, and fold in 2 stiffly-beaten egg whites. Drop batter from tip of spoon on to hot greased griddle. Bake, turning each cake when it is browned on underside and puffed and slightly set on top. Pikelets should be turned only once. Serve cakes as soon as baked on warm plates with butter and honey or orange marmalade.

Apple Fritters.

Make a batter of 1 cup of flour, 1 egg, two-thirds cup of milk, 1½ teaspoons of baking powder, ¼ of a teaspoon of salt. Mix all the dry ingredients—or sift them all together. Add the beaten egg and gradually the milk. Beat until smooth. This fritter batter is always useful. Four large apples must be peeled and cored and cup into very thin slices. Sprinkle some powdered sugar over the slices as well as a little lemon juice. Dip the slices in the batter and fry slowly in deep, hot fat until brown. Remove with a skimmer, thus draining all the fat. Sprinkle with cinnamon and powdered sugar and serve at once. Pears, oranges, apricots, and so on may be served as fritters. The treatment is the same as apple fritters.

Use Cooked Pumpkin.

Two tablespoons cooked pumpkin (left over), a dessertspoon grated cheese, and a teaspoon butter, well mixed until a smooth paste. Makes a cheap and tasty spread.

Ginger Bread.

One cup of butter, 4 eggs, 1 cup treacle, 1 cup milk, 3 cups flour, 2 cups sugar, 1 tablespoon ginger, 1 teaspoon baking soda. Cream butter and sugar, then add eggs and beat well. Add the milk, then add the dry ingredients, and mix well, and bake in a moderate oven for about 1½ hour.

Water Biscuits.

Rub 2 oz. of butter into 1 lb. of flour, adding a pinch of salt to the flour. Mix to a very stiff paste with water, and beat it well with a rolling pin. (This last is important.) Take pieces of the paste the size of a walnut and roll out round. Prick with a skewer or biscuit pricker, and put the biscuits on a hot baking sheet and bake them in a very hot oven.

Eggless Cake.

Two cups sugar, 2 cups water, 2 tablespoons butter or good dripping, small piece of lemon peel, 1 lb. dates. Put on to boil, and when boiling allow to simmer five minutes. Set aside until mixture is lukewarm, then sift in 4 large cups of self-raising flour, 1 teaspoon carbonate soda, cinnamon and mixed spice. Put into a deep, well-greased baking dish, bake in a hot oven one hour. This cake can be iced or left plain.

Lemon Slice Biscuits.

Take 4 oz. butter, ½ lb. self-raising flour, 3 oz. sugar, 1 egg, juice and rind of lemon, pinch of salt. Beat butter and sugar to a cream, add rind and juice of lemon, sieve flour and salt, beat egg well. Add flour and egg alternately to the mixture till of a stiff consistency. Roll out and cut into shapes, bake in hot oven for ten minutes. When cold join with butter icing.

Meat Salad.

One pint diced meat, 1 teacup cooked green peas, 1 small boiled beetroot, 3 tablespoons mock French dressing, 1 large lettuce or endive. Mayonnaise or salad cream. Mix the meat with the dressing. Soak for half an hour. Drain, then add green peas and mayonnaise or salad cream to taste. Arrange in a salad bowl, or on individual salad plates, ringed with crisp lettuce or endive or a little of each. Garnish with beetroot. Sprinkle, if liked, with a little chopped caper or nasturtium buds. Enough for six. If using cold lamb or mutton add ½ tablespoon finely minced mint leaves with mayonnaise. Garnish lettuce, if liked, with a dab or two of red currant jelly. If using cold veal flavour mayonnaise to taste with paprika, if available.

Brawn or Tongue Salad.

One pint diced brawn or tongue, 1 teacup shredded cabbage heart, 1 lettuce or watercress, ½ pint each of diced cooked carrot, turnip, and peas, 1 pint potato salad. Any salad dressing. Mayonnaise or salad cream. Mix the meat and cabbage with salad dressing to moisten. Moisten the cooked vegetables also with this dressing. Chill both for half an hour. When required coat meat with salad cream or mayonnaise and arrange in centre of salad dish. Place half the potato at each end, and the cooked vegetables in between. Garnish round edge with watercress or lettuce. If liked, sprinkle potato salad with minced chives or parsley, the cooked vegetable salad with paprika, and the meat with minced onion or with a little mustard and cress. Enough for six persons.

Fish Salad.

One large lettuce or two small ones, a little chopped parsley, ½ lb. flaked cold fish, mixed cold cooked vegetables, cold boiled rice or haricot beans, a little grated cheese, 1 hard-boiled egg. Wash the lettuce, dry well, and shred into a dish. Pile the flaked fish, previously seasoned, in the centre, sprinkle over the top of the fish the grated cheese and round the base the chopped parsley. Dice the vegetables and place in small heaps round the dish with alternate heaps of the rice or haricot beans. Cut the white of the egg into strips, arrange in a circle, like the petals of a daisy, or the heaped vegetables with a little of the sieved yolk to form the centres. Serve a vinegar and oil dressing separately. This salad is sufficiently substantial to form the main dish for a meal in hot weather.

