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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXIX. 1 FEBRUARY, 1928. PART 2

Event and Comment.

A New Vision of Agriculture.

THE recent announcement of the Minister for Agriculture and Stock (Mr. W. Forgan Smith) on the constitution of the Board of Agriculture was received very favourably by the Press, and the setting up of the new co-ordinating agency was commended strongly in able editorials. In the course of this comment it was recognised that there is an enormous field for such a Board, that it could do a tremendous amount of useful work by collecting the results of scientific investigation, and by helping to solve for the farmers many of the intricate problems ordinarily beyond their own resources. It was realised that each phase of agriculture has its own specific difficulties, and the value of a Board of Agriculture would be that it would so correlate the efforts of its constituent departments as to obviate overlapping and yield the best results.

Entomological and plant pathological problems are of immense economic importance. Each year enormous waste is caused by animal and vegetable pests, and their eradication or control are matters that must continue to receive the close attention of our scientific investigators and field workers, and through the new Board of Agriculture it will be possible to institute a thoroughly sound collaborative scheme which will be of great value to the whole industry. One leader-writer reminds us that the new vision of agriculture was very vividly described by Sir Alfred Mond at a luncheon he gave to delegates to the Imperial Agricultural Research Conference in London a few months ago. "The position of agriculture in the world," he said, "is slowly being recognised. Curiously enough, although it is the most vast industry

and the most fundamental industry in the world, it has, on the whole, been carried on without much regard to a scientific basis. It has, on the whole, been carried on by people who have worked hard, and who have reaped on the whole very small, if any, reward. But throughout the history of the world it has been looked down upon as a thing which could be carried on by relatively uneducated people, and as being of relatively small importance.'' The commentator continues:—''But all that is now rapidly changing, and Queensland can claim that it saw, many years ago, the change approaching. Agriculture and animal husbandry are coming to be highly-skilled professions, and in this State abundant opportunities are being provided for those now engaged on the land to extend their knowledge and improve their methods, and for the younger generation to qualify themselves thoroughly for all branches of primary production. . . . . In the last session of Parliament a Bill was passed authorising the setting up of primary produce research stations. One of the immediate aims of this measure is to assist the banana-growing industry. Whatever is done under the Bill will require to be co-ordinated with the work of the University and the Agricultural College, and here a use for the new Board of Agriculture is indicated. Similarly, the employment of the most efficient methods for the transport of fruit is of vital concern to the Committee of Direction of Fruit Marketing, and calls for research in one quarter, instruction in another, and the dissemination of information from another. The new Board of Agriculture can be of very valuable service in these and other matters as an agency of liaison and co-ordination among all bodies concerned in the development of agriculture.''

"Ploughing Lonely Furrows"—The Call for Co-ordinated Effort.

THE new Board of Agriculture is evidently one of the first fruits of the seed sown by the Public Service Commissioner (Mr. J. D. Story, I.S.O.) on the occasion of the opening of the new biological laboratory at the Queensland University in November last, when he emphasised the desirability of co-ordination in State Departments. In his address he pointed out that to-day we had the Press and public men stressing the necessity for closer relationship in many ways between Britain and the Dominions for the sake of the wellbeing of the Empire as a whole. Missioners had toured the Dominions with that end in view. In a minor way he pleaded for closer relationship at home—namely, in many of the State Departments. He feared that if we were not wise in time there would be much overlapping, much misdirection of effort, and much unnecessary waste in the various State and semi-State scientific, technical, and educational departments. There was the University with certain scientific departments, the Department of Biology being one of them; the Department of Agriculture with its botanical, entomological, pathological, and chemical sections; its bacteriological stations at Yeerongpilly and Townsville; its Sugar Experiment Stations and its State Farms. There was the Education Department with Gatton College. Now what relationship existed as amongst all these departments and sections? To what extent did officers confer with each other on matters which were of common interest? To what extent did they co-ordinate their work and general activities? Was there not far too much ploughing of lonely furrows and too little concerted effort? And this although the State paid. The Commonwealth, too, was now entering the field of research. He suggested that the time had come when a comprehensive review of the present situation should be made, steps taken to ascertain with some degree of definiteness the most pressing problems relating to primary production, or to the secondary industries closely allied to primary production, which were at present awaiting solution, and concerning which research was essential to their elucidation. He thought that if the scientists would confer and take stock of the situation they would be able to evolve a scheme of useful co-ordinated work which would be helpful not only to production but to themselves. By judicious allocation of work amongst the several sections, results might be expedited and the scope of investigations widened without material increase in expenditure. Where there was a will there was a way. He fully realised that each section might have to a degree separate functions to perform, and that administrative control must be safeguarded. He felt, however, that more would be accomplished by the sections keeping in touch with each other and working in a kind of elastic unison than by working as alien detached units. But if effective unison were to be secured there must be mutual trust and goodwill. Mere passive acquiescence was worthless; indeed, it was worse than direct hostility. Hostility could be met and overcome, but the very subtle elusiveness of passive acquiescence made it difficult to grasp and strangle. He, therefore, made an earnest plea for closer relationship amongst the cognate sections and scientists.

Fits and Misfits.

ARCHBISHOP DUHIG, whose public addresses always command attention, and whose ideas of sound citizenship so expressed always receive the commendation of thinking people, had some important things to say to a Brisbane lunch-hour audience recently. Speaking on the subject "Obstacles and Aids in Road of Progress," he opened with a reference to misdirected energies—obvious incongruities that might pass unobserved by the superficial mind and the indifferent eye, but must forcibly obtrude themselves on any one who has acquired the habit of serious thinking. These misdirected energies were observable in individuals, whole communities, and in Governments of countries. There was in every community a tremendous waste brought about by misfits in life, and by energies which, if directed in the right channels, would be fruitful and productive, but, misdirected, were worse than lost, for they were not only wasted themselves, but caused waste in the matters in which they were employed.

In every community, he said, there was a tremendous waste brought about by misfits in life. Communities, he remarked, rarely classified their energies. A large percentage of men fell into life's activities at haphazard and in the wrong place. Many having thus got in brought themselves to believe that they were specially created for the positions they filled, and ignored the fact that their lack of adaptability or knowledge was going to be a big obstacle to the success of the undertakings they would be called upon to handle. There was in life a place for every man, but many men were in the wrong places in life. They were there through circumstances which were absent in the cases of others really fitted for the work to be done. Many great men had been "discovered," and the world had benefited by their discovery. Artists, musicians, engineers, men of business genius had simply been "discovered." Through circumstances they had taken up positions where their energies were being misdirected, but a discerning eye, through some outward indication, had peered into their latent powers and led them into spheres in which they were able to render splendid service to society.

Elimination of Economic Waste.

IT was particularly necessary in a young country like Australia, Archbishop Duhig continued, that energies should be properly directed and economic waste eliminated. Queensland particularly needed every help that any one of her citizens could contribute towards her development. The point was to have the contribution rightly timed and rightly placed. Progress there was to-day, and they were all proud of it, but it was not well balanced. For instance, young men admirably adapted for country pursuits had come into the cities to fill spheres of usefulness of much less importance. They would tell you that they had been brought in by economic pressure. The drudgery of the farm repelled them, while the high wages of the city attracted them. Yet it would be a thousand times better for Queensland, and much better for the majority of those young men themselves and their families if they could have been advantageously kept in the sphere of primary industries. Australia, and Queensland particularly, possessed what was fundamental to prosperity—abundant natural wealth. Two main factors were necessary to bring about permanent prosperity—namely, capital and men, and the right kind of men was quite as essential as capital. To choose the wrong stamp of man or turn capital into wrong channels must obviously be detrimental to progress. Here they came face to face with the necessity for good government, because a young country like this, with immense undeveloped resources and millions of acres of Crown lands, must depend largely for its development on a sane government policy, and a sane policy could come only from a Government that had at heart and above all party considerations the good of the whole community; from a Government that would be careful to direct national funds into channels of the highest usefulness, particularly in the development of primary industries. As it was possible for the individual to waste his energy and his means by directing both into wrong channels, so was it possible for municipalities and Parliaments to do the same. The making of laws was one thing, their administration was another. Without good administration, legislation, no matter how good, was largely nullified. If misplaced persons and misdirected energies were a bar and a hindrance in the smaller affairs of life, they were a calamity in the greater ones. Conscientious public men would regard their trust as a sacred one from the people, and remember that God and the people would hold them responsible for it.

Bureau of Sugar Experiment Stations.

FERTILISER TRIALS.

The following fertiliser trials as carried out on the Sugar Experiment Stations should be of considerable interest to cane farmers. The results show that careful fertilising, combined with the best cultivation, will give payable results, and in many cases a handsome profit per acre.

As a rule, mixed fertilisers containing sulphate of ammonia, nitrate of soda, sulphate or muriate of potash and phosphates give the best results.

The Experiment Stations, in fertilising trials, do not manure the land, but manure the cane. By this is meant that in the application of fertilisers consideration is given as to what should suffice the crop for the season; the manures are applied at the right time, and the cultivation of the cane is good.

BUNDABERG.

Results from experiments with and without manures, Sugar Experiment Station, Bundaberg. Standover crop of first ratoons. Cane value, 30s. per ton:—

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertiliser in Tons Cane per Acre.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
Mixed Manure— Sulphate of Ammonia, 1 cwt. Nitrate of Soda, 1 cwt. Sulphate of Potash, 1 cwt. Meatworks Manure, 1 cwt.	80·75	20·21	3 15 0	26 11 3
No Manure	60·54	..	..	..

Results from experiments at Bundaberg with single and mixed fertilisers. Plant crop. Cane value, £2 per ton:—

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers. Tons per Acre.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
300 lb. Sulphate of Potash ..	22·17	6·79	2 10 0	11 1 7
200 lb. Sulphate of Ammonia ..	18·09	2·71	2 0 0	3 8 4
265 lb. Nitrate of Soda. ..	19·36	3·98	2 11 0	5 8 2
300 lb. Superphosphate ..	13·48	1·90 (loss)	1 10 0	5 6 0 (loss)
600 lb. Mixed Manure containing— 100 lb. Sulphate of Ammonia 100 lb. Nitrate of Soda 100 lb. Muriate of Potash 300 lb. Superphosphate	23·40	8·02	4 5 0	11 15 0
No Manure	15·38	..	..	..

Results from manuring at Sugar Experiment Station, Bundaberg. Cane value, 35s. per ton:—

Manure Applied.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	Cost of Manure and Application.	Increased Value of Crop per Acre for use of Manure.
			£ s. d.	£ s. d.
Mixed Manure— Sulphate of Ammonia, 1 cwt. Nitrate of Soda, 1 cwt. Sulphate of Potash, 1 cwt. Meatworks Manure, 1 cwt.	37·29	22·67	3 15 0	35 18 4
No Manure	14·62	..	..	..

SOUTH JOHNSTONE.

Results of experiments at South Johnstone with fertilisers. Cane value, £2 per ton. First ratoons—eleven months old:—

Manure Applied.	Tons of Cane per Acre.	Increased Yield due to Manure in Tons Cane per Acre.	Cost of Manure and Application.	Increased Value of Crops per Acre for use of Fertilisers.
			£ s. d.	£ s. d.
Mixed Manure— Sulphate of Ammonia, 100 lb. Nitrate of Soda, 150 lb. Sulphate of Potash, 100 lb. Superphosphate, 250 lb.	36·08	7·65	4 5 0	11 1 0
No Manure	28·43	..	..	..

POTASH FERTILISER TRIALS AT BUNDABERG.

Remarkable results have been achieved by the use of potash on the red soils of the Sugar Experiment Station in the Woongarra district of Bundaberg. When these soils were analysed some years ago they showed a very low percentage of available potash, in places as low as 13 lb. per acre. The use of potash was thus indicated from the chemical results, and experiments were undertaken to confirm this finding by field practice.

The vital necessity for potash upon the red soils of Childers and Bundaberg has been advocated for a long time, and these experiments prove that such advocacy is warranted.

It is not contended that dressings of potash alone will always give higher results than mixed fertilisers upon the red soils, but we believe they will do so at first where the potash content is low as it is in the two districts mentioned.

On the Northern alluvial soils, where the available potash is higher, potash alone would not give such an increase in yields.

We have also found that potash manures applied at the rate of 300 lb. per acre have a great effect in preventing the yellowing of the cane leaves and accompanying stunting of the sticks, which is often prevalent in the Bundaberg district.

The financial results of these experiments are shown in the following tables:—

Experiments using potash manures only upon the red soils of the Woongarra, near Bundaberg. Plant crop. Cane value, £2 per ton:—

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertiliser in Tons Cane per Acre.	Cost of Manures and Application.	Increased Value of Cro due to Fertiliser.
			£ s. d.	£ s. d.
No Manure	26·29	..	..	..
300 lb. of Potash	44·21	17·92	2 10 0	33 6 9

Experiment using potash manures only upon the red soils of the Woongarra district, near Bundaberg. Cane value, £2 2s. per ton. Average result of plant and ratoon crops:—

Potash Fertiliser Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons of Cane per Acre.	Cost of Manure and Distribution.	Increase in Value of Crop due to Fertiliser.
			£ s. d.	£ s. d.
No Manure	12·49	..	..	..
300 lb. of Potash	22·62	10·13	2 10 0	18 15 5

Results of experiment with manures containing a heavy dressing of potash on poor red scrub soil at Bundaberg Sugar Experiment Station. First ratoons. Cane value, £2 per ton:—

Manures Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
No Manure	16·18	..	..	..
Mixed Manure Containing— Nitrate of Soda, 100 lb. Sulphate of Ammonia, 100 lb. Potash, 200 lb. Meatworks Manure, 200 lb.	26·60	10·42	4 10 0	16 6 9

PARADICHLOROBENZENE FOR COMBATING CANE GRUBS.

INTRODUCTION AND PAST HISTORY.

By EDMUND JARVIS, Entomologist.

BUREAU OF SUGAR EXPERIMENT STATIONS.

In the following article will be found a brief review of our past experiments carried out in the Cairns district with paradichlorobenzene, and the results obtained with it against *Lepidoderma albohirtum* Waterh. ("greyback cane beetle"), together with a detailed description of this soil fumigant, its methods of application, when and how to apply it, and the cost per acre for such treatment.

Initial experiments against the grubs of this notorious cane pest were commenced by the Bureau at Gordonvale during February to April, 1915. At that time no attempts to combat the ravages of root-eating scarabæid grubs by fumigating cane land with paradichlorobenzene had been recorded in other sugar-growing countries; although during the same year (1915) its use as a commercial insecticide was demonstrated in America, where it was shown to be an excellent fumigant for destroying insects attacking stored products, &c.

Strangely enough at the very time when such conclusive results were being obtained in the States, our laboratory experiments at Gordonvale with paradichlor. against cane grubs were also proving highly satisfactory (see Bulletin No. 17, pp. 16 and 17).

Some years later (1923) our first field plots were laid down at Meringa and elsewhere, and in spite of encountering drought conditions and other disadvantages, successful results were again obtained (see Bulletin No. 18, pp. 49-58).

In the following year (1924) data yielded by several experiment plots established by our Sugar Bureau in various portions of the Cairns district served to further demonstrate beyond doubt the value of paradichlor. as a grub destroyer (Bulletin No. 19, pp. 37-47). Taking, for example, our experiment plots at Woree (see accompanying plate) it should interest growers to learn that according to figures supplied by the Colonial Sugar Refining Company, who weighed and crushed the cane harvested from these two plots at their Hambledon mill, the area treated with dry nodules of paradichlor. yielded cane at the rate of 27.208 tons per acre, whereas the grub-affected cane cut from the adjoining untreated check plot of similar size gave a yield of 14.032 tons per acre, representing the gain of an additional 13.428 tons of cane per acre as a direct result of such fumigation (see Bulletin No. 19, p. 57).

During 1921 experimentation was commenced by the Bureau of Entomology at Washington, U.S.A., in hopes of discovering some means of successfully combating the "Peach Tree Borer" (*Ægeria exitiosa* Say., the larvæ of which tunnel in and destroy the roots of peach and other fruit trees, causing injury amounting at that time to about 6,000,000 dollars a year. As a result of these experiments carried out during several seasons, Mr. E. B. Blakeslee, the entomologist in charge, clearly demonstrated that paradichlorobenzene when properly used was uniformly effective against this fruit pest, and in a recent Farmers' Bulletin No. 1246 states:—"There has now been accumulated a sufficient body of experience based on large scale commercial use, and further experiments by the bureau and others, principally the New Jersey Agricultural Experiment Station, to show that a practical economic method of control has been found for this heretofore almost invulnerable pest."

Finally, it is interesting to note in this connection that E. O. Essig (Professor of Entomology at the Californian Agricultural Experiment Station), in a bulletin published by him last October (1926), remarks:—"The wide use being made of this fumigant is well illustrated from the fact that during the year 1924, 39,695 lb., and in 1925, 59,469 lb., or a total of 99,164 lb. for the two years, were used in California, according to figures forwarded by one of the leading wholesale distributors."

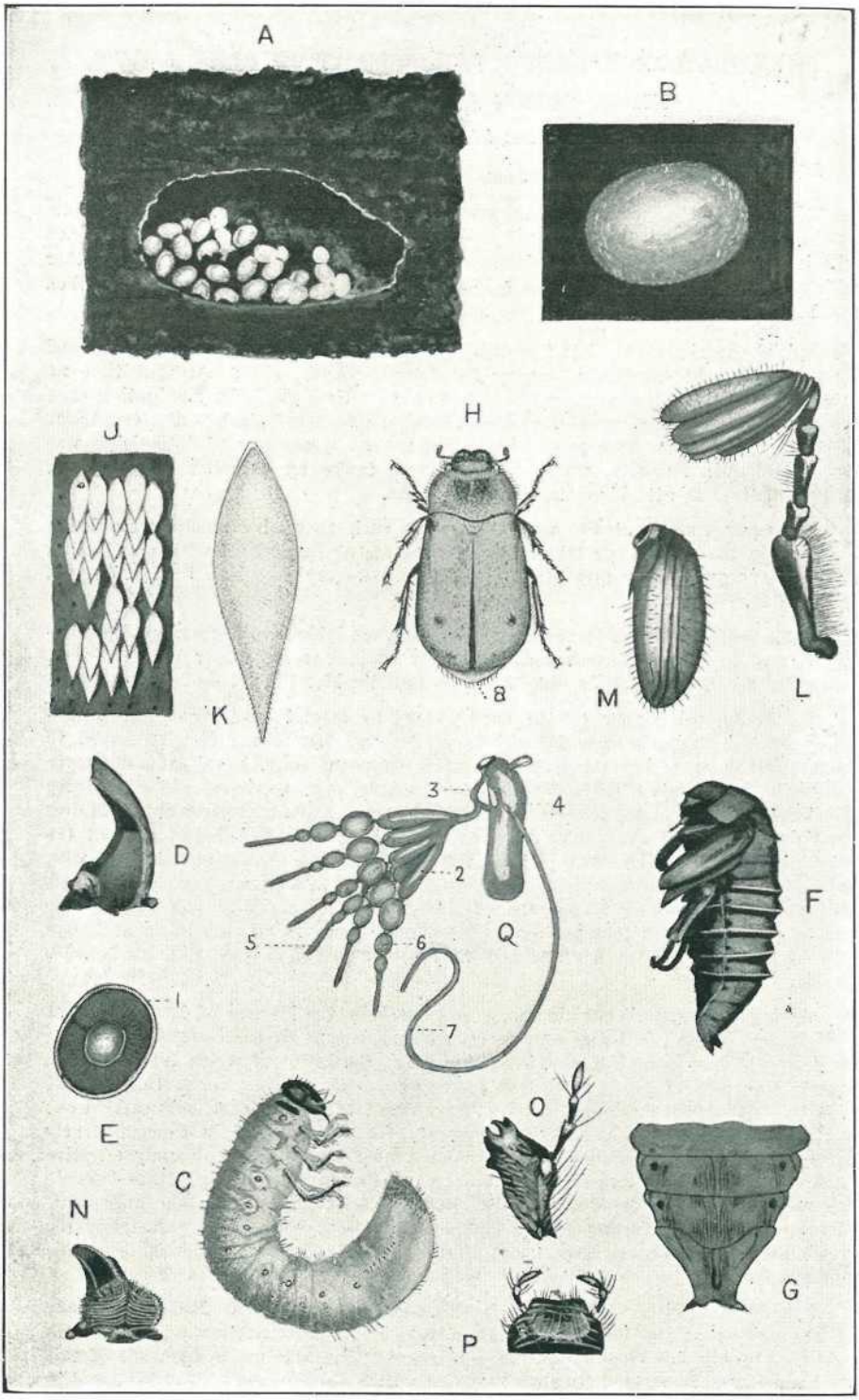

PLATE 44.
(*For description of plate, see page 99.*)

Description of Plate 44.

Fig. A.—Eggs of "greyback" cane beetle, *in situ* (nat. size).

Fig. B.—Egg of same (magnified).

Fig. C.—Grub of same, third instar (nat. size).

Fig. D.—Mandible of grub (enlarged).

Fig. E.—Stigma of grub of same (enlarged); 1, peritreme.