ASTRONOMICAL DATA FOR QUEENSLAND.

APRIL.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.57	5.47	Cairns	19	38	Longreach	31	29
6	6.00	5.41	Charleville	26	28	Quilpie	36	34
11	6.02	5.36	Cloncurry	44	56	Rockhampton ..	6	14
16	6.05	5.30	Cunnamulla ..	30	28	Roma	16	18
21	6.08	5.26	Dirranbandi ..	21	17	Townsville	17	33
26	6.10	5.21	Emerald	15	23	Winton	35	45
30	6.12	5.18	Hughenden ..	29	41	Warwick	4	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	4.33	5.25
2	5.37	6.03
3	6.43	6.42
4	7.50	7.23
5	8·58	8.08
6	10.06	8.57
7	11.13	9.52
	p.m.	
8	12.16	10.50
9	1.14	11.51
10	2.05	..
		a.m.
11	2.49	12.52
12	3.28	1.52
13	4.04	2.50
14	4.36	3.46
15	5.07	4.41
16	5·38	5.34
17	6.09	6.27
18	6.42	7.20
19	7.18	8.13
20	7.56	9.07
21	8.39	10.01
22	9.26	10.54
23	10.18	11.45
		p.m.
24	11.13	12.33
25	..	1.19
	a.m.	
26	12.12	2.02
27	1.12	2.41
28	2.13	3.19
29	3.16	3.56
30	4.21	4·34

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27 ; Cunnamulla 29 ; Dirranbandi 19 ;
Quilpie 35 ; Roma 17 ; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	22	17	38	33	13	8	44	37
6	12	28	27	43	2	19	30	51
11	13	27	28	43	2	18	31	51
16	21	18	37	34	12	9	43	38
21	29	11	44	26	19	1	52	29
26	27	13	43	28	18	3	50	31
30	19	20	35	37	10	11	39	42

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	36	24	55	46	40	32	30	21
3	25	36	47	55	32	40	22	31
5	13	45	40	60	25	46	14	37
7	7	51	36	64	21	50	8	43
9	6	50	36	63	20	49	7	42
11	11	48	38	62	23	48	11	40
13	19	41	44	58	29	43	18	34
15	29	27	50	48	35	33	25	23
17	38	21	56	45	41	30	32	19
19	46	12	61	39	46	24	37	13
21	52	6	66	35	50	21	43	8
23	52	4	66	34	50	20	43	6
25	48	8	63	36	47	22	39	9
27	44	15	60	41	45	26	36	15
30	28	33	50	53	34	38	24	28

PHASES OF THE MOON.

New Moon, 2nd April, 2.37 p.m.; First Quarter, 9th April, 6.04 a.m.; Full Moon, 16th April, 8.47 p.m.; Last Quarter, 25th April, 1.18 a.m.

On 14th April the Sun will rise and set 10 degrees north of true east and true west, respectively, and on 15th April the Moon will rise at true east.

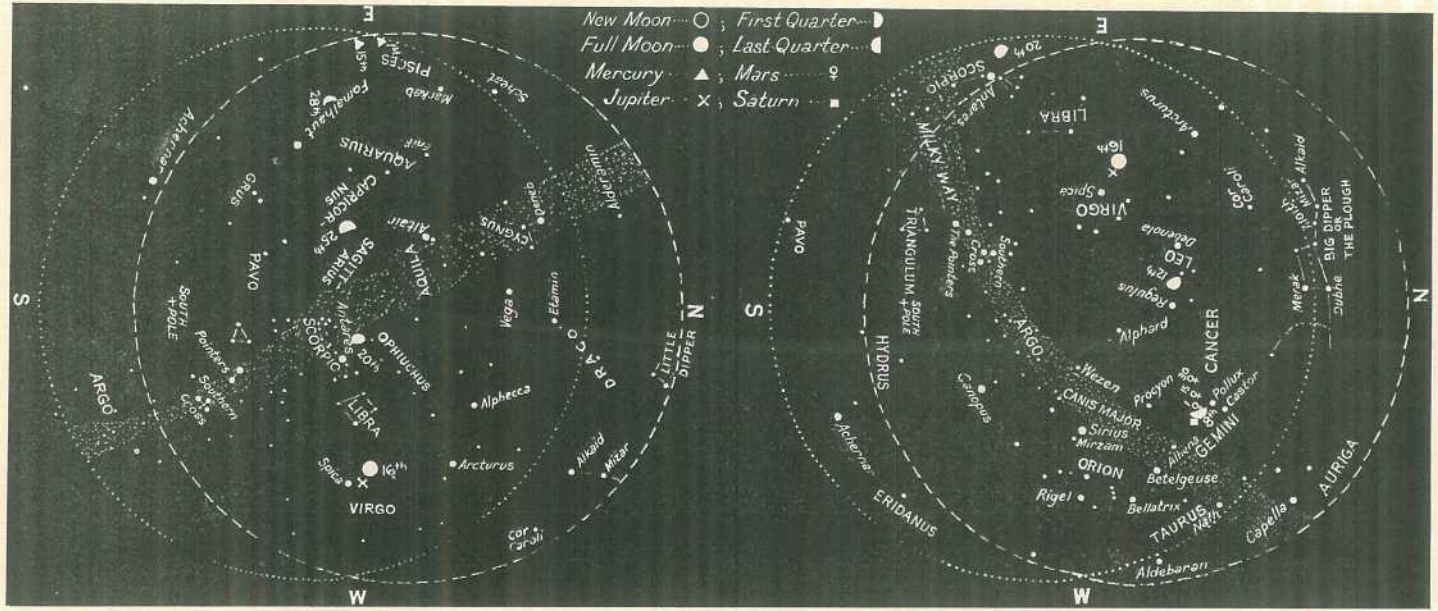
Mercury.—At the beginning of the month rises about 35 minutes before sunrise and at the end of the month rises 2 hours before sunrise, about 2 degrees north of true east.