Fig. F.—Pupa of "greyback" cane beetle (nat. size).

Fig. G.—Dorsal view of abdominal segments 7 to 9 of same, showing arrangement of striæ.

Fig. H.—*Lepidoderma albohirtum* Waterh., male (nat. size).

Fig. J.—Portion of wing-case of same, showing arrangement of scales (enlarged).

Fig. K.—A single scale (highly magnified).

Fig. L.—Antenna of same, showing 5-lamellate club of male.

Fig. M.—Antennal club of female, with four lamellæ (enlarged).

Fig. N.—Mandible of same (enlarged).

Fig. O.—Maxilla of same (enlarged).

Fig. P.—Labrum of same (lower lip) (enlarged).

Fig. Q.—An ovary of same, eight days after copulation; 2, ovarian tubes; 3, oviduct; 4, copulatory pouch; 5, terminal chamber; 6, immature egg; 7, spermatheca.

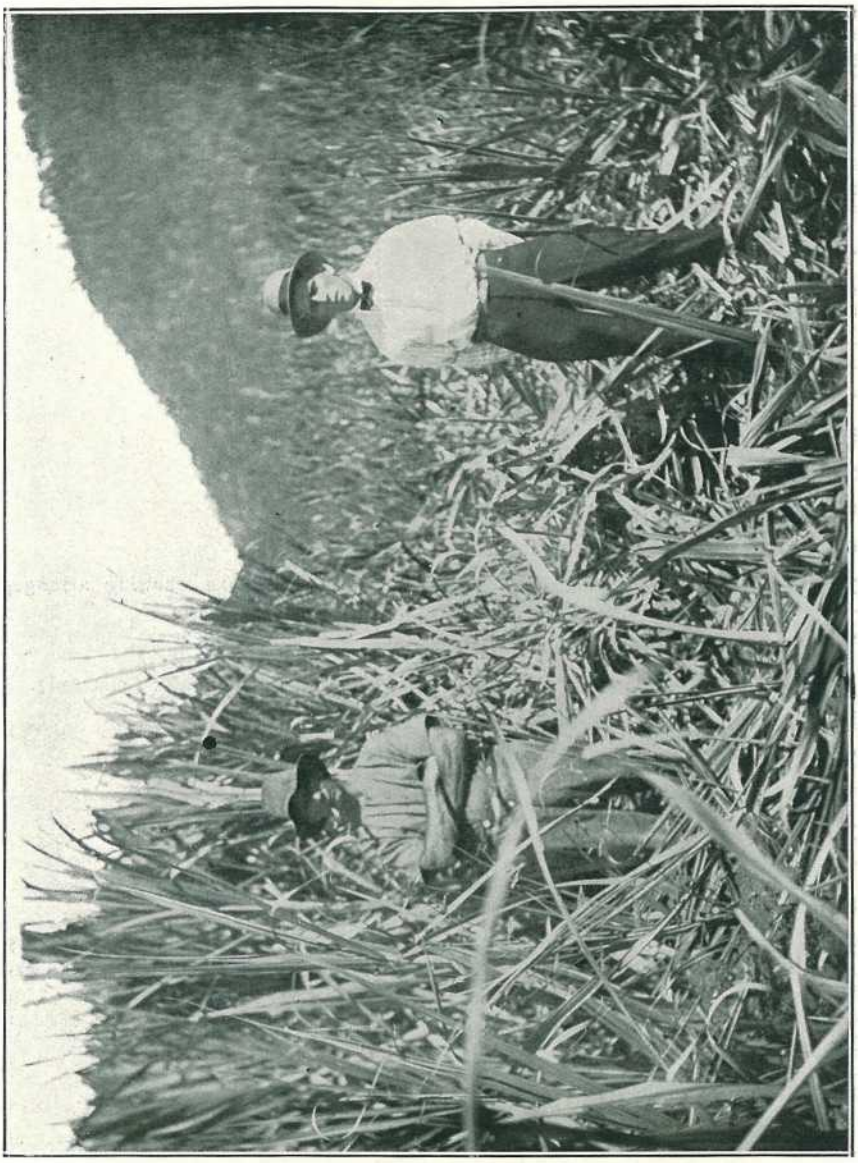

PLATE 45.

One end of the plot injected with paradichlor. (E. C. Earl's estate at Woree), showing cane over the head of manager on left of photo. The man on right hand of photo., who did the injecting, is standing among the cane on the check plot, which has fallen over on the ground owing to grub injury. Photographed about six months after fumigation.

Description of Paradichlorobenzene.

Paradichlor., as it is commonly called here, is sold in the form of irregular crystalline, semi-opaque nodules, granules, or lumps of variable size, somewhat resembling coarse salt or washing soda, and of a colour ranging according to quality or price, from whitish-grey, through pale greens and yellows, to deep brown.

The vapour arising from it is harmless to human beings and domestic animals, and being about five times heavier than air diffuses downwards through the soil from points of injection, permeating also in a lateral direction, and upwards through the surface soil during brisk evaporation of moisture from the ground.

When acted upon by the air the nodules do not deliquesce, but very gradually volatilise; thus allowing ample time for the gas to do its deadly work. Paradichlor. possesses an odour resembling that of ether or benzine; is non-poisonous, cleanly to handle, and not inflammable. Although practically insoluble in water, the crystals will dissolve readily in chloroform, ether, carbon bisulphide, &c.

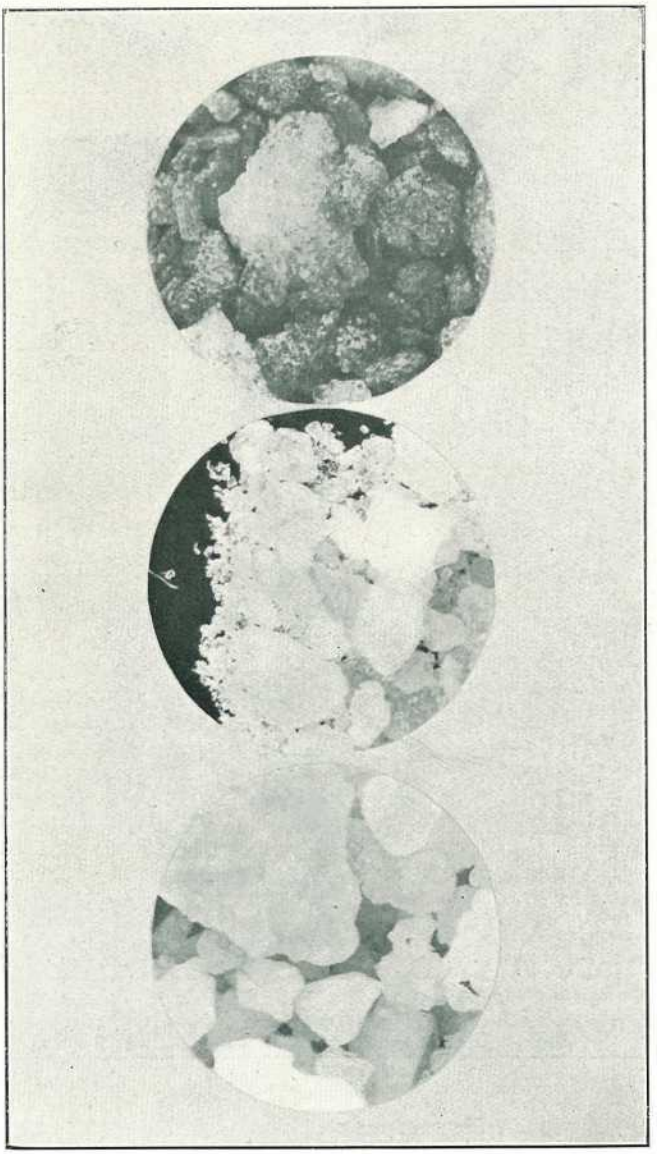

Plate 46.—Three Different Qualities of Crystalline Nodules of Paradichlorobenzene

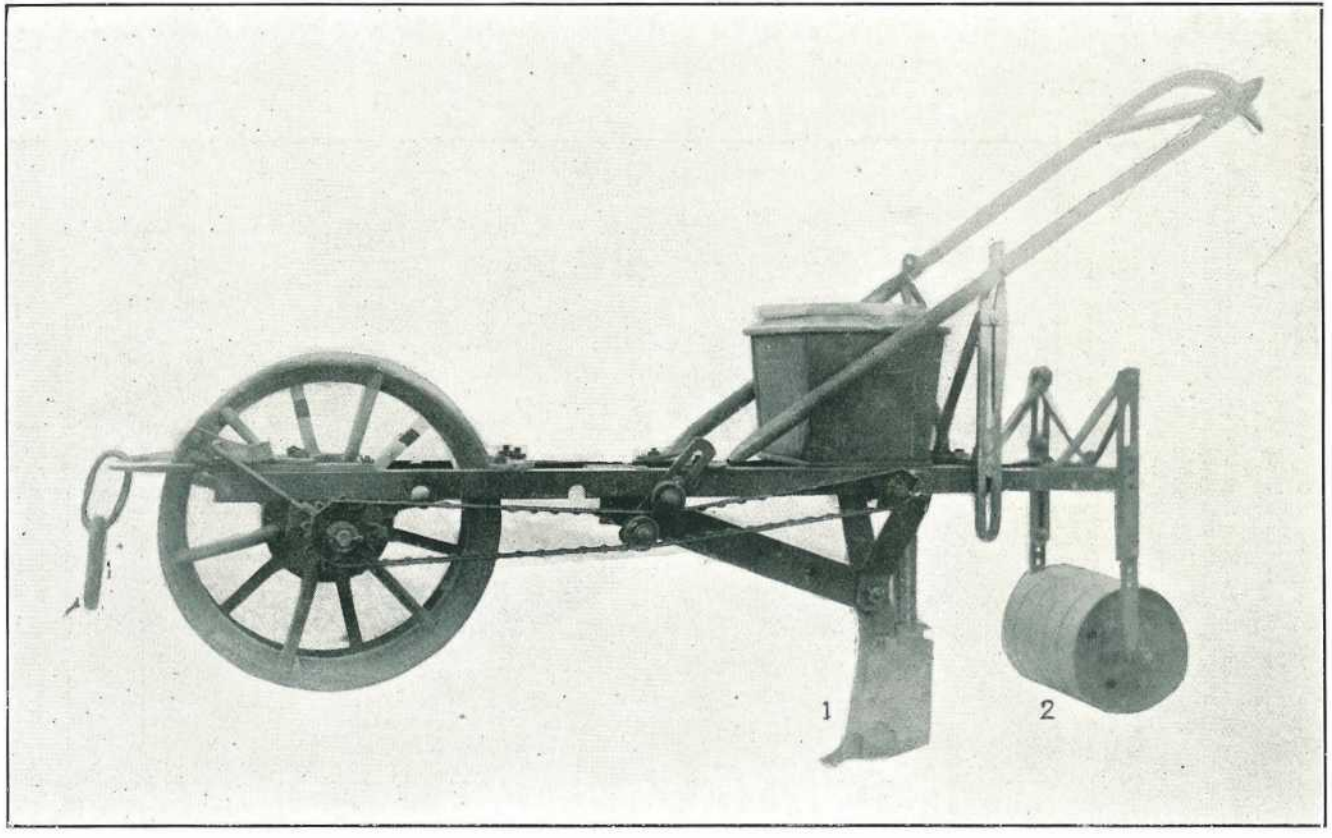

PLATE 47.—MACHINE FOR FUMIGATING GRUB-INFESTED CANE LAND WITH PARADICHLOROBENZENE IN DRY NODULAR FORM, DEPOSITING UNIFORM DOSES AT REGULAR DEPTHS AND DISTANCES APART, COVERING AND ROLLING SURFACE OF SOIL ABOVE SAME

(1) Swing-jointed coulter, protecting delivery tube. (2) Roller, having vertical movement, determining depth of injections.

Rate of Evaporation.

In the Cairns district during dry summer weather ¼-oz. doses of paradichlor.—when buried 7 inches deep in cultivated soil—were found by the writer to maintain effective fumigation throughout a period of about six weeks. Exposed to direct air and daylight, however, a similar dose of the crushed crystals (¼ oz.) evaporated completely in fifteen days under an average shade temperature of 84 degrees Fahr. As the rate of diffusion depends on degrees of soil temperature at the time of application, it is important to remember that the best results from the use of paradichlor. are likely to be obtained during November to January, when our average shade temperature varies from about 70 to 80 degrees Fahr.

Injections of ¼ oz. made in friable volcanic soil near Meringa on 25th January, 1923, lost only one scruple in two weeks (one-sixth of the original dose), while during this fortnight the fumes of paradichlor. had penetrated to a depth of 2 inches in unbroken subsoil, 10 inches in a lateral direction, and had permeated throughout the upper surface soil.

Methods of Application.

With regard to the various methods of applying this fumigant, the following have been tried at Meringa Experiment Station, viz.:—(1) Machine application, (2) injecting, (3) dropping dose in an open furrow by hand.

By the first method a man and one horse could fumigate about three acres of cane per day. The appliance used is a corn-planter adapted by us for such work, by means of which uniform doses of dry nodules of paradichlor. can be buried close alongside rows of cane at regular depths and distances apart; the soil above them being at the same time levelled and slightly consolidated by means of a special roller attached to the machine (see illustration on page 102).

The second method of applying this fumigant was made possible by an injector invented by the writer in 1921 for conducting initial field experiments (see illustration, page 104). This appliance met our need at the time, and answered admirably for treating experiment plots. Without some such simple injector, indeed, it would have been impossible to place in hard ground—except by hand with trowel or dibble—doses of the dry crystals at uniform depths and distances from each other and from the cane rows. Not having been designed for general work in canefields, a novice using this injector would not at first do much more than one-quarter to one-third of an acre of cane per day of eight hours; which would mean the making of from 4,000 or 5,000 separate injections. It may be well to mention here that our best results were obtained on plots where the paradichlor. had been applied in this manner.

Dropping the dose by hand at regular distances in the bottom of an open furrow ploughed close alongside cane rows, and then covering same by returning the soil, is a method which should be given a good trial, and will be further studied by us with a view to securing quicker and more uniform application by use of some simple mechanical dropper.

Note.—It would be well to state in this connection that another method of applying paradichlor.—viz., by dissolving it in bisulphide of carbon—has been tried at Goondi and elsewhere, and its use recommended by officers of the Colonial Sugar Refining Company employed to investigate diseases and insect pests of cane.

On account of the fact, however, that when dissolved in this way the most desirable quality of paradichlor. as a soil fumigant—viz., its long sustained toxic action—is practically destroyed, while at the same time additional cost is incurred for labour and material by employing two insecticides when either of them if used alone would do the work required, such method of fumigation has never been advocated by the present writer.

It is this undoubted advantage of sustained action possessed by paradichlor. in dry form over other soil fumigants which has led to its extensive use in America and other countries as a controlling agent against some of the most formidable insect pests known to economic entomologists.

One is forced to admit that when the fumes from injections of dry nodules of paradichlor. continue active day after day for a fortnight or longer in infested cane land, the toxic vapour can hardly fail to ultimately reach grubs chancing to be ensconced in compacted lumps of soil not easily entered by such vapours; or those grubs that so often lie directly under the stools in earth more or less consolidated by increasing pressure due to expansion during growth of the basal portions of the cane sticks and main roots, where the soil is a little moister as a rule than that disturbed by cultivation and proportionately difficult to permeate.

Further, with regard to the matter of dissolving paradichlor. in liquid mediums, it was shown by experiments conducted in America during 1923 in connection with

the fumigation of insects, that when paradichlor. is dissolved in carbon tetrachloride (a fumigant often used in the place of carbon bisulphide for combating subterranean larvæ, &c.) that about 1 per cent. only of the paradichlor. is given off during evaporation of the carbon tetrachloride, and that this small proportion of 1 per cent. is obtained regardless whether the amount of paradichlor. used be large or small, thus indicating that the toxicity or killing-power of the former insecticide is not greatly changed by such addition of paradichlorobenzene. Similarly, when

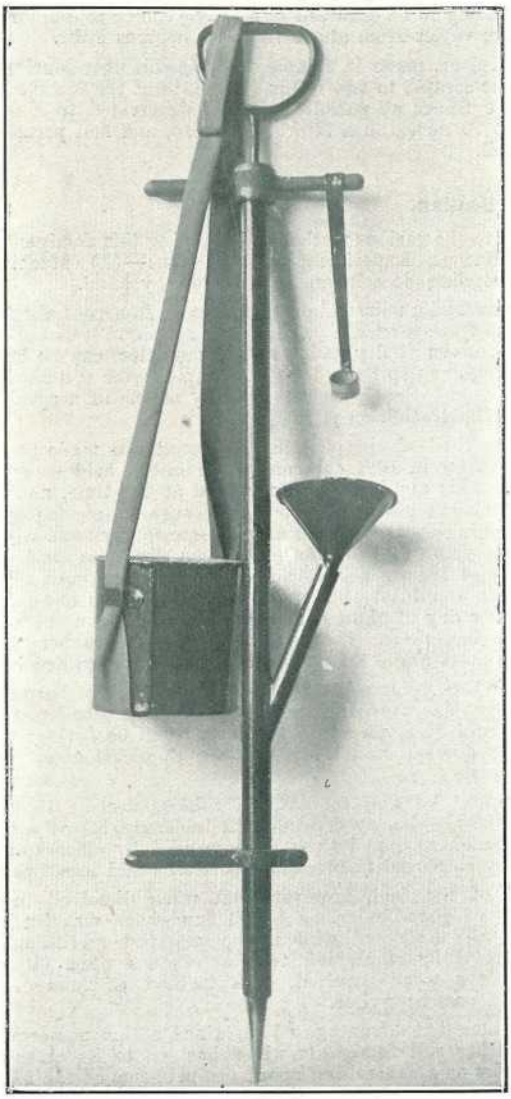

PLATE 48.—JARVIS' HAND-INJECTOR FOR FUMIGATING GRUB-INFESTED CANE-FIELDS WITH PARADICHLOROBENZENE (ABOUT ONE-EIGHTH FULL SIZE).

dissolved in carbon bisulphide the toxic action of paradichlor. lasts no longer practically than that resulting from fumigation of soil by carbon bisulphide when used alone.

Before applying paradichlor. (either by machine or hand injection) all large lumps or nodules should be crushed up and the whole passed through a sieve with ¼-inch meshes.

Quantity and Cost per Acre.

This would necessarily vary somewhat according to weight of the dose and distances allowed between injections.

When treating ratoon crops 3 to 4 feet in height by machine application, a dose of 1¾ drachms (Apoth.) could be used on badly infested cane land; although in most cases ½ oz. will be found sufficient. For plant cane from 1 to 2 feet high the dose should be about 1 drachm; and for still smaller cane 2 scruples (Apoth.) would prove effective. In each case these doses are to be administered from 5 to 6 inches from the nearest cane shoots, 15 to 18 inches apart, about 4½ inches deep, and on both sides of the rows.

Approximately, the quantities required per acre work out as follows:—

Dose of 1 drachm—

Placed 15 inches apart	= 113 lb.
Placed 18 inches apart	= 98 lb.

Dose of 4½ scrup.—

Placed 15 inches apart	= 169 lb.
Placed 18 inches apart	= 147 lb.

The probable cost per acre, including labour for treating such ratoon and plant crops by machine application, would depend largely, of course, upon the market price of paradichlor. At the present time (November, 1927) the cost works out at about £6 15s. for maximum doses—applied in exceptional cases to advanced ratoons—and £4 10s. for the majority of crops requiring fumigation.

Future experimentation, however, with smaller doses of paradichlor. is likely to effect a reduction in the costs mentioned above, seeing that field experiments already alluded to, undertaken during 1923, demonstrated that the vapour arising from a dose of only 1 scruple (1/24th of an oz. Apoth.) injected 6 inches deep in volcanic land, are sufficient to permeate and sustain effective fumigation during a period of two weeks. In well-drained friable soils this would permit ample time for the toxic vapours to reach about 95 per cent. of the grubs; so that in such situations it would not be necessary to extend fumigation over a longer period.

Price of Paradichlorobenzene.

This chemical can be obtained from Messrs. Buzacott and Company, Limited, of 7-11 Market street, Sydney, at the following prices:—32-lb. tins, 10d. per lb.; 8-lb. tins, 1s. per lb.

The quality supplied by the above firm, which is sold in the form of large rock-like brownish-black lumps of variable size, appears to possess good toxic properties; the vapour, when closely confined in a glass jar, tending to soon form large oblong crystals, which are thin, plate-like, and nearly transparent, and may be seen adhering in great numbers to the glass inside.

When to apply Paradichlorobenzene.

The best months for treating late-planted cane and ratoon crops is during a period dating from the middle of December to end of January, while the soil is not too wet, and grubs still in their first and second stages of growth. In the event of emergence of the beetles being delayed until the beginning of December, as often happens, fumigation may be carried out about the middle of January.

The soil at time of treatment should be nicely moist, neither too wet or very dry, in a condition to work freely without sticking. A capital test is to examine with a pocket lens of good magnification a small piece of soil between the rows of cane, taken without compression from a depth of about 6 inches. The individual tiny soil particles can then be clearly seen, and in ground not sufficiently aerated for fumigating, water will be distinctly observed filling the interstices between these particles. Treatment must never be delayed until after commencement of the wet season, when grubs have started to noticeably damage the crop, or the chances are that on low-lying situations, or on areas supporting cane of a size to completely overshadow the ground between the rows, such land may remain closed for several weeks against passage of the fumes.

An instance of such late treatment happened during 1923 on a piece of land at Woree, which was injected on 19th March, when grubs were fully grown and external injury to the cane apparent.

Treatment in this case was followed almost at once by a fall of 14 inches of rain spread over a period of eleven days.

The crop being higher than one's head naturally prevented the ground from drying, and when examined about three weeks later we found—upon digging up and

weighing some of the doses—that no appreciable evaporation of the paradichlor. had taken place, owing, doubtless, to the soil having remained waterlogged; and that nearly all the grubs were alive and quite normal.

When this water had mostly drained away, which occurred about a couple of months after injection of the paradichlor., another examination of these plots revealed a mortality of about 50 per cent. of the grubs.

The following instructions regarding the best time to commence fumigation work on different classes of soil will be found useful to canegrowers:—

Light, friable volcanic soils—From four to five days after a fall of about 3 inches of rain.
Sandy soils—Two or three days after heavy rain.
Clay loams or sandy loams—About six days in well-worked and well-drained land.

Fumigation of heavy clay ground is seldom advisable, unless such land be very well cultivated and treated with organic manures and thoroughly drained; but, fortunately, this class of soil rarely becomes seriously grub-infested.

In the event of wet weather occurring a few days after an application of paradichlor., the very slight solubility of this chemical in water is, of course, greatly in its favour, since during wet conditions evaporation of the crystals simply remains in abeyance, as it were, becoming operative again as soon as excess of moisture has drained away.

Does not Injure Cane Plants.

During November of 1922 a field experiment was carried out at Meringa, in which forty-eight stools of young plant cane about 14 inches high, growing on volcanic soil, were treated with ¼ and ½ oz. injections placed along one side of a row of D. 1135, and from 4 to 6 inches from the stools. An adjoining row of similar cane on each side of the treated row served as check plants.

Some of these injections were placed immediately opposite stools, and others diagonally, in intermediate positions, all being 6 inches deep. When examined a few months later none of the treated stools were materially injured by this fumigant, while some months later still, growth of both the treated and check rows was found to be quite normal, not a single stool having been stunted in any way (see Bulletin No. 18, pp. 25, 26).

On experiment plots established at Sawmill Pocket, Woree, Highleigh, Meringa, and elsewhere during 1923-24, on which the varieties Badila, Clark's Seedling, and D. 1135 were fumigated with injections varying from 1/16th to ¼ oz. of paradichlor. to test its action upon the growth of young ratoon and plant cane, the results in all cases showed that this fumigant when properly applied does not in any way injure the plants.

On one of these experiment plots (D. 1135) the owner, indeed, noticed that, although no evidence of grubs could be found in the treated or check areas, the cane on the fumigated plot appeared slightly higher than that on the adjoining check plot.

Upon comparing the length of the sticks from these two plots while lying in the field after cutting, this difference in tonnage was quite marked.

Another grower who fumigated some of his cane last season (1926-7) discovered when getting his returns and figures from the mill that the cane he had treated with paradichlor. showed a higher percentage of sugar than that cut from the check plot.

In this case also, no apparent grub-infestation chanced to occur in either of these two plots. The quality of paradichlor. used was that sold in the form of black, rock-like masses at 10d. to 1s. per lb., and was applied with a cane fertiliser machine.

Used against other Insect Pests.

Growers should not lose sight of the fact that paradichlorobenzene holds first place among the various insecticides employed both in Europe and America for controlling not only soil-frequenting larvæ of some of the most serious insect pests, but also for combating numerous world-wide species of great economic importance affecting stored foods and other products.

When first employed in California against the "Pacific Peach Tree Borer" (*Ægeria opalescens* H. Edw.), "preliminary tests," states E. O. Essig, "demonstrated at once the efficacy of the paradichlorobenzene treatment, and immediately presented an unexplored field in the control of agricultural pests, and particularly those difficult and hitherto almost uncontrollable forms which inhabit the soil."

The following list of a few of the more serious insect pests against which paradichlor. is at present being used may interest some of our farmers:—

Ægeria exitiosa Say.—"Peach Tree Borer"; for larvæ boring the main roots.
Ægeria opalescens H. Edw.—"Pacific Peach Borer"; for larvæ boring roots of peach, cherry, prunes, apricot, and other trees.
Eriosoma lanigera Haus.—"Woolly Blight" or "Apple Root Aphis."
Eriosoma languinosa Hartz.—"Pear Root Aphis."
Gortyna immanis Gn.—"Hop Borer"; for aphides on roots.
Diatræa saccharalis F.—"Moth Borer"; to destroy caterpillars in cane sticks before planting.
Rhizoglyphus sp.—"Bulb Mite."
Capnodis tenebrionis L.—"Root Borer" attacking plum and cherry trees.
Wireworms in dahlia roots.—*Note:* Splendid results have been recorded in California against this pest infesting planted dahlia roots.
Miscellaneous insects attacking furs, carpets, &c.
Caterpillars infesting stored fruits.
Insects attacking stored products, grain, nuts, &c., &c.
Termites in houses (for fumigating confined spaces).
Beetles damaging stored timber.
Flies, ants, cockroaches (these are readily killed by using 1 lb. to 100 cubic feet of air space).

Points to be Remembered.

(1) The correct time for administering paradichlor., modes of fumigating, cost per acre, &c., described in this pamphlet, apply only to the "greyback cockchafer," our chief pest of sugar-cane, which has a life-cycle of one year.

(2) Do not use excessive doses. From 1½ to 3 scruples weight (Apoth.) is sufficient in most cases for plant cane 1 to 3 feet high; and 5 scruples for older plant or ratoon crops.

(3) When treating very young plant cane avoid placing the crystals closer than about 5 inches from the nearest shoots.

(4) Do not fumigant when the soil is very dry, or while it is excessively wet.

(5) Only one treatment is needed each year—to be given when possible during December or early in January before commencement of the wet season.

(6) Store this insecticide in airtight tins when not in use, or in closely-fitting wooden boxes, to prevent waste from needless evaporation of the crystals.

(7) Order supplies in good time (about end of July or early in August).

DESTROYING CANE GRUBS WITH CARBON BISULPHIDE.

PREFATORY NOTE.

The reputation of this fumigant for combating the activities of numerous species of insects attacking miscellaneous stored products, such as dried fruits, leather goods, tobacco, flour, &c., or damaging the roots of many trees or plants of great economic value may be said to be world-wide, its suitability for such control work having been amply demonstrated during the last forty years or more.

It was used in Australia as far back as the year 1891, when Mr. C. French, senr., who at that time had just been appointed Government Entomologist in Victoria, recommended it for controlling the ravages of the "Apple Root Borer" (*Leptops hopei*).

More recently, carbon bisulphide has been employed in our canefields against grubs of root-eating scarabæid beetles; and when applied intelligently appears to have given general satisfaction.

It should be mentioned here that during 1905 experiments on a large scale were carried out in canefields at Mossman under the supervision of Mr. W. E. Seymour-Howe, who subsequently published a pamphlet on the destruction of cane grubs by the carbon bisulphide treatment for the benefit of our Northern canegrowers.

This publication has proved very serviceable, as it describes how to manipulate a hand injector, and enumerates various important points worth memorising in connection with the use of carbon bisulphide.

I may state that its use against caterpillar borers or grubs tunnelling the roots of fruit trees, &c., has of late years been largely superseded by paradichlorobenzene; as although under proper conditions of soil moisture and porosity carbon bisulphide has proved an effective fumigant, its extreme volatility during ordinary temperatures renders it difficult at times to secure uniformity of evaporation under subterranean conditions.

Such troubles, due to variation in soil porosity, would naturally be liable to occur when fumigating the ground around the trunk of a fairly large fruit tree, which may have lain uncultivated for years, while subjected at the same time to uneven compression in different spots owing to growth and expansion of its main roots.

Soil conditions of the above nature, however, should very seldom be experienced in well-worked canefields.

Description of Carbon Bisulphide.

Most farmers are familiar with the appearance of this fumigant, which may be described as a colourless liquid with a very offensive odour, about one-fourth heavier than water, and considerably more than twice as heavy as air. Although not dangerous to handle as a fluid, its vapour explodes readily and violently if exposed to a flame or any incandescent object, which accordingly necessitates great caution on the part of the operator handling it. This should be carried out whenever possible in the open air, and away from any source of heat, even that arising from a lighted cigar or tobacco pipe. On this account carbon bisulphide is usually put up in iron drums, which ought always to be stored some distance away from any dwelling, and in a cool, well-ventilated spot. Upon exposure to the air this liquid evaporates with great rapidity, so that in order to be effective against such insects as cane grubs, the toxic fumes need to be confined in sufficient proportions to render the air occupying the tiny interstices between soil particles fatal to animal life.

Action of Carbon Bisulphide on Cane Grubs.

When injected into the soil close to a stool of cane, the volatile fumes, on account of being so much heavier than the air, tend to spread mostly in a lateral and downward direction.

Though gradually working upwards, the greatest density of the vapour is found to usually occur at the lower levels.

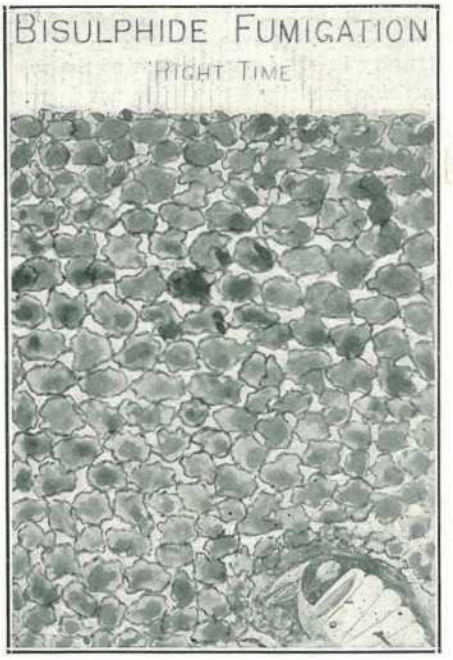

Photo.: E. Jarvis.]

PLATE 49.

DIAGRAMMATIC DRAWING OF VERTICAL SECTION THROUGH SOIL ABOVE A CANE GRUB.

(A) Interstices between soil particles filled with air, open for fumigation.

This fact was remarked by us when experimenting in the year 1923 with carbon bisulphide in a canefield against greyback cockchafers lying in pupa cells, when beetles situated at depths of 15 to 18 inches below the surface in unbroken subsoil were killed by ½-oz. doses injected 7 to 13 inches above them. It is important, therefore, to make sure that such doses are always made at least a couple of inches above the general level at which grubs happen to be feeding during the treatment of cane land.

The fumes upon reaching a grub act very rapidly on its vitality, producing paralysis and suffocation, as well as exercising other injurious effects on fats and proteins contained in the body.

Photo.: E. Jarvis.]

PLATE 50.

(B) Interstices clogged with water, closed against fumigation.

How and When to apply Carbon Bisulphide.

This fumigant is usually injected into the soil by means of an appliance specially designed for the purpose, with which uniform doses can be administered at any depths or distances required. Familiar examples of reliable hand injectors are those known as the "Danks' Injector" and the "Vermorel Excelsior," both of these being forms of the old "Pal Injector" originally invented by Vermorel for fumigating the "Grape-vine Aphis" (*Phylloxera vastatrix* Planch.) in the vineyards of France.

The former appliance, which may be obtained from John Danks and Son, Bourke street, Melbourne, costs £10 10s., or £9 9s. if six or more be ordered at the one time. The freight on up to three injectors would be 18s. 6d. The "Vermorel Excelsior" is supplied by Cooper, Pegler, and Co., Ltd., of 24-26 Christopher street, Finsbury Square, London, E.C. 2, at a cost (including duty, wharfage, packing, &c.) of under £5. Full directions as to how to use same and regulate the various doses obtainable are sent with each appliance (see illustration on page 110).

Before applying carbon bisulphide to ground thought likely to prove infested, it should first be examined at a time when grubs are in their early stages of growth, in order to discover the extent and degree of infestation and the depth at which they happen to be feeding. The best time to inject is when the first inch or two of the surface is firm or slightly caked, while the main body of soil below is in a moist, well-drained, and open condition. It should be remembered that land is not fit for such fumigation unless it has lain undisturbed by cultivation for at least a fortnight.

A good way to find out whether it be in a fit state for treatment is to take a handful of soil from a depth of about 6 inches and squeeze it firmly between the palm and fingers.

If this compressed lump readily breaks into particles when dropped about 6 feet upon hard ground it shows that excess of moisture has drained away. Another method is to examine with a pocket lens a small portion of uncompressed soil taken from a similar depth, and look for the glint of water filling air-spaces between the minute soil particles.

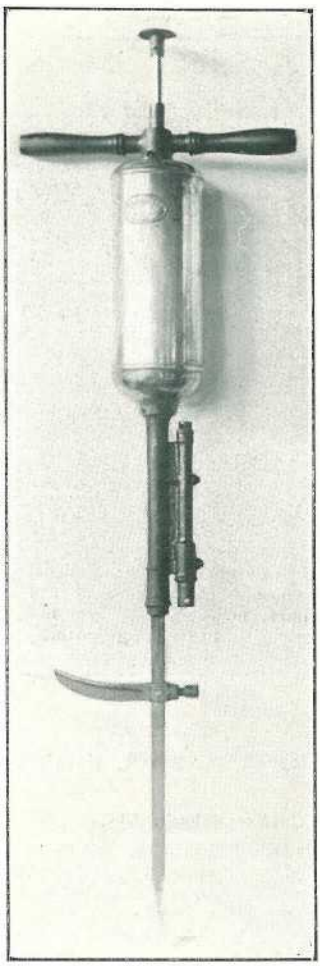

PLATE 51.—"VERMOREL EXCELSIOR" HAND-INJECTOR, FOR FUMIGATING CANE LAND WITH BISULPHIDE OF CARBON (LENGTH 44 IN., WEIGHT ABOUT 14 LB.)

The following guide as to the best time for fumigating various classes of soil will be serviceable to canegrowers:—

Highland volcanic soil or coarse sandy loams—From four to five days after a fall of 2 or 3 inches of rain.

Clay loams or fine sandy loams—About six days on land that has been well worked and drained.

Sandy soils—Two or three days after heavy rain.

Fumigation of stiff clay land is never advisable, unless in cases where the drainage and cultivation happen to be exceptionally good, and organic manures have been freely used.

Failure to secure good results from the use of carbon bisulphide is generally due to lack of essential knowledge on the part of the operator. When a farmer who has neglected to fumigate at the right time suddenly notices external evidence of grub damage amongst his cane he generally hastens to inject at once, without waiting to find out if the soil be in a fit state for such treatment. The most propitious time for using this insecticide is during a period dating from about the middle of December to the end of January (see further directions on page 105 under heading "When to Apply Paradichlorobenzene").

Cost of Fumigation per Acre.

According to a late quotation (September, 1927) received by the writer, carbon bisulphide is supplied by Cumming, Smith, and Company at the rate of 38s. 6d. per drum of 60 lb., f.o.b. Melbourne.

The freight for this works out at £6 1s. per ton measurement of ten cases—that is, twenty drums to the ton measurement, or slightly over 6s. per drum. Allowing for this additional freight, the price asked for by their Brisbane agents (Messrs. Taylor and Elliott) would be £2 4s. 6d. per drum—practically about 9d. per lb.

The amount of carbon bisulphide required per acre would necessarily vary somewhat, according to the age, &c., of the stools treated. One drum per acre has been recommended by some authorities as being sufficient in most cases. For young plant or ratoon cane growing on friable classes of light soils, doses of about 1 drachm, injected 3 to 4½ inches deep, 18 inches apart, and on both sides of rows planted 5 feet apart should destroy 70 to 95 per cent. of the grubs. This would take about one and a-quarter drums (77 lb.) of carbon bisulphide per acre—equal to £2 15s. for material.

A similar treatment would be suitable for older plant cane or ratoon crops, either on clay loams or light soils, but in such cases it will often be found advisable to inject every 12 inches instead of 18 inches apart, which works out at about two drums per acre—equal to £4 10s. for material.

Unfortunately, the only way at present of applying carbon bisulphide in canefields is by hand injection, which, in addition to being expensive, is liable occasionally to be more or less uncertain as regards results obtained, owing to the difficulty of procuring men who will faithfully perform work of a disagreeable nature. Assuming, however, that a labourer can fumigate one-third of an acre in a day of ten hours—which is about as much as could be done when treating both sides of rows of cane planted 4 feet 6 inches apart, necessitating the making of about 6,100 separate injections—the total cost per acre for treating ordinary crops 2 to 4 feet high would amount to about £6 15s.

After making each injection the operator should close the hole left when withdrawing the spear of the injector by pressing loose earth into it with his heel to consolidate the ground above the dose.

During fumigation work in the field, instead of filling an injector by pouring into it the bisulphide from an ordinary drum, the entire contents of the latter are usually emptied at once into special drums fitted with taps, and placed on headlands or convenient roadways, from which the injectors in use can be easily replenished without incurring unnecessary waste of material.

Very favourable conditions for applying this fumigant are when the soil is firm, yet nicely moist, and with good porosity, while the surface is compacted owing to recent wet weather.

If very dry or too porous even large doses injected at such times may have little or no effect on soil-frequenting grubs or insects.

When fumigating orchards that have been indifferently cultivated, it is sometimes advisable to use a water emulsion of carbon bisulphide, which applied in this form has been found to standardise soil conditions, and prove uniformly effective without causing injury to the plants or young trees.

Manurial Value of Carbon Bisulphide.

We should not lose sight of the well-established scientific fact that carbon bisulphide, even when applied in strong doses, exerts a favourable influence on the soil, producing beneficial effects, and greatly improving the fertility of exhausted lands.

Its action, whilst resembling that of the bare fallow, is said to be more effective, as it gives immediate results by at once disinfecting soils so treated, and rendering them fit for new crops.

When using soil fumigants such as paradichlorobenzene or carbon bisulphide, it should always be remembered that in addition to the extra tonnage of cane obtained as an immediate outcome of such fumigation, beneficial results are also derived as a matter of course by the ratoon crops of the following season, owing to the absence of root-eating grubs and injurious soil bacteria, &c.

SUMMARY.

Carbon bisulphide is a volatile liquid, heavier than air or water, the vapours from which will explode if brought near fire, and when confined underground prove quickly fatal to animal life.

In well-aerated soils the fumes spread laterally and downwards, paralysing and suffocating all grubs or insects occurring within a radius of about 9 inches from points of injection.

Application is made by means of a hand injector, costing from £5 to £10, at a time when the ground is moist and permeable to the toxic fumes, and the surface even and slightly compacted by recent rains.

Doses of about ½ oz., injected from 12 to 18 inches apart, are placed just above the level at which grubs are feeding.

The best months to use this fumigant embrace a period dating from about the middle of December to end of January, while the cane shows no signs of being grub-affected.

Avoid working the soil for at least a fortnight, both before and after fumigating same with carbon bisulphide.

Cost of treatment per acre for labour and material varies from about £5 to £6 15s.

Carbon bisulphide possesses valuable manurial properties, and greatly improves the fertility of poor land or exhausted soils.

Do not apply carbon bisulphide to very young cane just beginning to make roots, but wait until the stools are established and the cane about 2 feet high.

Calcium Cyanide as a Soil Fumigant.

Laboratory experiments with calcium cyanide were commenced at Meringa Experiment Station during February, 1924, to determine the effect of hydrocyanic acid gas on the grubs of root-eating scarabæidæ. Data obtained at that time showed that a dose of 8 grains was sufficient to kill first-stage grubs of *Lepidoderma albohirtum* Waterh. (greyback cockchafer), and third-stage grubs of *Lepidiota frenchi* Blkb. in less than twelve hours.

This was sprinkled about 2 inches above the level at which they were feeding, in cages containing 36 cubic inches of soil, the dose being at once covered by moist earth to a depth of a couple of inches. Having proved that it would kill grubs located just under injections, a series of experiments were made to determine how far hydrocyanic acid gas would travel laterally underground with fatal results. The cages used for this work contained about 144 cubic inches of soil, the poison being placed in the centre of each cage, and about 1½ inches below the surface. In the first experiment three of these cages were used, and a first-stage *albohirtum* grub placed at opposite ends of each, 2 inches below and 2 inches to one side of the dose.

One of the grubs in each of these cages was prevented from moving farther away from the injection by a vertical screen of wire gauze. When examined twenty-four hours later, results were as follows:—

Cage A.—Dose 15 grains of calcium cyanide; both grubs dead in the position placed.

Cage B.—Dose 15 grains; grub imprisoned by wire gauze dead; other grub had moved to one side and was dead.

Cage C.—Dose 8 grains; both grubs dead in original position.