Venus.—At the beginning of the month Venus will set about 45 minutes after sunset. At the end of the month it will be above the western horizon for a little over an hour after sunset.

Mars.—At the beginning of the month will set about midnight, and at the end of the month about an hour earlier.

Jupiter.—At the beginning of the month will rise a little after sunset and at the end of the month will rise about an hour before sunset.

Saturn.—Will set about midnight at the beginning of the month and at the end of the month will set between 10 p.m. and 11 p.m.



Star Charts.—Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. The positions of the moon and planets, which are continually changing in relation to the "fixed" stars, are shown for certain marked days. When no date is marked the position is for the middle of the month. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions.

The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border, on 15th April. The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon at Cape York and the dotted circle is the horizon along the New South Wales border.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

FEBRUARY RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of years' records.	Feb., 1945.	Feb., 1946.		Feb.	No. of years' records.	Feb., 1945.	Feb., 1946.
North Coast.	In.		In.	In.	*South Coast—cont'd.*	In.		In.	In.
Atherton	11·44	42	25·14	14·56	Gatton College ..	3·52	44	7·17	..
Cairns	16·30	61	27·72	20·61	Gayndah	4·20	72	4·61	1·30
Cardwell	17·00	71	21·93	20·02	Gympie	6·58	73	6·28	4·73
Cooktown	13·71	67	14·59	14·93	Kilkivan	4·91	62	7·46	6·20
Herberton	8·63	57	17·10	11·37	Maryborough ..	6·65	72	6·95	2·24
Ingham	17·12	51	33·06	18·16	Nambour	9·57	47	9·34	8·36
Innisfail	23·07	62	44·88	33·34	Nanango	3·93	61	7·65	3·29
Mossman	20·86	19	17·79	22·04	Rockhampton ..	7·74	72	3·36	2·95
Townsville	11·33	72	12·09	18·38	Woodford	8·05	55	7·53	5·95
Central Coast.					*Darling Downs.*				
Ayr	9·62	56	16·59	11·99	Dalby	2·85	73	6·05	2·42
Bowen	8·96	72	7·49	10·22	Emu Vale	2·59	47	5·07	1·87
Charters Towers ..	4·63	61	2·55	7·45	Jimbour	2·75	64	4·66	3·00
Mackay	12·41	72	3·23	3·36	Miles	2·72	58	8·14	2·03
Proserpine	13·85	40	6·55	9·71	Stanthorpe	3·18	70	5·24	1·41
St. Lawrence ..	7·67	72	2·65	4·49	Toowoomba	4·53	71	4·44	3·27
South Coast.					Warwick	3·10	78	2·51	2·75
Biggenden	4·18	44	7·49	1·40	*Maranoa.*				
Bundaberg	6·39	60	7·42	1·30	Roma	2·87	69	3·51	0·20
Brisbane Bureau ..	6·23	94	10·77	7·32	St. George	2·39	62	2·76	1·27
Caboolture	7·82	67	16·74	5·89	*Central Highlands.*				
Childers	6·42	48	12·21	2·25	Clermont	4·27	72	1·73	3·30
Crohamhurst	12·48	50	9·74	8·17	Springsure	3·78	72	0·93	1·54
Esk	5·24	56	6·26	4·80					

CLIMATOLOGICAL TABLE FOR FEBRUARY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure Mean 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	86	74	95	4, 5	71	2	2061	20
Herberton	..	81	64	86	3, 4, 23	59	2, 3, 4, 5	1137	23
Townsville	..	89	75	96	21	72	9	1838	16
Rockhampton	29·84	89	73	96	3	70	3, 13, 25	295	11
Brisbane	29·91	85	71	82	4	67	24	732	17
Darling Downs.									
Dalby	..	91	68	100	3	62	1	242	7
Stanthorpe	..	81	62	91	20	56	2	141	9
Toowoomba	..	81	65	96	3	60	24	327	14
Mid-Interior.									
Georgetown	29·75	91	73	96	20, 23 24	70	11	991	13
Longreach	29·82	99	75	104	21	68	8	61	5
Mitchell	29·84	95	71	101	2, 3	57	5	176	3
Western.									
Burketown	..	91	76	97	4	72	5	1850	15
Boulia	29·71	96	76	105	3	65	28	194	8
Thargomindah	29·78	98	76	110	2	59	28	17	2

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