In another experiment in which 15 grains of this poison were buried 1½ to 2 inches below the surface, second-stage grubs were placed 4½ inches from the injection, laterally, and a couple of inches below same. When examined about twenty hours later results were as follows:—

Cage D.—Both grubs dead, but had worked about ½ inch nearer to the surface.

Cage E.—Both grubs dead.

Cage F.—One grub had travelled into corner of cage and was dead; the other sick, but able to move its legs.

In a third experiment conducted later second-stage grubs of *albohirtum* were placed 2 inches under, and 4½ to 5 inches away from, injections of 15 grains, and when examined twenty-four hours later results were as follows:—

Cage G.—Both grubs dead; one had moved 1 inch nearer the poison; the other was in original position.

Cage H.—Both grubs dead in original position.

Cage J.—Both grubs dead and soft; one had moved ½ inch nearer the poison.

Two months later (April, 1924) thirty-six third-stage grubs of *albohirtum*, each in a cage containing moist soil, were treated with 8 to 12 grains per cage of calcium cyanide flakes, placed 3 inches above the grubs, and after a lapse of twenty-four hours all grubs were found dead, and a strong odour of cyanide still pervaded the soil.

Experiments made to determine the effect of such fumigation on growing cane roots yielded highly encouraging results.

In the first tests doses of 40 to 60 grains were injected about 6 inches from shoots of young plant cane, without any injurious effect on growth of the stools. These field tests were followed up later on by application of 80 to 200 grains of calcium cyanide per plant, without any harmful effects resulting.

When examining these plots forty-seven days after treatment with maximum doses, plants that had received 120 and 200 grains were found quite normal, and appeared to have made better growth, if anything, than the check plants alongside.

Field Experiments with Calcium Cyanide.

Early in February of 1925 preliminary field experiments at Meringa resulted in our securing a mortality of about 48 per cent. of first and second stage grubs of *L. albohirtum* on light volcanic soil, with doses of 1 scruple, injected 1 foot apart on both sides of cane rows. During 1926 experiment plots were laid down at Meringa to determine the effect on cane grubs of calcium cyanide flakes, but owing to the occurrence of drought conditions and other adverse influences these plots showed a difference of only 36.7 per cent. in grub infestation between the treated and check areas in favour of the former. The cane in both plots had also suffered the previous season from grub damage, and consequently the "strike" in many places was uneven and numbers of the ratoons were stunted.

Judging by the results of laboratory experiments outlined above, calcium cyanide may prove an effective fumigant against cane grubs in North Queensland. At the present time, however, insufficiency of data in connection with field work renders it inadvisable to publish definite recommendations with regard to the use of this insecticide in our canefields.

SEASONAL PROSPECTS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has returned from a brief visit to the Bundaberg, Isis, Maryborough, and Nambour sugar districts. All the Southern mills finished crushing prior to the New Year, and the crop was much better than in the previous year, 1926.

So far the season, as far as rainfall is concerned, has opened up well, but there has been very little hot weather, and the cane though of good colour has in many instances not made the anticipated growth. Weeds are also giving much trouble. It is hoped, however, that a warmer spell of dry weather may eventuate and so enable cane farmers to clean up their lands and bring about a more rapid growth of cane. The present season has been remarkable for its absence of hot, humid weather so far, and many farmers are unable to recollect so cool a summer before.

Some fine Badila and Q. 813 were seen on the Maroochy River. Wet conditions here have prevented many farmers from getting on with cultural operations, though they are working early and late to take advantage of every opportunity offering. This land, while of excellent quality, is moist naturally, and farmers have to go to much trouble and expense to provide suitable drainage. This has been done by a large number of the growers who have spent large sums of money in getting rid of the surplus water, and by so doing have considerably improved their holdings.

All the mills are providing for large crops this year, and it is hoped that the remainder of the season will be satisfactory.

CANE PESTS AND DISEASES.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has received from the Entomologist at Meringa, near Cairns, the following report (22nd December, 1927) from Mr. J. H. Buzacott, Assistant to the Entomologist at that place:—

INNISFAIL.

The second week in December was spent in the Innisfail district examining farms for beetle borer and other pests. As the Goondi mill had finished crushing, opportunity for examining borer infestation was poor, as there was little standing cane left on plantations served by this mill.

Beetle Borer.

The beetle borer has been very bad everywhere this year, probably owing to the cyclone and floods during February. Many farmers seem to consider that, in attacking the cane sticks about the middle and top as well as at the base, the borer has formed a new habit; but this is not the case. It only means that there is a heavier attack than usually experienced on the farm in question, as, only in comparatively light infestations does the beetle confine its attentions to the butts of the cane.

Rats have been very bad this season, and borer damage was frequently noticed in rat-eaten canes, the removal of the rind by the rat having formed an easy ingress for the ovipositor of the egg-laying beetle.

Tachinid flies were found parasitising grubs of the beetle borer on several farms in the South Johnstone district, upon some of which no liberations had been made, thus proving that the flies are gradually spreading, although they have met with serious reverses this year. The practice of burning so much cane as has been burnt at South Johnstone this year is ruinous to the efficient spread of flies.

It would not be surprising to find the borer worse than ever next year owing to the dumping of many thousand tons of cane; for although this cane may be burnt before cutting, burning only kills the borers close to the surface, whilst those near the centre of the stick escape, thus releasing hordes of the beetles which normally would have been exterminated during milling operations.

On the whole the beetle borer was far more plentiful (1) near creeks, swamps, or the river bank, (2) in dirty cane, and (3) along headlands and outside borders of blocks rather than nearer the centre. No borers were seen on red volcanic soils.

Grubs.

In the sections visited grub damage was negligible, and grubs of French's cane beetle (*L. frenchi*) do not appear to have created the same havoc down there that they have farther north. A few odd grubs of the Christmas beetle (*Anoplognathus boisduvali*) were turned up by the plough in sandy soils.

Beetle Flight.

The only beetles seen in flight were the Greyback (*Lepidoderma albohirtum*), the Christmas beetle (*A. boisduvali*), and the small green beetle (*Anomala australasiæ*). The flight of greybacks was small and followed an inch and a-half of rain about a fortnight before. It is probable that there will be a larger flight as soon as there are any heavy rains.

Army Worms.

One of the army worms (*Cirphis unipuncta*) was responsible for a fair amount of damage on one or two farms. If the cane affected be sprayed with a mixture of 2 lb. of lead arsenate in 50 gallons of water, the greater part of them will be killed.

Moth Borer.

The large moth borer (*Phragmatiphila truncata*) was observed in small numbers on nearly all farms, but nowhere was it causing appreciable damage.

General.

The districts visited comprised Mundoo, Wangan, Goondi, South Johnstone, and Mourilyan, and the cane in all these areas should greatly benefit by heavy showers which fell during the week. Ratoons of borer cane were very backward in dry places owing to the borers having removed a great deal of the food matter in the stool; however, with rain a great many of these backward stools may improve.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report from the Assistant Entomologist at Bundaberg, Mr. R. W. Mungomery, for the period November-December, 1927:—

Activities of Army Worms (*Cirphis loreyi* Dup.).

During the past month large numbers of army worms have been in evidence, and in many parts of the Bundaberg district they have completely stripped the leaves of young ratoon cane, leaving only the bare midrib and the small stalks exposed to view. In severer cases they have even eaten the young tender shoots, and in this way were responsible for a marked check on the growth of the cane stools.

These pests occurred mostly in small patches in widely separated fields of cane, and when first noticed they were distributed uniformly throughout the affected areas. Growers soon became apprehensive of the safety of their crops and sought advice from this station, and we advised the use of the following poison bait, scattering the mixture throughout the infested area:—Bran 50 lb., sodium arsenite 2 lb., the juice of six lemons, and molasses.

The sodium arsenite is first dissolved in a small quantity of water, and this together with the lemon juice is thoroughly mixed in with the bran, and enough molasses is then added to bring the mass to a stiff dough. By using sodium arsenite in this manner instead of white arsenic as is sometimes used, we found this mixture to be far more effective and that it gave a quicker kill, for dead caterpillars could frequently be found under pieces of trash at the base of the stools on the day following its application. Caterpillars that were taken to the laboratory for experimental purposes seemed to be attracted by this mixture, and were eager to eat it even during the daytime, although it is customary for them to feed after nightfall. Therefore it is best to distribute the bait late in the afternoon, when the sun's rays are no longer powerful enough to dry up the mixture, and it will then be in a moist and attractive condition when the caterpillars commence their feeding. By sprinkling the mixture lightly along the cane rows, 20 lb. will be found sufficient to treat an acre.

Some growers sought relief by spraying the foliage with lead arsenate (5 lb. in 100 gallons of water) and obtained good results with this method.

Of many hundreds that were kept under observation, only a few caterpillars assumed the imaginal condition and emerged as perfect moths, the remainder suffering a heavy parasitism. The moths proved to be *Cirphis loreyi* Dup. The parasites, though not yet identified, represent two species of flies (*Tachinidæ*) and a wasp (*Ichneumonidæ*).

Much the same state of affairs prevailed in the Isis district, where parasites were also found to be active. In view of the small percentage of moths emerging and the large number of parasites, as well as the increased vigour of the cane, it is not expected that succeeding generations of army worms during the early part of the coming year will be large enough in numerical strength to cause any appreciable damage to cane crops.

Notes on Cane Beetle Pupæ (*P. furfuracea* Burm.).

Part of the months of October and November were occupied by Mr. G. Bates, Assistant to Entomologist, in carrying out investigations in the Isis district concerning the pupal stage of the cane beetle (*P. furfuracea* Burm.). This was a most important subject for investigation, in view of last year's observations when an overwhelming preponderance of male beetles were found to be attracted by the light traps. Some maintained that probably the beetles emerged in these proportions, and although the writer was of the opinion that such an occurrence would be quite unusual amongst insects of this class, we sought to gain definite data on the subject. The primary object, therefore, was to determine the relative proportions of the sexes of these insects as they occurred naturally in the soil, and in consequence as they would emerge from the soil, after the advent of suitable rains.

Now sex in "furfuracea" beetles may readily be determined by an examination of the antennæ, the clubs of which are much larger in the male than in the female sex, being longer and composed of a greater number of plates. The pupæ also exhibit the same characteristics in this respect as the beetles, though, of course, it is not possible to distinguish the actual number of plates which go to make up the club. Therefore, to determine sex amongst pupæ of this beetle, one has merely to examine those parts which will subsequently develop into the antennæ of the perfect beetle.

By digging trenches in several different fields of cane previously infested with grubs, pupæ and some newly changed beetles were found in their cells in the soil, at depths varying from 9 to 22 inches, the average being 16.8 inches, and it was interesting to note that females had, on the average, pupated from 1½ to 2 inches deeper than the males.

Of the total number dug up in this manner, 248 should have assumed the beetle stage this year, and of these 133 were males, 93 were females, and 22 were of undetermined sex owing to being either grubs in the prepupal condition, or pupæ so badly damaged by digging operations that it was impossible to distinguish their sex.

Additional data was obtained from several grubs that were collected from canefields in the early part of this year. These were taken from the furrows as they were exposed by the plough, and were bred through to the adult stage at the laboratory, where the ultimate figures showed 21 males and 16 females. This, however, was not considered so accurate as the field test, for it was thought possible that while living under unnatural conditions the larvæ of one sex might be more susceptible to the attacks of fungus and bacterial diseases than the larvæ of the other, and again, some died of mechanical injuries. Nevertheless, in the main, these results agree with our findings in the field, which work was carried out as a check on the laboratory rearing.

Another digging previous to the flight of the beetles resulted in a find of 17 males and 17 females, and another farmer submitted to me for examination beetles which he had dug from the ground, and of these 49 were females and 44 were males. Though there appears to be a slightly greater ratio of males to females recorded from our diggings, we can say that for all practical purposes the proportion of the sexes of the cane beetles is approximately equal.

Warning to Farmers.

At this time of the year, when beetles are emerging in countless thousands, and later will deposit their eggs in canefields, it will not be inopportune to warn farmers of the dangers to which their crops are exposed when the young grubs begin to hatch out and commence feeding. Particularly do I wish to draw the attention of some of the Mackay growers who are troubled with "greyback" cockchafer grubs to the importance of combating these pests. Seasons of late have been especially suitable for the development of pests of this kind, and apparently very little natural control has taken place. Accordingly the year 1928 is likely to show increased grub damage in many parts, and it behoves those whose holdings are more or less grub affected each year to have a supply of fumigant ready to wage war on the young grubs towards the end of January and so prevent them from exacting their usual toll, which means tons of cane lost to the grower.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (10th January, 1928) on the Diseases of Gumming, Mosaic, and Fiji, in the Bundaberg district, from Mr. E. J. F. Wood, B.Sc.:—

GUMMING DISEASE.

In view of the serious outbreak of gumming disease that was reported on the Woongarra this year, Mr. George Wilson, B.Sc., and I went up to investigate the damage caused by the disease and its extent, and to report on any available means of control. We found that, although the season was finished, the amount of damage could be easily observed, and we had the additional advantage of seeing the effect of the epidemic on the young plant crop. It is a very difficult matter to put into figures the losses due to such a disease as Gumming, but it is hoped that we will be able to give some idea of these caused by this factor this season.

A scheme of control has been worked out and will be detailed later in this report, but it must be clearly understood that the control of any disease rests as much on the farmer himself as on the Pathological Staff. It is a matter for the co-operation of all concerned, and it is hoped that the farmers in their various associations will discuss the disease question, and that they will refer to the Bureau any matters on which they desire information. It will be noted, too, that Gumming has been gazetted, along with other diseases, under the Diseases in Plants Act, and that this gazettal gives inspectors under that Act wide powers. That has been a necessary measure in order that, when control measures are undertaken by all parties working in co-operation, a refractory individual will not be able to spoil the whole result of efficient control work. The suggestions that have been adopted are those that will fall most lightly on the farmers, will benefit them most, and at the same time will, if carried out, gradually improve the situation, and will tend to prevent a similar epidemic from affecting the community as this one has done.

For the benefit of those farmers who do not know the symptoms of gumming disease, and are consequently unable to detect it in its earlier stages, the following description is given:—

Symptoms.

1. A series of yellow leaf streaks with the edges dotted with dark crimson red occur on the older leaves of the cane from comparatively early stages in plant and ratoon crops until the time for cutting. They run obliquely towards the edge of the leaf, and are usually upwards of 12 inches long and of a varying width which averages about one-quarter of an inch. The central part of the streak often darkens and dies, so that a mature streak has an elongated dead patch in the centre. At times they run from the midrib, but often occur in the middle of the blade of the leaf and gradually extend to the edge and midrib. They appear, as they really are, at places wherein the leaf has been infected by some external agent, and whence the organism is naturally extending his operations. Several of these streaks usually appear in the same leaf, and the youngest leaves are not usually affected. Mr. D. S. North, of the C.S.R. Company, has shown that the gum oozes from the pores of the infected leaves, and if it be transferred to an injured portion of the blade of another leaf the streak may appear. There are periods of the year when these streaks cannot be observed, but when they can be seen they form a very safe characteristic of the disease. These streaks show that a cane is infected, though very often no gum can be made to ooze from the stem when they are present. They give, however, no idea of the relative resistance of canes, for Q. 813 shows the streaks (though perhaps not to the same extent) as often as M. 1900 Seedling, and M. 55—which Childers reports seem to indicate has powers of resistance—is showing the streaks in Bundaberg to an even greater extent than the M. 1900 S. on the same farm. They show, however, that the streaked cane is infected, and that clean seed is needed if that can be obtained.

2. A more severe stage of the disease is shown by the fact that the leaves are white, or white streaked with green, and gradually merging into green. This stage is seen very often just now in the young plant, and often, too, in ratoons, even occasionally in the older cane. In the young cane which has just emerged from the ground the leaves are inclined to be twisted, and the young shoot has a deformed appearance, besides the fact that it is white in colour. It is well known that D. 1135 and M. 1900 S. have sports in which the leaves are striped with white, but in this case the stripes are regular, and there is little chance of confusion with the true gumming chlorosis.

3. On cutting the stick lengthwise it will be seen that the fibres are scarlet in colour, and that in bad cases where sticks are dying or dead there are cavities in the stem which are full of yellow slime and are often of an unpleasant odour.

4. At times the growing point of the young plant or ratoons decays and gives off a bad smell. This is somewhat similar to injury by the Pink Moth Borers, but the top is slimy and rotten and does not appear to have been chewed.

5. The best known symptom is the oozing of gum from the cut ends of the stick, and the yellow gum need not be described. In the case of plants which are lightly infected, the gum may only ooze after the cut plants have been left under a moist bag overnight, and this process of sweating should be carried out always before planting, so that some, at any rate, of the gummed plants can be rejected.

Cause.

The disease is caused by a bacterium known to science as *Bacterium vascularum* (Cobb) Greig Smith. This bacterium, however, seems to live a very balanced parasitism within the host plant, and to require certain conditions for development. The weather, therefore, has a very great bearing on the severity of this disease in any season. The account of transmission as given by Mr. North points to the fact that the disease requires wet weather in order that it may spread rapidly, and this seems actually to be the case. Wet weather seems also to be necessary for a severe attack, and the effect of the disease on the plant is much governed by rainfall. It would appear that the effect is due to the fact that in very wet weather the soil is waterlogged, and therefore improperly aerated. The disease gets a good hold on the plant tissues, and a dry spell, such as that experienced last year, has the effect of weakening the plant and further aiding the parasite. During my visit early in the year I predicted to several farmers who were planting badly gummed plants that the weather conditions were such as to cause a serious outbreak of the disease, but my advice was disregarded. The farmers at Bundaberg have been repeatedly warned that the droughts of the past years have been saving them from gumming, but have taken no notice of any warnings. That is where Field Officers are so helpless, for unless they undertake the actual farming they cannot impress on farmers when a disease is not causing much damage that by continued neglect it will become so severe that very strenuous, continued, and expensive efforts will have to be made to save the situation.

Many farmers realise that a cane grown on the one class of soil for thirty or forty years will be bound to lose its vitality, but in spite of this fact the cane grown

on the Woongarra is very old stock, and whatever resistance it ever had to disease has long since been lost. In any case, the varieties which are grown (M. 1900 S, D. 1135, Badila, and N.G. 16) are known elsewhere as susceptible varieties.

Transmission.

1. Plant cuttings. This is the means by which the disease has been fostered throughout the Bundaberg district, for in the majority of cases the stock which was grown in 1895 and later (when the previous gumming epidemics occurred) and which must have become infected, is still grown on every farm. New strains may have been introduced at rare intervals, but they have long since become contaminated by the older canes.

2. Knife infection.—The wise farmer, when selecting for plants, chooses his cleanest field and his freest variety and places his cut plants under a bag overnight so as to sweat out the gum, and then he rejects the plants which have oozed. Many do not realise, however, that plants which do not show the infection may be infected by cutting them with a gummy knife after cutting a plant which has oozed gum on to it. The gum bacteria are very small and live in the fibres; so that, when a fibre is cut, many millions may ooze in a thin film on to the knife. On cutting another stick, some of these are bound to be wiped on to the end of a fibre and will very probably move with the juice into the cane and set up infection. The bacteria multiply in moist atmosphere, and the hot, moist atmosphere of the soil, which is best for young plants, is also ideal for the bacteria, so that the stick is easily infected. The obvious remedy is to place the knife in a tin of disinfectant as often as possible while cutting plants, so as to kill the bacteria.

3. Secondary infection after the plants have struck.—Mr. North has given us a theory that in wet weather the bacteria multiply rapidly and the gum containing them oozes from the leaf pores. It is easily miscible with water, and can drip from the leaves, or be borne from plant to plant by wind-blown rain. Thus it will travel in the direction of the prevailing wind, in Bundaberg, from the south-east to the north-west, with modifications due to the elevation. There is also the possibility of insect infection, which will also take place in the direction of the wind.

A study of the nature of the disease will show that the only measure that will promise success is that of growing resistant varieties and subsequent selection of canes.

Distribution

Infection occurs over the whole of the Bundaberg district, and Childers is also badly affected. However, the disease has only assumed epidemic proportions on the Woongarra, but there is no reason to suppose that if the conditions were right it would not spread over the Bingera and river areas and Gin Gin. The farmers in these parts must take an example from those of the Woongarra, and realise that the disease is at all times imminent, for traces of the disease are not wanting in any area. The serious nature of the Mosaic problem on the river farms would make the losses particularly heavy in this area. The fact of the general prevalence of the disease makes the problem of control a difficult one, and it would be no use for farmers to get cane from the Bingera area in order to free themselves of the disease. It is probable, and almost certain, that the cane when planted in the Woongarra soils would develop gumming to the same extent as the plants from the Woongarra itself. The reason for this is that the plants are infected, and that the Woongarra soils are in the right physical and chemical condition for the development of the disease. I might predict that if the weather continues to keep the ground in the sodden state that it is in at present, gumming will be quite as bad next season as it was this. It has been noticed by me on the Woongarra and independently by Mr. Richardson, of the C.S.R. Company, at Childers, that gumming is worse in the heavy scrub red soil areas than on the light forest red soils such as those at Elliott. The Bingera soil, too, is lighter than the Woongarra red soil. Gumming has not shown up to the same extent on the Rubyana area, on the sandy loams there, and this is probably due to the nature of the soil and its better drainage. In dry weather the red soils are very porous and well drained, and this is true in moderate rains. When, however, the rainfall is heavy and the soils become waterlogged, the drainage becomes bad, as there seems to be a fair percentage of clay in these soils.

It seems a general rule in the Woongarra that the infection is worst in the lower-lying areas and basins, wherever the water is likely to lie, even though the hollow be almost imperceptible to the naked eye. There are (as are bound to be) exceptions, but history of the seed cane planted and other factors concerned would no doubt account for this. In one noticeable case a crop of H.Q. 426 was no doubt responsible for the extreme virulence of the disease on this and the adjoining farm. It has been

shown in other gum infested areas that drainage was of inestimable benefit, but most of the farmers in the Woongarra will aver that the land is well drained. I should like, however, to see the effect of drainage on the disease, and I think that some drainage experiments would not be out of place.

Gumming is serious in the region stretching from Elliott Heads, which has long been seriously affected, through Pemberton, Windermere, the Hummock Plantation, South Coast road, and the Sandhills road along the Burnett Heads road on the red soil, and west to Kalkie. Farms on the alluvial soil at Burnett Heads, and along Rubyana, on the river bank, show serious infection only in isolated places, and a light infection was noted in the Barolin and South Kalkie sections south of the Windermere road, and roughly west of the Hummock. On the lower ground beyond the Barolin section the disease was epidemic again. This comparatively clean region was confined to the higher, well-drained, red soils.

The cleanest section of the Bundaberg and Childers districts, as regards gumming and also as regards Mosaic, is that comprised in the Elliott River section, along the Maryborough road, around Clayton and Elliott. Hapsburg, also at Childers, is very free of gumming, which is due to the fact that the most susceptible cane in this section (D. 1135) has been discarded by the manager of that plantation.

Fairymead had trouble with gum in the Badila grown on that plantation, but had little or none in that from Avondale to Hapsburg.

Control Measures.

The control of gumming in the Bundaberg district rests at present on the general planting of canes which are recommended as being resistant to the disease and on their subsequent selection. It is hoped that we will be able continuously to introduce new stock of these canes for plants to the Woongarra, and thus to give a continuous supply of healthy seed, which will gradually reduce gumming to a negligible factor. The resistant varieties recommended (and these are at present in the district) are Q. 813 and H. 227.

Q. 813.—This cane was tried by many of the farmers some years ago without much success, and was abandoned without having a fair trial. In the meantime it has become acclimatised, for it has been shown by experience to require acclimatisation, and is now a much better cane than when it was introduced. It is admitted that it will not give as heavy a crop as a healthy crop of M. 1900 S. or D. 1135, but it is asserted without hesitation that with the present diseased state of D. 1135 and M. 1900 S. it will give a higher yield of sugar per acre than either of these canes. In a normal time it is lighter in crop than D. 1135, but it has the advantage of giving about two units higher in density. Like M. 1900 S. it is a late maturer in the south, and if not cut at the right time will not ratoon, but when cut in September and when the trash is burnt off or rolled soon after cutting, it proves a good and heavy ratooner. It is a perfect striker, but should be planted in September, as it germinates best in that month, and at the same time the ratoons are not impaired. Qunaba cut this year a crop of first ratoons at 28 tons per acre in the midst of badly-gummed canes of other varieties. That the cane is a shallow rooter and is not at its best in red volcanic soils is conceded, and the variety is of little use in the Childers district, except in isolated cases. On the Woongarra, however, the situation is different, and we know from the results that Qunaba has achieved and from our own experiments with the cane at the Sugar Experiment Station that it is a profitable crop.

The Experiment Station has badly infected farms on all sides of it, and efforts have been made in the past to keep it clean by selecting plants and retaining D. 1135, Badila, and M. 1900 Seedling. This year practically the whole area has been planted with Q. 813, and in a detailed inspection we could not find much trace of gum. In some varieties gum was found, and these were immediately dug out. It will not be long before the station will be very free from gum, and as it now stands it is far less affected by the disease than any other farm in the Bundaberg district, except, perhaps, some of the Elliott farms, and that is in the midst of a seriously affected area, on a place that was itself badly affected last year. It serves as a standing example of the rapidity of control measures when the farmer is working in collaboration with the Pathological Staff, and to effect this the expenses have been no greater than they would normally have been for the replanting of the blocks cleaned up. We are convinced of the fact that Q. 813 is resistant to gumming, though it does at times show the leaf streaks, for rarely has the stick been seen to ooze gum in comparison with the other varieties. It will do so at times, but so will Uba or any of the other canes which have been used successfully to overcome the disease in other districts. At Qunaba, the c.e.s. jumped up immediately the other varieties stopped coming to the mill, and Q. 813 was the main cane crushed. Moreover, its density was still holding out at the close of the season, when the other canes had fallen off. It is

urged, then, that the farmers plant as large an amount as possible of Q. 813, for the trouble due to gum is worse in the mill when the density reaches its peak and most of the delay occurs then; so that the season is protracted and less cane can be crushed just at the period when the returns to both farmer and miller are at their maximum. If the mill could be kept running on Q. 813 from September to the end of the season, the mill could work at full capacity till the end and the farmers would get their crops off without difficulty and with the best results.

H. 227.—This cane has been grown for some years at the Experiment Station and also at Nambour, and on a few farms on the Woongarra, and in all cases it has shown signs of marked resistance to gumming. It is, however, highly susceptible to Mosaic, and must be carefully selected and looked after. Experiments with this cane show that it matures early, and those who have grown it state that it will also ratoon strongly when cut early. It is a cane very like D. 1135 in growth and habit, but has a higher c.c.s. and is a very good striker and ratooner. There is not much of this variety available for seed, but farmers are recommended to get a small patch of it if possible as a seed plot. Mr. A. Christensen has some of this variety, which is standing and ready for immediate use. He is willing to sell it to farmers for plant at any time between now and March. This cane appeared at the time of our visit to be free from gumming, but it is hoped that fresh stocks will be made available to the farmers by the end of next year.

These are the only promising canes which are at present in the district in sufficient quantities to be of any use, and are therefore recommended to the farmers, and should be used to replace M. 1900 Seedling and D. 1135, which should be rejected.

Another cane which shows resistance is Black Innis (M. 189), and our observations on this variety have been confirmed by Mr. Richardson, at Childers, working independently. It is, however, so susceptible to Mosaic that I do not recommend it to farmers. The whole stock in the Bundaberg district is contaminated with this disease, and general use of this variety would mean reintroduction of fresh stock. The presence of Shahjahanpur 10 on the Woongarra would be fatal to any results which might be expected of this cane from its resistance to gum. It is not immune, however, to this disease, and at times shows marked symptoms—far more marked than those in Q. 813 under the same conditions.

B. 147 is another cane which shows strong evidence of resistance to gum in the North, but is so susceptible to Mosaic and Leaf Stripe that it could only be recommended to farmers whose places are practically free from Mosaic. It is hoped, however, to introduce this cane into a nursery to obtain plants.

M. 55, according to reports of farmers at Childers, resists gum to some extent, but as the only field seen on the Woongarra showed marked leaf streaks in the young cane, it must be subjected to further trials. This cane is being introduced in large quantities into Bundaberg from Childers, but it will not do for farmers to assume without further trials that it is resistant to gumming. It is possible, even probable, that it may be, but this must be proved. A nursery of this variety has been started in a very free area. It is, however, highly susceptible to Mosaic, and the remarks which apply to H. 227, M. 189, and B. 147 apply here also. For that reason I have made a separate report on Mosaic Disease in Bundaberg, and have pointed out the necessity for control, especially of Shahjahanpur 10. For the sake of the control of gumming this cane must be eradicated, as it will not do to substitute one disease for another, as we should do if we planted canes susceptible to Mosaic near this variety.

One of the objects of the Experiment Stations during the next few years will be to try out varieties for resistance to gumming, and to test the resistant canes for their productiveness. There are a number of varieties at the Bundaberg Station, many of which show promise as resisters, but require further trials before they can be recommended. With the Woongarra in its present state of infection, the station cannot be used for the distribution of varieties; so that the canes tested there will have to be grown in a more isolated situation and sent to the farmers on the Woongarra. The varieties grown include Korpi, Oramboo, and Nanemo, which are known resisters of good density, but which have never been tried out on the Bundaberg soils for early maturing or cropping capacities. It is hoped that the Bureau will shortly be able to get supplies of these canes in isolation, so that some distribution may be made in the course of the next few years.

While examining the district for gumming, we kept our eyes open for some isolated farm or farms which were reasonably free from gumming, and were rewarded by finding that on the red forest soils around Clayton and the Elliott River the farms seem to be practically clean and are well isolated. There is in these places a fairly clean stock of Q. 813, and farmers on the Woongarra are advised to buy plants from there if they are planting up with the variety. The existence of this area is a godsend, and will probably save a very serious position. If farmers wish to procure seed cane for next spring planting, they will do well to get in touch with the Bureau, so that

arrangements may be made to select for them the cleanest cane. The Elliott area will be thoroughly examined at intervals through the year, and a careful watch will be kept for disease.

It may now be said that the machinery for the control of gumming has been made ready, and it remains for the farmers to combine so that everything may work smoothly. It will be realised that it is more economical to grow a resistant variety than to grow a susceptible cane which may, but probably will not, give a return for the money expended in planting it. Many farmers are loth to give up D. 1135, although they are forced to admit the fact that there are other canes which give a much better return, and are quite hurt when they are told that they are not efficient farmers. The strikes of plant M. 1900 Seedling are very bad over the Woongarra, much of the cane not having grown at all, and more having struck, turned white, and died off. All this is solely due to gumming. Several farmers have planted up three times and still have not more than a 30 per cent. strike, and it has taken a set-back such as this which will cost them some hundreds of pounds to make them realise that it would have been cheaper to plant Q. 813 and risk not getting a fourth crop from this variety.

Recommendations such as these are not made without careful consideration of the financial situation, and the farmers may be sure that the recommendations made in this report are those which appeal to the officers of this Bureau as giving the greatest gain to the farmers who adopt them. They are not theoretical suggestions, but suggestions based on purely practical considerations.

It was further noted on the Woongarra that on the whole the soil is in a very poor condition. It is a general rule in Queensland that red volcanic soils are low in potash and also in phosphate, and in many cases little fertiliser is added to keep the soils up to standard. Still more urgent is the need for humus. Green manuring is in very little use on most farms, and is of the greatest importance to restore the humus to the soils. Without humus a soil does not retain the water in drought and becomes puggy when wet, while the application thereof makes the soil porous and better drained, and at the same time keeps small amounts of moisture in the soil in drought. It will be long before the soils of this district will be restored to their original humus content, even if a beginning is made now.

The other control measures, such as seed selection, the methods of which have been given above, will naturally follow the introduction of canes like Q. 813 and H. 227, and knife disinfection will also have to be practised by the farmer who wishes to clean his place and render it free from gum.

In conclusion, I should like to thank Mr. Wilson, of the Bureau, for his help in making the field observations, and Messrs. Richardson, Crabtree, and McBryde for their information and opinions, which have done much to give me the true idea of the situation.

Mosaic Disease in the Bundaberg District.

My observations on this disease were only incidental to the main ones on gumming, but it was noticed that the disease was very bad along the Burnett and Kolan Rivers, on the low-lying alluvial soils. Given the same conditions in other respects, the disease seems worse in Queensland in low-lying areas than on hills.

The prevalence of the disease is due to the fact that Shahjahanpur 10 is still grown on many farms, despite many warnings and its obvious disadvantages. Even Q. 813 will be diseased under such conditions, and it is hopeless to try and clean up other varieties while this cane is grown. This cane is prohibited in some mills, but not at Bingera, and here the growth is widespread.

Farmers have read in the paper that Mosaic has been gazetted as a disease under the Diseases in Plants Act, and this gives the inspectors wide powers under the Act. While the Bureau has no present intention of applying these regulations with regard to Shahjahanpur 10, farmers who are still growing this variety are advised to plough it out after next harvesting, as it will be the first variety to be attacked. This is of great importance owing to the fact that so many of the canes which are showing some resistance to gumming are very susceptible to Mosaic, and unless there is reason to hope that the Mosaic position can be improved, these varieties cannot with safety be recommended. Such canes are H. 227, which, besides showing evidence of gum resistance, is an early maturer, B. 147, M. 189 (Black Innis), and M. 55. None of these canes can be profitably grown where they would be near Shahjahanpur 10, and this fact will considerably hinder the control of gumming owing to the fact that fields which are infested with Mosaic cannot be recommended for seed. It is to the interest, both of the farmers and the millers, that Shahjahanpur 10 be placed on the disapproved list, and a penalty be imposed and enforced that will prevent this cane being grown profitably. Failing that, it is likely that the regulations will be enforced in the future to control Mosaic disease.

On the Woongarra, where gum is rife, every effort should be made to keep Mosaic under control by plant selection and rogueing of both plant and ratoon cane. Not till this is done will we feel safe in introducing stocks of canes such as H. 227, B. 147, and M. 55 for fear of a severe Mosaic epidemic. The gumming situation is a serious one, but it is made much more so by the lack of attention which the farmers pay to Mosaic disease.

That Q. 813 is resistant to the disease is well known to all who have studied the question. Another cane—P.O.J. 2714—is also resistant, as shown in a trial in Bundaberg, where this variety is growing alongside badly Mosaic infected B. 208 and corn and grasses, and is 100 per cent. free from Mosaic. It is thought that this cane is susceptible to gumming, but it could be grown to advantage on the river soils at Sharon, Gooburrum, and South Bingera, where Mosaic is so bad. It is a heavy cropper, but its density is not the best. It grows well on Bundaberg alluvial soils.

These are the only two canes which are recommended as resistant to Mosaic for the Bundaberg district. Farmers are urged to do their utmost to clean up the district of Mosaic so that we may be able to attack the gum problem unhampered by any side issues.

Fiji Disease in the Bundaberg District.

The Bundaberg district has now been discovered to be infected with Fiji disease, though the infection appears to be slight and confined to the Bingera district as far as can at present be ascertained. Three varieties are infected—Garvan's Black, N.G. 16, and H.Q. 274—and farmers are warned to be very careful in planting these canes and to reject anything suspicious when selecting their plants. Many fields of these varieties were inspected in many areas in the Bundaberg and Childers districts, but no trace of the disease was found. For this purpose detailed surveys were made, and it is intended to repeat them at an early date in case the disease was latent.

The fields found were lightly infected, and are being rogued, so that the disease may be brought under control immediately. It is considered, owing to the lightness of the infection and its present apparent restricted character, that it is unnecessary to quarantine the district, and this is undesirable from other points of view. The owners of farms infected have been requested to adopt quarantine methods, but should they fail to do so rigid quarantine will, of course, be instituted and strict control measures brought into force. Farmers in the Bundaberg district are advised for their own protection to report anything of a suspicious nature which they may observe to the Bureau as soon as possible. There is no need for panic, as the outbreak is slight and the control in efficient hands.

CANE PEST COMBAT AND CONTROL.

The Entomologist at Meringa, near Cairns (Mr. E. Jarvis) has made the following report for the period November to December, 1927, to the Director of Sugar Experiment Stations, Mr. H. T. Easterby:—

Aphides Attacking Cane Roots.

In the last monthly report issued by Mr. R. W. Mungomery (Assistant Entomologist at the Southern Sugar Experiment Station, Bundaberg), some interesting observations were recorded respecting the habits of a species of aphis, found by him feeding on the roots of cane and "nut grass" (*Cyperus rotundus* Linn.).

As often happens in such cases, these aphides occurred in association with ants, the species in the present instance being *Aphænogaster longiceps* Sm.

Judging by Mr. Mungomery's remarks, this cane-root aphis appears to be very similar to, or identical with, that discovered by me in 1916 affecting young plant cane at Meringa, illustrations of which were published at the time in the first edition of Bulletin No. 3 (Division of Entomology).

This large, dull, yellow aphis was noticed on several occasions during winter and early spring clustered in small colonies at the bases of the shoots or on swelling buds of "sets" planted about 4 inches deep. It was invariably attended by ants, and sometimes associated with mealy bugs (*pseudococcus* sp.).

Winged forms were not present, and no specimens were noticed on the stems or leaves above ground level.

Description of Larva.—Elongate, hairy, pale orange-yellow, slightly darker on dorsal margins of body. Rostrum reaching nearly to end of abdomen. Antennæ, short, stoutish, 4-jointed; 4th joint longer than remainder taken together. Extremity of rostrum, tarsi, and antennæ, blackish. Legs short, stout. Length of body, 0.65 mm.

Description of Viviparous Female.—Rotund, nearly spherical viewed from above, hairy, dull orange colour, dusted with white powdery secretion. Abdomen much wider than thorax, with dorsal marginal edges depressed, tail conspicuous and obtusely conical. Head small, eyes nearly obsolete, consisting of about four dark red ocelli. Rostrum not reaching beyond posterior coxæ. Antennæ and legs short, stout; the former not reaching to metathorax 4-jointed, 4th joint slightly longer than 2nd and 3rd taken together, 3rd joint clavate. Length of body, 1.40 mm.

This aphis appears to be of very minor importance in our Northern canefields, as although searched for at intervals during the last ten years or more, no additional specimens have been found.

Cane-Root Mealy Bug.

Another very interesting insect affecting cane roots is a species of Coccididæ belonging to the genus *Ripersia,* specimens of which were first noticed near Gordonvale, and at the laboratory there during 1916 on the roots and underground buds of cane "sets." The adult female varies much in shape, being often observed packed tightly in irregular crevices between expanding buds, &c. Like the well-known coccid *Antonina australis,* which it closely resembles in general appearance, it is more or less enveloped by a crust composed of a yellowish white felted secretion, but differs from that insect in being dark purplish-brown instead of black, and in the absence of conspicuous tubercles and hairs on the anal segment. The young larva, which is elongate-oval in form, and dark-brown above, margined with yellow, is covered with minute excrescences, and possesses a very long hair-like rostrum and 6-jointed antennæ. Length of body, 0.60 mm.

When touched, these curious mealy bugs emit a tiny globule of clear sugary fluid that is greedily devoured by a small golden-coloured ant which is usually in attendance; and in return for such sweet morsels probably protects them from the attacks of various insect enemies.

A species of *Ripersia* is known to damage the roots of sugar-cane in Cuba; while *Ripersia terrestris* Newt. frequently proves troublesome in England, where it injures the roots of greenhouse plants throughout the year. A 1 per cent. solution of potassium sulphocarbonate has been found to kill these root-eating coccids without injuring the plants.

Enlisting the Services of Grub Parasites.

It may interest farmers to learn that in the Cairns district three weeds belonging to the genus *Sida* occur very plentifully, at least two of which happen to be of more or less economic importance in connection with the natural control of our cane grubs. By far the commonest of these plants is *Sida acuta,* which apparently takes first place in this northern portion of the State, where it is often referred to erroneously as *Sida retusa.*

This latter species, however, which in the year 1908 was proclaimed a weed pest under the Quarantine Act, and is a common species around Brisbane, is frequently met with also in the Cairns district, growing alongside *S. acuta.*

The third of the weeds alluded to is *Sida cordifolia,* which happens to be quite different in general appearance from either of the foregoing species, and may at once be recognised by its flowers being larger, more open, and lighter in colour, and by its rather thick, soft leaves, which are broadly heart-shaped, seldom oval or narrow, and have long stalks. This plant is taller than the others; somewhat coarse, erect, and branching; its leaves and twigs being more or less clothed with soft hairs.

Our commonest species, *Sida acuta,* differs from *retusa* in having the leaves narrower, of a lighter green shade, with edges noticeably serrated, the extremity more pointed, and the veins strongly marked. In *retusa* the leaf surface is smoother, and the colour darker, but never of a yellowish-green. The flowers in both these species are of similar size and shade of yellow.

Isolated plants of *acuta* often develop a symmetrical cup-like form of growth, growing from a single short stem, the middle of such plants appearing at times regularly concave owing to the scarcity of central leaves and shoots. Plants of *retusa,* on the other hand, never assume such shape, the usual growth of this species being irregular, more erect, and slightly taller.

Attention is drawn to these common weeds on account of the fact that two of our principal digger-wasp parasites of cane grubs, *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr. are fond of visiting the honey-bearing flowers of the above-mentioned species of *Sida* during sunny mornings throughout the year.

Growers should, therefore, leave small patches of such food-plants here and there when noticed growing near headlands of canefields, in order to encourage these useful parasites to remain and breed in the vicinity of grub-infested areas.

FIELD REPORTS.

The Northern Field Officer, Mr. A. P. Gibson, reports, 3rd January, 1928:—

TULLY.

Seasonal.

This is the time when the mercury is expected to climb near or over the century mark. The weather from a field man's point of view has been distinctly suitable for proper cultivation, the rapid advancement of the new crop growth, and the uninterrupted removal of the district's greatest crop.

Rainfall.

Rain and sunshine alternated for the greater part, followed by cool nights. Tully was leader in the field last year so far as rain and cane are concerned. The official record is interesting, and is as follows:—January, 34.58; February, 65.65; March, 14.40; April, 22.67; May, 4.12; June, 11.48; July, 3.54; August, .14; September, 6.61; October, 3.33; November, 4.59. Total rain for eleven months, 171.11 inches.

Thirty inches of this total have fallen since the factory commenced its operations. One inch of rain represents 101.5 tons of water broadcasted over an acre. This enormous precipitation is naturally responsible for great soil washing and plant food leaching, hence the great need of growing cover crops during the wetter periods.

The 1927 Crop.

The big and excellent crop of Badila continued to grow throughout the season, therefore the early forecast of 180,000 tons had been exceeded by some 20,000 tons. Some heavy and reclining crops were harvested on the more fruitful lands of the Lower Tully. These heavy crops are invariably low in quality and sometimes are not desired by the harvesters. The recent rain, combined with the decidedly warmer conditions, had promoted new and rapid growth of the remaining uncut cane, reducing its sugar content.

The New Crop.

Though weedy in parts, it generally is splendid in appearance and well advanced; in consequence, at the moment it promises well for another prolific yield. Some unpermitted cane will not be harvested. There does not appear to be so much advanced plant cane as last year. This cannot be expected, for most growers have the area assigned to them about fully planted to cane. It is more than likely the factory will start crushing 8,000 tons of cane weekly instead of 6,000 as last year. This would, of course, favour a later starting on the same crop tonnage.

The local people are proud of their ever-growing town and big modern new mill. The cane put through in one week—viz., 9,020 tons—appears to have been the greatest quantity of cane milled during any one week in Queensland. This amount may be easily eclipsed in future; the present difficulty obviously is to obtain cane enough for the mill's big daily requirements. It is better that a mill be idle a little time daily in preference to operating continuously on a big quantity of stale cane. The mill's average quality has been good. As time goes on the crop growth will be less rapid, when a higher c.c.s. cane may be expected.

Cultivation.

Endeavour should be made to maintain or improve the fertility of the soil from the beginning by leguminous crops and judicious manuring (soil samples should aid the grower in determining what is required). Comparatively little land is yet under the plough, therefore much tedious and costly hoe work is required to keep the field clean. It is highly desirable that weeds be controlled in fields and headlands from the outset. Less scrub is being felled. The total cost of this work from brushing and including cane planting may be put down from £28 to £30 per acre. November weather was favourable for this class of work.

Pests.

Rats are responsible for much crop damage in parts. Weevil borers were observed on several farms. Army worms had temporarily checked the crop growth in many fields. This pest is spreading too rapidly, due, maybe, to its natural enemies (our insectivorous birds) being unwisely destroyed by the action of man; it is urgently desired that our feathery friends be protected. Mound-building ants are located generally in coarse-grained poor soils; frequent light tillings before the crop is well established will in a large measure have a controlling effect.

Diseases.

Leaf Scald is the chief disease. Disease-free cane from the outset should have been introduced and early grown, and the area's supply of seed compulsorily taken from it. Had this been done the area probably would have been clean, whereas it is now far from it. Badila is becoming highly susceptible to Leaf Scald; many canes after stem-shooting from the disease had perished. Parts of fields held over for seed were found to be too highly diseased for seed use. We can only point out such diseases and urge the growers to discontinue planting same, also recommend that the farmer go over his plant field at intervals, especially that intended for seed use, and remove anything diseased or not quite up to type. Badila, which is North Queensland's greatest field and milling cane, soon will be on the scrap heap unless our farmers devote more attention to the seed-selecting part of the business; it is slowly weakening, and in consequence becoming more susceptible to disease. Top Rot streaks widespread throughout the area.

HERBERT RIVER.

Rainfall.

Some 97 inches had fallen to the 16th December. This registration, though overshadowing the annual average, had not been well distributed, nearly half falling during February. The December fall to the 20th was far below the average. Storms are threatening; but there is, however, plenty of time for the month's average to be reached or even eclipsed. Surface water is becoming scarce. A good precipitation is urgently required to replenish the depleted supplies and to maintain the continuous crop growth. The area planted to cane has increased greatly during the last few years. Plenty of good land—enough for another mill it is said—is to be found some miles back from Long Pocket.

The 1927 Crop.

The early crop prospects speedily changed from one of gloom to that of brightness and prosperity, despite the memorable and disastrous flood. Freedom from disputes, mechanical troubles, and adverse conditions has permitted the two factories working continuously and well, therefore the unexpectedly great crop (probably the district's largest with one exception) of some 355,000 tons was expected to be milled by the end of the year. The lighter and more severely damaged crops are being fired prior to harvesting. Some Badila flood remnants were being cut on the river lowlands; they were very soiled and appeared poor in quality. The crop averaged some 3 feet of cane when inundated; the tops quickly perished and subsequently dropped off; side shooting followed; each at time of cutting showed about 18 inches of cane; such shoots depend on the parent cane for their existence, therefore rob it of sweetness. The writer has sometimes found that flood or frost damaged canes low in sugar, whilst the newly formed cane on its shoots is generally quite satisfactory in quality. The new crop has been well cared for. There is a great area of plant cane, most of which had germinated very favourably. Less gumming disease is in evidence. The cane is forward in growth. The crop, however, may yet be regarded as a very speculative one, despite its present most favourable qualifications. It is quite clear that the two local mills will be called upon to start very early so as to fully cope with the 1928 now apparent record crop, but, even so, there is a great probability that they will not be able to fully treat the whole crop. Victoria's upper rich alluvial deposits specially look well. Most of the 1927 stubble on such lowlands was destroyed by water; this was ploughed out and replanted with Badila. The curling of the leaf is just one of Nature's little economising ways; by so doing the leaf area exposed to sun and drying winds is minimised, thereby reducing plant evaporation.

Varieties.

Many varieties are grown; the principal are as follows:—Badila on the better lands; H.Q. 426, confined now to the Upper Stone River. H.Q. 409, a popular kind—it arrows freely and rather early—is a good weigher and germinator. Oramboo, Korpi, and Nanemo generally are liked; that planted early had germinated well; later plants, however, were less favourable. The growing of Q. 813 I think could be extended with profit in selected soils. Some healthy and most promising crops of this variety were noted.

Cultivation.

Generally this has been satisfactory and the fields on the whole were then reasonably clean. Farmers realise the enormous value to be gained by the frequent mulching of the soil interspaces, especially during the early stages of the crop growth and when the soil is bared of crop covering. The prevailing dry conditions have advanced this work considerably. It is important that the farm's drainage system be in the best of order now that the wet season is fast approaching. Not many rotary

cultivators are in use. The soil for the greater part is cohesive. These implements do excellent work in the more friable soils free of encumbrances. Volunteer crops (trash left as cut) cannot be said to be a good practice on level country; though controlling weeds, conserving moisture, and perhaps retarding plant food leaching during times of heavy wetness, it harbours pests and fungi, is always a source of danger from fire, and reduces considerably the stooling of cane. Such fields are better relieved—that is, the blanket of trash should be removed off the cane stool.

Manuring.

The local farmers are big users of manures; different kinds at different rates per acre are applied at intervals to plant and ratoon crops with apparent good results.

Leguminous Crops.

We cannot get our farmers to realise the enormous value of the growing and ploughing in of cover crops, also the cane trash. Different sorts of cowpeas are sometimes grown. A kind of giant cowpea is becoming popular; this variety flowers some eight weeks after sowing and does not perish, as does the ordinary kind, after seeding, but continues to grow and seed for about five months before it finally dies. A sample of this was obtained and forwarded to the Government Botanist for identification. Small areas of maize are grown for feed; it serves the purpose well, but must be looked upon as dangerous from a disease-spreading point of view.

Pests.

Pest destruction is not great. Rats at the moment are occasioning the greatest amount of damage to what is left of the old crop; they are being driven from the harvested fields and are concentrating in the yet uncut ones, hence the increased damage. They appear hungry and are devouring unpicked up harvested heaps of cane that happen to be lying in the trash-covered fields, also completely severing innumerable ratoon shoots in the same class of fields. Aphis Sacchari are very common at present; their presence may easily be detected by the shiny and sticky nature of the lower leaves.

Leaf Hoppers.—Three different kinds may be found here. A few greyback cane beetles were on the wing.

Noxious Weeds.—The real Johnson grass and Star of Bethleham noted; the former is a dreaded pest, a quick spreader, a deep rooter, is very stubborn to eliminate, and may speedily take possession of a cane field.

Diseases.

The Herbert River cane still appears the most disease-free of the whole of what is known as the No. 1 Division. Three years back the gumming disease was serious, but the area affected has been wonderfully reduced by the almost total elimination of H.Q. 426, a highly susceptible kind, together with a logical system of plant selection, helped perhaps by less favourable weather conditions. What has been achieved here may be performed elsewhere by greater co-operation between farmers and mill field men.

The following information is interesting and shows the progress made in reducing the affected acreage in the Victoria Mill area alone:—

Year 1925—Area known to be gum affected	3,240 acres
Year 1926—Area known to be gum affected	2,137 acres
Year 1927—Area known to be gum affected	580 acres

The chief parts diseased are Victoria Estates, Gairloch, and Fairford.

Top Rot.—Red streaks widespread and found in patches of Badila plant and ratoons alike. Generally the most advanced stool shoots are affected; the number of shoots affected in stools varies from one to sometimes the lot. Many shoots were dying or had perished from the disease. (This disease truly wants investigating.)

Leaf Scald, Leaf Stripe, and Mosaic are here, but not yet in a dangerous way, and when noticed are immediately removed. The writer found four stools of Leaf Stripe in Korpi ratoons and one stool of Mosaic in Korpi plant at Fairford.

Yellow-striped leaves, not unlike Leap Stripe yet different, are sometimes found in H.G. 426 and Badila throughout No. 1 Division.

Nearly 1,000 tons of cane were transported by Victoria for plants, the greater part of which had been used to supplant known unclean areas.

NOTES ON THE BLUE OAT MITE

(Notophallus bicolor Froggatt).

By J. HAROLD SMITH, M.Sc., Entomological Branch.

A pest reputed to have caused the failure of a crop of wheat in the Back Plains section of the Nobby district in 1925 showed signs of further attack in September, 1926. A brief investigation in that year yielded some interesting information, and the following notes contain the gist of a memorandum supplied to the Chief Entomologist (Mr. Veitch).

General Considerations.

The soil is a rich black basalt, easily worked if well soaked with rain. In dry weather, the soil sets into a hard pan at a depth of a few inches and becomes increasingly difficult to work. At the time of my visit sufficient rain to permit satisfactory drilling had not materialised, and the seed sown was planted under conditions far from favourable to the crop.

Continuous cropping of wheat is the normal practice of the average farmer, though some have a knowledge of its attendant evils in the spread of insect pests and disease organisms. When necessity compels a change, a volunteer fodder crop of oats may be allowed to grow or occasionally lucerne is sown. Conditions of cultivation generally are such that a continuous growth of those host plants required by cereal pests exists in the form of crops actually cultivated, or allied grasses to be found as weeds.

The affected paddocks had a south-east aspect with sufficient fall to occasion a surface wash in times of heavy rainfall.

Identity of the Pest.

The pest proved to be a mite of the family Eupodidæ. In appearance and habit it agreed with *Notophallus bicolor* Frogg., and further study confirmed that identification. About 1 mm. in length, the adult mite has a dull blue body colour, with mouth parts and limbs red.

This record appears new to Queensland, at all events as a pest of cereal crops.

Injury.

No standing crop of wheat was present on the farm from which the inquiry originated and, though observed feeding on young wheat elsewhere, advanced symptoms of attack by the Blue Oat Mite could not be examined. In the previous year—i.e., in 1925—the wheat crop had been practically ruined on the farm referred to, and, according to local wheat growers, the apparent cause was an excessive infestation of the mite. The incidence of the pest has extended during a period of two years from a small patch in the uppermost paddock throughout the whole length of two, each some 18 acres in area. In both cases, the wheat grew healthily until 8 to 12 inches in height, at which stage the infestation reached a maximum. The plants then dried out rapidly; any grain cast being only partially filled. From the farmer's point of view the crop was an entire failure.

Wheat attacked by the mite presents no symptoms other than a typically sick appearance when 6 to 8 inches in height and makes little

additional growth, though climatic and cultural factors may be favourable. The plants dry up, and "en masse" have the colour of well-cured hay—i.e., the pallid green indicative of nutritious fodder rapidly dried.

N. bicolor swarmed on wild oats (*Avena fatua*), and oats growing as an escape from cultivation, without any apparent harm to the host plants. Close examination of these in bright light revealed pale longitudinal stripes in the leaf blades on which numbers of mites had been congregated. In some cases successive pale green areas followed each other in a line giving rather a characteristic appearance of irregular straight dashes. Whether these are typical on infested oats or likely to be noticed in wheat is uncertain.

Wild oat plants were brought to the office for experimental purposes. A number of mites were introduced into a seedling plant kept in a wide-mouthed test tube, sealed by means of a loose plug of cotton wool. After some time the mites began to feed, their fore limbs oscillating in rather a characteristic way. The mites preferred the upper surface of the lamina in the proximity of the ligule, and the precise positions of feeding were marked for convenience of further work. These parts of the leaf were sectioned. Examination of these sections gave some idea of the mode of penetration and the consequent injury to the plant tissue.

The following description of a typical section indicates the physiological effects of feeding. Two irregular cavities were visible on the upper surface of the leaf blade, one broadly open, the other deep and comparatively narrow mouthed. In each the epidermal cells had been forced into the mesophyll, suffering at the same time considerable derangement and losing the normal closely apposed structure. Such contusions would be made by the stiff unspecialised mouth parts possessed by *Notophallus bicolor*. Following this rough mechanical entry to the softer plant tissue the cells of the mesophyll are displaced and often ruptured, the contents of some having been extracted during feeding. In the surrounding tissues, the chlorophyll appears darker and more concentrated than in other parts of the leaf.

Feeding Habits.

The mites are very sensitive to intrusion, and exact observations in the field become a matter of some difficulty. At the slightest sound or movement they may crawl rapidly to the ground or should the plant be touched, fall immediately. Sometimes the adults crawl to the under side of the leaf. During feeding the body is set at an angle to the leaf, the anterior legs oscillating rapidly during the act of suction. When necessary the mouth parts may be withdrawn immediately, and the insertion appears to be only slight.

During the hotter hours of the day the bulk of the mites remain in concealment, the few specimens observed being confined to the leaf bases near the insertion to the stem. Most shelter in the soil, and all in some position not exposed to the direct effect of the sun's rays. Only rarely do they leave such sites during the day, and it is quite exceptional to find any immature individuals at that time. After sundown an efflux of the mites from concealment to the host plant takes place. Large numbers scatter over the plants, the bulk comprising immature forms. Most feed only on the upper surface of the oat leaves, but whether this is due to ease of penetration of the epidermal cells in this region requires determination.

Feeding appears to be restricted to the few hours round about sunset when the leaves are dry, the wind slight, and the solar heat at a minimum. The restriction of the mites' activity to this period suggests a disposition, negatively thermotropic and negatively phototropic. Immature forms compose the majority of the mite fauna observed at this time, a contrast to diurnal conditions when early instars are exceptional. At daybreak a heavy frost rind had settled on the ground, the leaves being wet and any interstices filled with dew. Adult forms were taken in the postligular space totally immersed in water. On drying these resumed their normal activity. Heavy dews apparently inhibit both the feeding and the movement of the mites, though total immersion for considerable periods does not have fatal results.

Life History and Habits.

Notophallus bicolor belongs to the group of softbodied mites known as the Eupodidæ, whose structure permits considerable activity. At rest the legs are partly withdrawn under the body, and detection is difficult if the mites are present in the soil. During the day shelter is found in the soil about the roots. On uprooting a seedling of oats, the disturbed mites move rapidly in all directions, their outstretched legs, bright red in colour, making them very conspicuous. Every effort is made to reach cover, aboundance of which is available in the soil.

Captured specimens were placed in jars together with seedling plants of wild oats. Examination of these plants at a later date revealed two egg masses, faint red in colour. These masses occurred on the upper suface of the leaf blade, a short distance, about one-quarter to one-half an inch, from the ligule. The mass has no definite orientation, the eggs being irregularly dispersed over an area of one-twentieth of an inch in diameter. Some twelve to twenty minute oval eggs, loosely attached to the leaf surface, were seen in the groups examined.

Under natural conditions large numbers of the mites are destroyed in the normal farm operations, their soft bodies offering little resistance to disturbances of the soil.

Host Plants.

W. W. Froggatt recorded the Blue Oat Mite from New South Wales in 1921 as a pest of cultivated oats. Cultivated oats were not grown to any extent in the neighbourhood of the farm on which the wheat had been attacked. The vigorous constitution, general in species of Avena, may account for the resistance of this plant, for no noticeable injury to it could be discerned.

While partial to oats, the mites may spread to any wheat grown in the immediate vicinity. If oats is a prominent weed in young wheat, severe injury may result to the latter plant. Along the headlands weeds occurred in profusion, but no trace of mites or any injury resulting from their attacks was observed.

Distribution.

Some three years ago the wheat failed in the upper part of the paddock near the top of a slope, and in the succeeding year the infested area included the whole hill. Two paddocks which covered the rise were generally infested; mites being found on oats growing here and there over the whole fallowed area. This extension downwards may have been accomplished by means of surface wash, evident after heavy rains,

which would carry the light-bodied mites to previously unaffected areas. In addition to the small size of the mite, its readiness to lose hold of any surface, liberates it to the full force of such a natural distributing agent.

As the mite was originally described from the Delungra district of New South Wales, inquiry was made locally into fodder importations, in order to test the possibility of its having been introduced into the State by such means. During the dry periods of 1918 and 1923 considerable quantities of fodder were imported. There is, however, no evidence to show that any of this came from the district where the mite has been recorded previously. The alternative hypothesis, viz., that the mite is indigenous to the Nobby and Back Plains district, seems more probable. As the feeding habits and injury resulting from slight infestations are not such as would attract attention, only an abnormal influx of the mites, overrunning a crop sufficiently to cause serious injury, would make its economic status evident. These considerations place the mite among those organisms which may be regarded as potential pests, which increase to dangerous dimensions under exceptional circumstances, associated with some climatic or other variation in cultural conditions.

The limits of the local distribution of the mite in Nobby district were not ascertained, but it occurs within at least a 5-mile radius of Mount Glen.

Control.

The necessary conditions required for the use of sprays in the control of pests indicate that for the treatment of the mite the practice will prove of doubtful value. As previously mentioned, the least sound or movement sends the mites to the ground at once. Thus the impaction of the spray, if crudely applied to the seedling plants, would send many into cover on the ground where some protection from the effect of any spray used is available. The refinements of spraying which would be necessary are practically unobtainable on the farm, hence control measures of this type are of doubtful utility in this case. Even were it possible to secure effective control of the mites by this method, the high cost of application to cereals would prohibit its use in other than very exceptional cases.

Cultural operations seem the more practicable, and suggestions may be summarised as follows:—

1. *Deep Ploughing.*—The mite, in common with other Eupodidæ, is soft bodied in structure and hence easily destroyed. Occasional deep ploughing to a depth of 8 to 9 inches both disturbs the mites and buries them at a depth from which they can scarcely emerge. To render the practice effective, the use of a skim coulter is desirable, as the upper 2 inches of the soil, containing the mites and contaminated vegetation with the egg masses, will be securely placed at the bottom of the furrow. The frequency of the operation must be determined in accordance with the specific requirements of the crops being grown.

2. *Fallowing.*—Apart from the importance of fallowing to the successful growth of the wheat crop, insects and other pests are robbed of host plants for some time. Frequent working of the land keeps weeds, including wild oats, in check and disturbs the soil. Both these factors react unfavourably on *N. bicolor*, in the first place by starving the mite, and secondly by mechanically destroying large numbers. Where fallowing over long periods is impossible, harrowing, cultivating, and other modes of working the land are advantageous from the entomological point of view.

3. *Rotation of Crops.*—The cropping of wheat from year to year, a common practice in the district, affords a supply of host plants which is suitable to the spread and multiplication of the mite. As an alternative, the crop may be changed frequently, either by planting some other graminaceous crop or the insertion of a green crop, e.g., lucerne, into an elastic rotation. Such may be easily devised by anyone conversant with local agricultural conditions and possessing a knowledge of the potentialities of various crops in the soil of the district.

FARM TRACTORS AND THEIR MANAGEMENT.

By E. T. BROWN.*

No matter how skilful the tractor driver may be there are times when things go wrong with the engine. It may be loss of power or the engine may cease work altogether. This is the time when the technical knowledge of the driver comes into play, since it is his duty to locate the trouble as quickly as possible. Trouble invariably occurs when the machine is being used, and, therefore, the less time taken to discover the cause of the trouble and to set matters right the better. But it is not always an easy thing to decide at once what has really happened. There are ways, however, of diagnosing the complaint quickly, and correctly. The best method of tracing the trouble is by the elimination of those factors that cannot possibly have caused the trouble. But before one can do this it is essential to appreciate at the beginning what symptoms are likely to be displayed, and, moreover, to understand what the cause of these symptoms is most likely to be. Then by classifying the complaints and working in a methodical way, it is an easy matter to find out what is amiss.

The Systems to Examine.

The plan that I have always found to work best is, when anything goes wrong, to examine the ignition system first, then follow with the fuel supply, and, if the cause does not lie with either of these, to examine the engine. It is generally possible to remedy any defect in the ignition system or the fuel supply when out on the land, but in most instances when it is the engine that is at fault it is necessary to effect the repairs in the workshop, since most probably the engine will have to be dismantled. It is surprising, however, how much a skilled man can do in the way of remedying a fault when away from his shop. But there must naturally be many jobs that cannot be done at the time. There are six symptoms for which to look, and if these be taken in rotation, the work of diagnosing the complaint is simplified. These are: (1) Engine misses fire or stops; (2) loss of power; (3) knocking or pounding; (4) backfiring; (5) overheating; and (6) irregular speed. These I propose to take in order, and explain the causes that may account for the trouble.

Misfiring.

Misfiring may be due to (1) dirty distributor in the magneto; (2) vibrator points pitted or dirty; (3) sparking plugs dirty or cracked; (4) sparking plug points not properly set or the contact breaker stuck up. If the fault be not here, ascertain whether the fuel mixture is correct or whether there is any water in the fuel. If the trouble lies with the engine, look for loss of compression by turning the engine slowly over by hand and testing the compression, or the valves may be out of order.

Loss of Power.

Loss of power is very quickly noted and particularly when the loss is considerable. Loss of power may be due to: *Ignition*—The spark not sufficiently far advanced; the wiring may be faulty; the plugs dirty; the contact-breaker points pitted or incorrectly adjusted; the commutator brush may be dirty. *Fuel*—The mixture may be too weak; that is, have too much air; the intake manifold may be leaking; water in the fuel; the float of the carburetter may require adjustment. *Engine*—The oiling may be insufficient; the governor may require adjusting; loss of compression; worn, stuck, or broken piston rings; scored cylinder walls; sticking valves; leaking head joints.

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* In the "Farmer and Settler."

Knocking or Pounding.

This cannot be a fuel complaint, therefore examine the ignition system. The spark may be too far advanced, but as a general rule it will be found that the engine is at fault. It may be that the carbon deposit on the cylinders, pistons and valve parts has accumulated sufficiently to cause the noise; the bearings may be loose; the pistons too tight or insufficiently lubricated; the water system may not be working properly. Usually the cause is carbon deposit.

Backfiring.

This is generally caused by faulty ignition. The high-tension wires may be connected to the wrong plugs; there may be a short circuit in the primary wires; the spark may be too far advanced. This complaint is sometimes caused by a weak mixture, but this is not often the case. It is possible, however, for a stuck or leaking inlet valve or a leak in the manifold or the carburetter gasket to cause backfiring.

Overheating.

A weak spark or one that is timed too late may cause the engine to overheat, and this also is true when a too-rich mixture is used. In most instances, however, it is due to insufficient oiling; an impeded water circulation; or heavy carbon deposits on the cylinders, pistons, and valve ports.

Irregular Speed.

This is a complaint with which one frequently comes into contact. One minute the engine is running well and pulling strongly, the next it is very sluggish. It is not always an easy matter to account for this irregularity, but it is generally due to one of the following causes:—*Ignition*—Loose connection, partly broken wires, or pitted or badly adjusted platinum points in the contact breaker. *Fuel*—Irregular supply of fuel, a dirty needle valve in the carburetter. *Engine*—The governor working badly or sticky valves.

Beware of Loose Nuts.

One loose nut on the tractor outfit may cause untold damage. A tractor by the very nature of its work, and the unevenness of the ground over which it travels, is constantly subjected to severe shocks and excessive vibration. This undoubtedly accounts for the frequency with which one comes across loose nuts on the outfit. True, many of the most important nuts on the engine are secured with a split pin, but there are hundreds not so held. The only way of making certain that all nuts are screwed home as tightly as possible is to go round them at frequent intervals. An unbreakable rule should be made by every tractor operator that whenever he is looking over the machine, for any purpose whatever, he does so spanner in hand. It will be found that some nuts never require attention, but, on the contrary, there are others that seem particularly given to working loose. It is the latter that should receive attention every day, and this is an easy matter, for one quickly finds out which are most likely to suffer from the vibration.

The Need for Clean Air.

The average tractor operator does all that lies in his power to ensure fuel passing into the engine. A very large number of them, however, do not appear to appreciate the fact that it is equally important to take precautions to prevent dust-laden air from entering the induction pipe. To ward off the danger of allowing dirty air to be mixed with the fuel vapour, all tractors are fitted with air filters. These filters, however, are useless unless they be cleansed out at very frequent intervals. It will be realised how much dust the air is capable of carrying when it is stated that it is no uncommon thing to find that close on 2 lb. of sandy material has accumulated in the filter during a normal day's work on dry soil. The most satisfactory type of filter is that in which the air has to pass through water. This arrangement ensures only clean air entering. But it is essential to clean out the filter at least every day the tractor is at work.

A Tip for Benzole Users.

I have frequently heard tractor operators state that they object to the use of benzole as a fuel on the ground that when a cork float is fitted to the carburetter there is always a danger that the benzole will destroy the varnish on the cork. If this varnish be destroyed the cork will sink and a flooding carburetter will result. This difficulty can very easily be overcome. A celluloid varnish is not acted upon by benzole, and, therefore, this is the material to employ. Procure a few scraps of celluliod—an old comb or tooth-brush handle will answer the purpose admirably—and dissolve them in amyl acetate. This liquid can be obtained from practically any chemist. Dissolved celluloid is a tacky solution, but it can be successfully applied with a small brush. The life of a float treated in this way is a long one.

FAT LAMB RAISING.

J. CAREW, Assistant Instructor in Sheep and Wool.

In a recent radio lecture by Mr. J. Carew, assistant instructor in sheep and wool, the lecturer impressed upon his hearers that the carrying capacity of the holding should be first considered and then stocked with a type of ewe suitable for lamb raising.

In Queensland, he said, the natural pasture is, generally speaking, unsuitable for fattening lambs. The great proportion of the coastal lands in the State vary from poor rough country to rich alluvial river and creek flats, and many of the natural grasses on this class of country, while good in the early stages of growth, become too coarse and rank and produce seeds injurious to the well-being of the sheep, as well as being deleterious to the wool. That these pastures can be greatly improved has been conclusively demonstrated in many places; that is, in places where the land was put under cultivation for a year or two and then sown down with artificial grasses, principally Rhodes grass; and there are instances in which the pastures, after cultivation in this way, have been allowed to revert to natural grasses without any sign of spear or wire grass making its appearance. Stocking heavily during spring and summer is the method usually employed in controlling these grasses, and in keeping them suitable for sheep for the greater portion of the year.

In the scrub areas, where artificial grasses are sown, they will be found sufficiently good for fattening purposes, but even they are greatly enhanced by having cultivated crops that can be regulated to come in at a time when they will supply any deficiency in feeding values that may be known or expected, as seasonal influences play an important part.

Fat lamb raising should be combined with mixed farming, and anyone carrying on mixed farming will find that sheep will give a remunerative return. Assuming that an established farmer has his cultivation paddocks fenced off with the ordinary stock-proof fences, he would be able to convert them into sheep-proof fences with wire netting at a cost of about £30 a mile. Paddocks of about 20 acres or smaller are suitable, and in this way the sheep can be put in after a crop is taken off, and instead of burning off before ploughing, be cleaned up by the sheep; the manure that they will distribute will leave the paddock all the better for their being in it. Cultivation is one of the best means of converting a worm-infested paddock into worm-free country, and worms form one of the greatest enemies to the sheep industry along the coast and, indeed, well inland, especially in years when summer rains are abundant.

When the weight and probable price of the breeder's wool is taken into consideration, a fair margin of profit should be secured on the breeding flock. Should the lambs be sold when five months old at anything like present market rates a an admirable dual-purpose sheep, an essential in the farmer's breeding flock.

Mr. Carew described the Corriedale as the most suitable farmers' sheep, it being large, well-proportioned, possessing a strong constitution with a plentiful milk secretion, combined with a capacity for producing a weighty fleece of fair crossbred quality of about 50's to 54's spinning counts. The Corriedale could be considered an admirable duel-purpose sheep, an essential in the farmer's breeding flock.

"As the Corriedale is not suitable for producing fat lambs" (Mr. Carew continued) "it is necessary to mate the ewes to a breed of ram likely to give the best results, and, despite the claims made on behalf of other breeds, I would" (speaking from experience gained under Queensland coastal conditions) "recommend rams of the Dorset Horn or Border Leicester breeds for the higher and well-drained areas within, say, 50 miles from our sea-board.

"If the Corriedale breed is not procurable, or if for any other reason the sheep farmer wishes to raise his own breeding flock, full consideration must be given to geographical, climatic, and general conditions. The Corriedale is based on being fifty-fifty Lincoln and Merino. Therefore, Lincoln rams mated with Merino ewes will give a suitable type, but would probably be composed of a big percentage of rough-covered ewes that would greatly reduce the value of the clip. (The Corriedale, which has been developed by careful selection, is composed of a more even type.) Should the Lincoln-Merino first cross be used as the breeding flock, the pure-bred Lincoln ram will not produce lambs to mature as quickly as the Border Leicester or Dorset Horn, therefore, by introducing two breeds of rams, complications are being constituted unnecessarily. Should the holding be within 50 miles of the coast with low lying as well as elevated ridges I would recommend the Romney Marsh or the Romney cross as the breeding flock.

"On the higher and better drained areas the Border Leicester crossed with the Merino can be recommended as likely to give the best results all round. The first cross will be quick to mature. The wether lambs should be fit for market when four and a-half to five months old. The first cross ewe lambs should be retained as breeders, being very suitable both as wool and mutton sheep, growing to a good size, possessing plenty of vigour, capable of a quick recovery after a pinch, having a good milk secretion (which is so important in securing early maturing lambs) and being prolific; all these characteristics, combined with the quality of adapting themselves to the varied diet usually supplied on a mixed farm, help to secure for them a position amongst farmers' sheep that is difficult to displace. These half-bred ewes can be mated again with the pure Border Leicester ram, but, as the result of this mating I would recommend that all this drop be sold as fat lambs, as soon as fit, as the ewes from this cross are on the coarse side in regard to wool production.

"It will, therefore, be understood that only one pure breed of ewe and one pure breed of ram is necessary, that is, the Merino and Border Leicester. This will simplify matters considerably, as all the breeding ewes can be run in one flock during the whole year.

"The Dorset Horn is a very desirable breed for the fat-lamb trade, but as they are not so valuable as wool producers and do not possess any distinct advantage over the Border Leicester as a fat-lamb getter there appears to be no reason why they should be used instead of the Border Leicester and Merino Cross.

"Assuming then that this is the cross to be used, we find that the Merino is suitable to be mated either in spring or autumn, but the Border Leicester Merino cross will only mate successfully in autumn. For the purpose of getting fat lambs it is better to keep the rams away from the ewes except at mating time. Seeing that the autumn is the only season in which a good mating can be expected, I would recommend joining the rams with the ewes from the second week in February to the last week in March. The lambing will thus commence in the middle of July and finish the last week in August.

"At the time of mating, the ewes can be kept on good and suitable natural pasture. If the season be good, they will probably be attacked by the sheep maggot fly, but at this season the ewes can stand the knocking about that is necessary for crutching, jetting, &c., to keep them free. If stomach worms are present they are worst at this season. In this respect I do not mean that the effects are worse, as at this season the sheep should be better able to withstand the evil effects owing to the feed being more suitable and nutritious.

"When winter comes on the sheep should be practically free from worms, and as no worms are hatching out owing to cold conditions, the ewes can go right through the lambing without disturbance, as flies also are, as a rule, absent at this period. By the time the flies begin to get busy the lamb marking should be over, as the most suitable time to mark lambs is when they are from two to six weeks old. The flock will be fit for shearing by the end of September or early October. The shearing has a retarding effect on the attack of the fly, especially if all sheep are jetted as they go through the race after shearing.

"As the sheep are to be shorn, they should be examined for broken mouth and specially marked to be fattened off. The broken-mouthed ewes can be fattened off with the lambs and sold while they are still capable of fattening up, otherwise they are likely to be kept hanging on in an unprofitable manner. When the lambing is timed to take place in July and August provision should be made to have a supply of feed for the whole batch, as the more quickly they are fattened the more economic the fattening.

"If lucerne is grown on the holding there will be but little growth in it during July and August. If cut during June, the short growth during July and August is very suitable for grazing sheep, on which they will do well, thus giving the lambs a good start off. Up to the time the lamb is dropped the ewes should be kept going, but should not be put on luscious feed. After the lambs are dropped, the best and most luscious is not too good and for grazing purposes lucerne is among the best.

"There are other crops, however, that are suitable and that can be grown during our normal autumns and winters, such as oats, barley, wheat, turnips, rape, &c. I regard the latter as giving the best results for fattening purposes. If sown in April and May it will be suitable for feeding during August, September, and October. For feeding during November and December, lucerne is about the best; failing this, Sudan grass or one of the panicums will fill the bill and top off all the lambs by the end of January or the middle of February, which brings the proceedings to a close for one year, when a fresh start can be made to follow the same routine."

CONSIGNMENTS AND HOW TO DEAL WITH THEM.

By G. B. GALLWEY, A.F.I.A., A.A.A., A.A.I.S., Queensland Agricultural High School and College.*

A farmer grows produce to sell and has two markets in which to make sales. These are the local market and the city market. It often happens that he uses both, and with the former his transactions are not particularly complicated as he sells either for cash or credit and has dealings with one particular man and his accounts show straight-out debits and credits. In the city market he has to open a consignment account and work on it for the periods he is sending his produce afield.

It may be well to consider what a consignment is, the reasons for making the consignment, and who are the parties concerned. The first may be termed an adventure, because it is the forwarding of goods by one person to another for sale by the latter for a remuneration, usually a percentage on the sales, which is known as a commission.

The reason for making a consignment is generally the hope of obtaining a better price than is ruling locally and thus obtaining a better profit. In some cases the local demand is more than satisfied by the supply and the farmer is forced to seek another market. Often the particular produce grown can only be sold in certain places, and the farmer will then find it necessary to make consignments.

The parties to a consignment are the consignor and the consignee. The consignor is the principal—that is, the person who owns the goods comprised in the consignment and who is entitled to receive the proceeds of the sale of such goods. The consignee is the agent—that is, the person who receives the goods and sells them for the consignor or principal.

It should be noted that the ownership of the goods remains with the consignor or principal. The consignee or agent is really in a position of trust and must account to his principal for his dealings with the consignment.

The farmer, when he forwards his goods, should advise the agent, sending any papers necessary for delivery to be obtained. He should also advise any special instructions he wishes to be observed regarding the sale. If the farmer fixes a certain price on the consignment, the agent is expected to sell for as much above that price as he can, but should not sell below the price unless he has the permission of the farmer.

When a sale is made the gross proceeds are received by the agent. This amount is the total obtained for the sale of the consignment.

On this amount the agent receives his commission and deducts it from the gross proceeds. He then deducts all expenses for receiving, handling, storing, and selling, and has left the net proceeds which are due to the farmer.

In order to show the farmer the result of the consignment the agent forwards a statement which is known as an Account Sales. This statement may cover either partial or total sales and shows all the details of the goods sold, all charges and commission, and the actual net proceeds. The agent either forwards his cheque with the Account Sales or in some instances a few days after.

The foregoing is in short what happens when produce is sent on consignment. Other points arise in this connection, and the principal of these is the fact that the farmer enters into a contract with the person or firm who carries his goods. This contract fixes certain obligations on both parties, which, however, do not affect the relations of the farmer and his agent.

From the farmer's point of view the procedure outlined is known commercially as a Consignment Outwards, and the farmer interested in keeping books should make these entries. As it is not possible to know what the produce will realise, the farmer should note down what he has consigned and the date the consignment was made, and what he estimates he will receive. This amount should be debited to the consignment account and credited to the produce account concerned. If the farmer has made any payments he should debit consignment and credit cash. When account sales come to hand the amount of the net proceeds should be credited to consignment account and debited to a personal account of the agent. On the arrival of the agent's cheque, debit cash and credit his personal account. If a cheque accompanies the account sales there is no necessity to open a personal account for the agent, but debit cash and credit consignment account only.

An examination of these entries will show that the agent's account is written off, the cash will show the amount received and the payments made, and the consignment the profit or loss made on the venture. A profit is made if the credits exceed the debits, and a loss is suffered if the debits exceed the credits.

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* In a radio lecture from the Queensland Government Radio Station, 4QG.

Consignment accounts of another class are called Consignment Inwards, and do not as a rule affect the farmer, but principally concern the agent.

Sometimes two or more farmers may join together in a deal or sale, and such cases are recorded in commerce as joint accounts. In these accounts there exists more often than not a big element of speculation. The primary cause is that it is considered a particular line can be turned into a big profit by a snap deal and one party finds the money and the other manages the transaction and receives a commission on the gross sale. After the completion of the deal and the managing party has been paid his commission the profits or losses are shared.

The farmer's interest in these accounts centres principally in Consignments Outwards, and in regard to these let me conclude with a little advice: Help the agent by sending your best; be straight with him and he'll be straight with you; and, as I said in a previous lecturette, if you are puzzled about your account sales consult your banker and your agent, and you will find how easy it is for transactions and business relations to move along smoothly.

RADIO LECTURES ON AGRICULTURE.

THE LIST FOR FEBRUARY.

By arrangement with the departments concerned by the Director of the Queensland Government Radio Service (Mr. J. W. Robinson) through his Market Reports Officer (Mr. Robert Wight), forthcoming wireless lecturettes on agricultural and related subjects are listed as follows:—

Wednesday, 8th February, 7.45 p.m.—A lecturette arranged by the Queensland Agricultural High School and College.

Thursday, 9th February, 7.45 p.m.—Meat Inspection, by Mr. Inspector Cheeseman, Department of Agriculture and Stock.

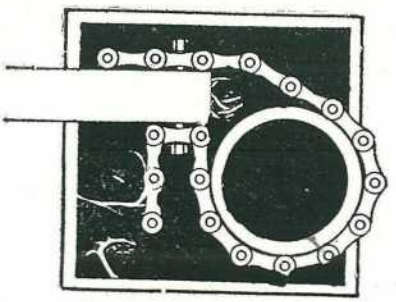
Tuesday, 14th February, 7.45 p.m.—Progress of Agriculture in Queensland, No. II.—Mr. J. F. F. Reid (Editor of Publications).

Monday, 20th February, 7.45 p.m.—Pig Raising—Mr. E. J. Shelton (Instructor in Pig Raising).

Tuesday, 28th February, 7.45 p.m.—Points in Fruit Growing Practice—Mr. George Williams (Acting Director of Fruit Culture).

A CHAIN AS A PIPE WRENCH.

When it is necessary to turn a pipe in making a pipe joint it is a difficult matter to grip the pipe unless the jaws of the turning tool have teeth that will bite into the outer circumference of the pipe. The pipe wrench is the proper tool to use for this, but so little need is found for this tool that it is rarely found in the collection of tools at hand. The accompanying illustration depicts a scheme that will accomplish the same result. It consists of a section of old roller chain, a long bolt, and a heavy steel or wood beam. The beam is drilled at one end to



take the bolt, and the chain is placed around the pipe, then bolted to the beam in such manner that the smallest number of links will surround the pipe. Applying leverage to the beam pulls the two ends of the chain in opposite directions, and causes the links to bite into the pipe in very much the same manner as the sharp jaws of a pipe wrench. The greater the leverage applied the greater will be the grip of the chain on the pipe.

POULTRY HOUSING.

HINTS FOR JUNIOR POULTRY CLUB MEMBERS.

By P. RUMBALL, Poultry Expert, Department of Agriculture and Stock.

Correct housing is very important if the best results are to be obtained from poultry raising. Poultry houses and buildings should be dry, well ventilated, free from draughts, with plenty of sunshine and sufficient room to allow the birds to move about with freedom and comfort. The foregoing features are all necessary factors in maintaining the good health and vigour of the birds, without which profitable production cannot be obtained. Poultry houses may be built in a variety of shapes, and a variety of material. It may be possible for old buildings to be remodelled to suit the requirements of the poultry, but in the building of a new house or houses it is better to follow the system of poultry house building generally adopted.

Making a Beginning.

Club members are commencing operations with only a few birds and consequently a very large house is not required. The house that is recommended although small will make a suitable breeding pen if the operation of poultry keeping is extended by club members. The material most suited for building fowl houses is hardwood, free from cracks and crevices for the frame work, and galvanised iron for roof, back, and ends. With this class of material the least possible harbour is offered to vermin which frequently infest poultry houses. If it is not possible for a club member to procure iron and good sawn hardwood for his building, timber may be used for both ends and the back of his house, but iron should be always be used for the roof, for it is most important that the interior of the shelter should be kept dry.

The Building.

A house, 4 feet long and 4 feet deep, will be sufficiently large to accommodate the stock, and large enough to hold six hens and a mate bird at a later date for breeding purposes. This house should be open in front and face the north or north-east. The ends and back closed in with iron or timber. If the timber is to be used it is as well to dress it with wood-preserving oil with the object of not only protecting the timber, but guarding against vermin making their home in the building. The height of the house at back should be 4 feet, and in front 4 feet 6 inches. If 6-foot iron is used for roofing purposes and a 3-inch overhang is allowed at back, it will be found that there is considerably more than a foot of iron projecting in front. This overhang in front largely assists in keeping the house dry, which is essential. Ventilation must be provided. This is best done by space of 2 inches between the top of the back wall and the roof. This is also an important point in building a fowl house, as without it the house becomes very hot in summer, and in houses where large numbers of birds are housed together and no ventilation is provided, the air in the house becomes very stale, and consequently injurious to the birds health.

In a building where the ends and back are to be constructed of timber, if the timber is just fitted together it will shrink and eventually leave gaps that will cause a draught. Draughts are largely responsible for the birds developing colds. The joins in all timber-constructed sheds should, therefore, be covered with a small lath or beading to prevent this. Where neither iron nor timber can be procured for the walls of the fowl house, wheat or corn sacks opened and stitched tightly may be used. These are fairly durable if given a coat of whitewash and reduce considerably the initial cost.

The material required for the most desirable class of house, that is iron and timber, is as follows:—

3 inches by 2 inches hardwood for corner posts—Two 5 feet 6 inches, two 6 feet.

3 inches by 1½ inches pine battens for roof, back, and ends—Six 4 feet, two 5 feet 6 inches.

6 inches by 1 inch hardwood for front of house—One 4 feet.

Iron—Roof, two 6 feet; back, one 8 feet; ends, two 9 feet.

This material will cost approximately £2, but it may be possible for many members to procure second-hand material that will do equally as well.

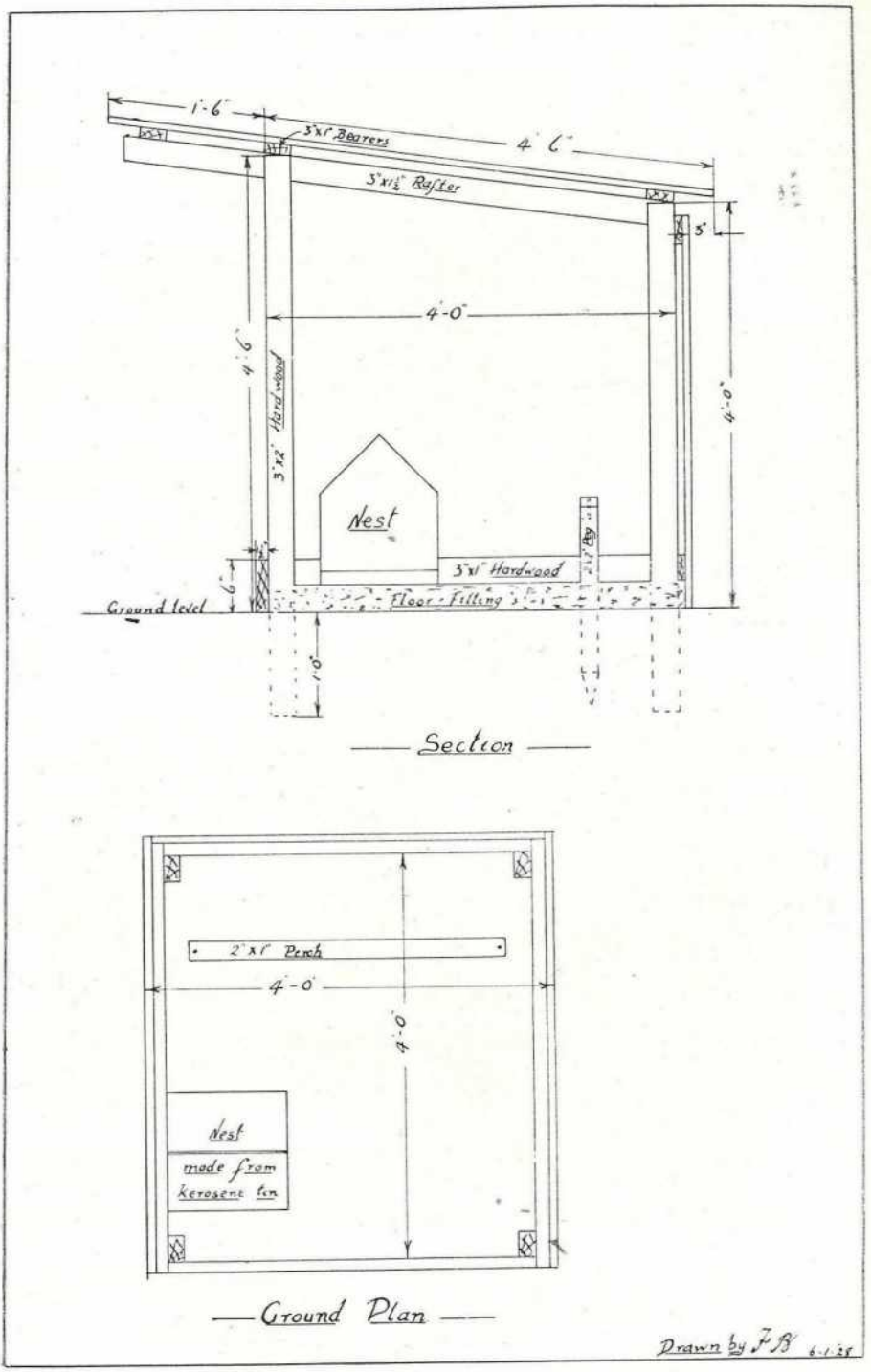

1'-6"
3"x1" Bearers
4'-6"
3"x1½" Rafter
5"
4'-0"
4'-6"
3"x2" Hardwood
Nest
3"x1" Hardwood
Ground level
6"
Floor Filling
1'-0"
Section
2"x1" Perch
4'-0"
4'-0"
Nest
made from
Kerosene tin
Ground Plan
Drawn by F.B. 6.1.28

PLATE 52.

To this house should be erected a netting run. The number to be housed together, however, is so small that the run need not be large, and, therefore, no hard and fast rule will be laid down for this purpose. If it is possible to give the birds the run of the yard or free range, and this will be possible where no other fowls are kept, the expense of building a pen may be saved.

Location.

Having the material to commence operations, the next point to consider is the location. Poultry houses should be built, if possible, on a slope and well drained soil. Wet and damp houses mean a cold one, and this is frequently responsible, by its weakening effect on stock, for sickness and disease.

The interior of a poultry house should be simple and easy to clean. The first consideration is the floor. This should be raised several inches above the level of the surroundings. Cement floors are the easiest to clean and the most desirable, but here again expense has to be considered. Clay and ant bed filling well puddled and tramped down make a very good floor, and is readily cleaned. The roosts should always be placed at the back of the house, and be situated about 10 inches from the back wall. They should be made of timber 2 inches by 1 inch hardwood, and fitted on to two pegs standing 10 inches to a foot out of the ground. The best way of attaching the perches to the pegs is by driving a nail into the peg to within an inch of its full length, then bore a hole in each end of the perch which will enable it to fit loosely on the peg, and so allow of its removal for cleaning operations.

One nest will be sufficient for four pullets. This can be constructed out of a kerosene tin, as illustrated, and placed at one end of the building. This type of nest is fairly well secluded, a feature which birds appreciate, and one that also assists in preventing such vices as egg eating. Good clean nesting material is the next essential, as without this eggs cannot be kept clean, a highly important point in securing top market prices.

IMPORTATION OF PEDIGREE STOCK.

The proposal of the Empire Marketing Board to make available to the Commonwealth Government portion of the annual grant provided by the British Government to assist the export of pedigree live stock to the overseas parts of the Empire was discussed in detail recently at a conference held in Melbourne by the Minister for Markets (Hon. T. Paterson, M.P.), the Commonwealth Chief Veterinary Officer (Mr. R. P. Allen), the Commonwealth Chief Dairy Supervisor (Mr. P. J. Carroll), the Secretary to the Department of Markets (Mr. C. J. Mulvaney), and representatives of the Royal Agricultural Society of Victoria, the Chamber of Agriculture, and several breed societies.

The conference was convened in consequence of the Marketing Board's request that the various Dominions should suggest means whereby assistance under the terms of the grant could be most suitably rendered. The conference was unanimously of the opinion that everything possible should be done to encourage the importation of the very best class of pedigree stock into the Commonwealth.

It was also agreed that any financial help rendered should not act as an encouragement for the importation of inferior stock or for the purchase of stock for speculative purposes. The opinion eventually arrived at was that the cost of any assistance rendered should be borne by the Empire Marketing Board, the Commonwealth and State Governments, and the ship owners and should be available to Australian registered stud stock breeders only; also that such breeders should be relieved of two-thirds of the expense of bringing the stock from Great Britain to Australia.

It was stipulated that, where assistance is rendered, the breeder receiving such assistance must not dispose of the stock within twelve months of its importation into Australia, and should it become necessary to sell the animal within that period the amount of any assistance rendered be refunded.

Among those who attended the conference were—Messrs. C. E. Merrett (President, Royal Agricultural Society of Victoria.); H. Schwieger (Secretary, Royal Agricultural Society of Victoria); L. Monod (Secretary, Cattle Breeders' Societies); H. Kendall (representing the Chamber of Agriculture); A. H. Mactier, and the following representatives of Breed Societies: Messrs. J. McIntosh (Red Poll), H. H. Peck (British Breeds of Sheep), D. C. Morpeth (Shorthorn), J. Lidgett (Milking Shorthorn), W. Cockbill (Ayrshire), G. A. Bedwell (Australian Stud Pig Breeders Society), C. D. Lloyd (Jersey), and W. Finn (Guernsey).

SELECTING AND HANDLING THE BOAR.

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

There is an old stock adage that the boar is half the herd. Though the statement needs some considerable backing, yet, in a general way it is true. It embodies an idea that must be constantly kept in mind when selecting a sire.

Mr. Shelton's notes on the subject will, therefore, be read with interest, for they cover a wide range and carry much practical information.—Ed.

Visiting a Southern farmers property recently and inspecting his stock, the topic of conversation turned to the class of boar he was using, whereupon the farmer invited the writer to "have a look at him"—i.e., the boar—which was penned some distance away from the herd.

Continuing our chat I observed, "Yes, but surely you are not using that fellow, he's a crossbred such as we would certainly not recommend for use on any farm, no matter what class of pig it was intended to use." This conversation, which, happily, was a very productive one, lead to the preparation of a few notes on the subject and this in turn to the present article, which it is thought, covers the ground required and gives information such as may be made use of on any farm, no matter in what part of the State the farm may be situated. It might be added that, before we left the farm referred to, an order had been booked to secure a really good purebred boar and to have him delivered as early as convenient to replace the crossbred, which our friend decided to replace as soon as another more suitable one came to hand.

Selecting the Sire.

There are many points to be observed in the selection of the head of the herd, for the boar represents a very important section of the pig stock.

Even if there is a tendency at times to exalt unduly the influence of the boar and seemingly to neglect that of the sow, the farmer should not permit himself to reverse things and entirely neglect the paternal head of the herd. Breeders cannot afford to neglect either the boar or the sow; they are both important factors in the production of a good herd of young stock. The boar, of course, has a greater influence in the herd for the reason that he will sire a considerable number of the pigs kept. Probably all the individual young pigs on the smaller farms will be the progeny of the one side, whereas they would not all have the same dam.

The more important the stud is or the more pigs there are on the farm, the more important is the selection of the sire. That there are risks associated with the purchase of all classes of stock is a well-known fact, but this does not lessen the importance of the selection of the head of the herd, or of the sows or of other farm stock.

Fundamentals of Success.

Fifty pounds stirling or even more spent on the purchase of a good boar would be money well spent by the man that had the work for him and that hoped to build up a really good stud herd. Similarly, £10 or more is not too much to pay for a good boar for use on pure or grade sows for the production of pork or bacon pigs. Whatever the price, so long as the animal is good and the stud warrants the outlay, get a good one, and don't stop and listen to the man that says, "Any old thing is good enough for me so long as he can serve its purpose." A boar of inferior quality will have a disastrous effect on any herd. A good boar raises the standard of the herd; an inferior boar lowers it.

Essential Characteristics.

The boar should, above all, have his masculine characteristics strongly developed; weak effeminate boars are disastrous. Recognising that the boar represents at least 50 per cent. of the reproductive force of the herd divided up amongst the sows to whom he is mated, it will be necessary first of all to consider the class of sow to

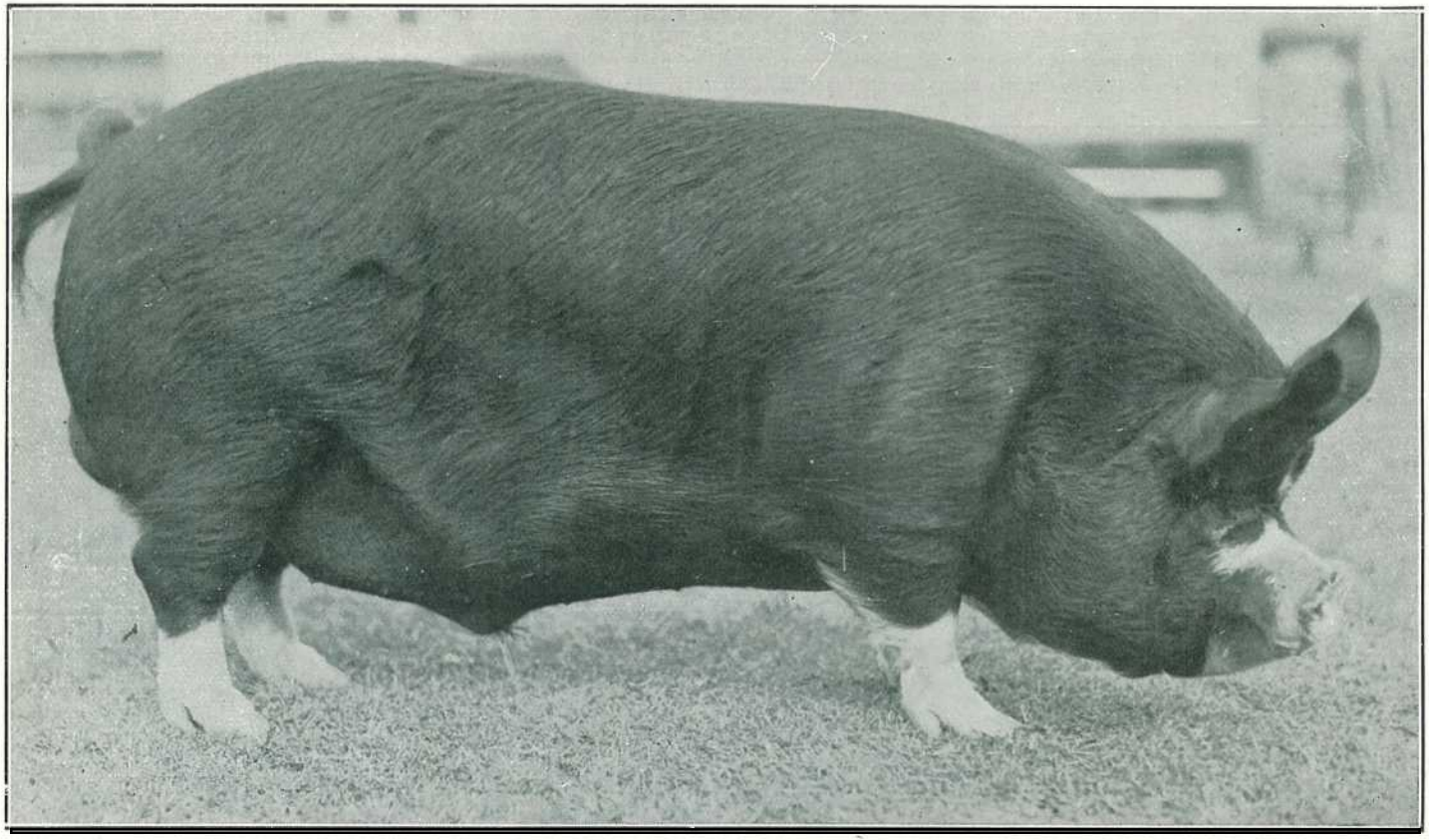


PLATE 53 (Fig. 1).—A CHAMPIONSHIP-WINNING BERKSHIRE BOAR.

"Murray Glen Star" (4969), the Berkshire Boar here shown, has proved a valuable investment as a stud sire. His progeny have been in great request and have sold readily. The property of the Queensland Agricultural High School and College (Gatton College) he has been a popular and attractive addition to the stud. Many of the best Berkshires in the College Stud to-day have in their breeding blood of the Murray Glen Star strain and of "Bylands Nancy" (5238), a Berkshire Sow purchased at the same time for the College stud. Note this boars type and character, his bodily developement and style, also his markings and quality.

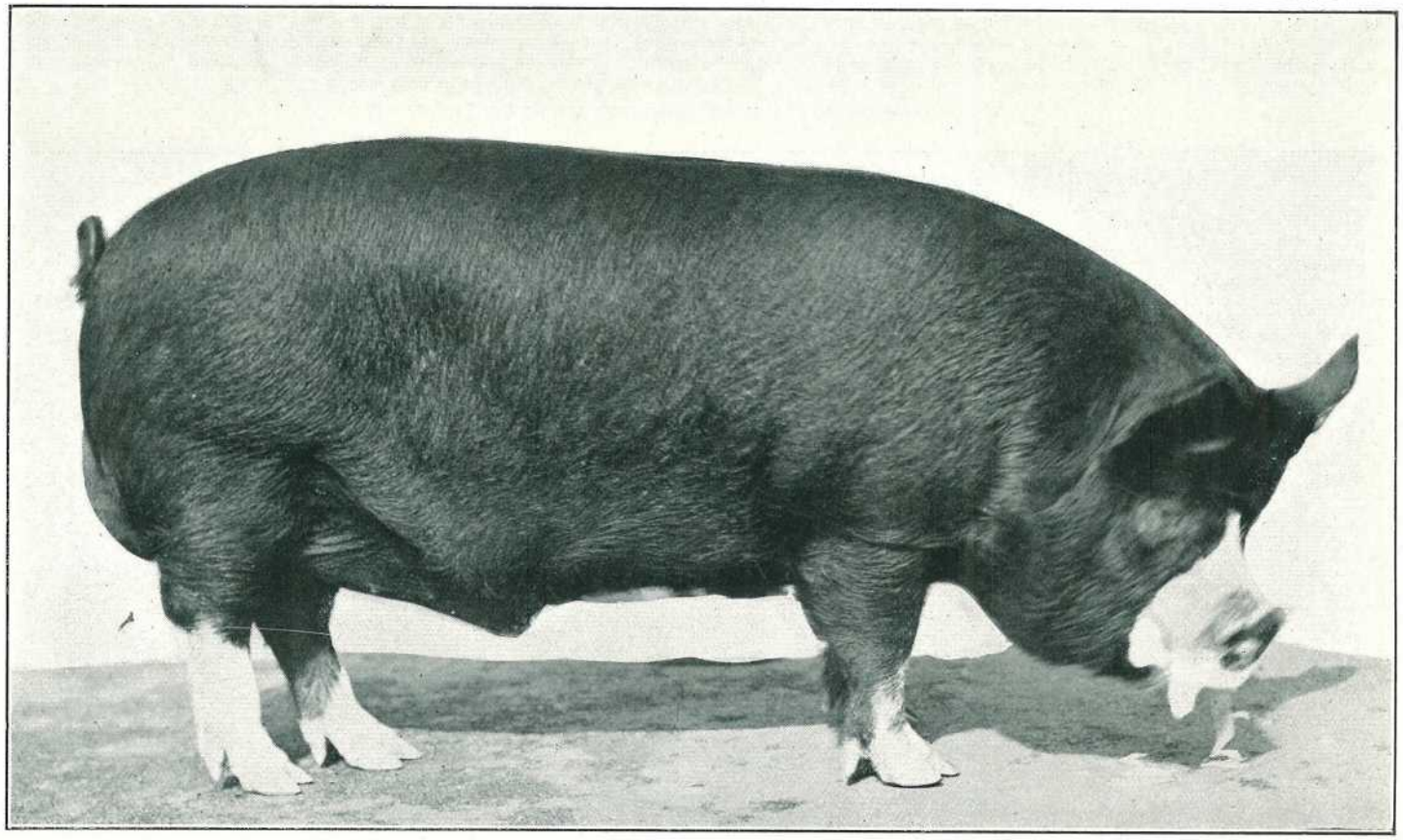


PLATE 54 (Fig. 2).—A LENGTHY WELL-DEVELOPED STUD BERKSHIRE BOAR.

Prominent among this boars characterastics are his great length and evenness and his well-developed hindquarters. Owned formerly by Mr. D. P. Hayes, a prominent New South Wales breeder, he realised a very high figure at the Stud Pig Sales held at Sydney Show in 1925. He shows breeding and quality second to none and is reasonably well marked. His legs are strong and he stands well off the ground, both points in favour of a young animal.

whom he is to be mated before deciding on type, age, price, &c. It is a considerable advantage in a general way to select a boar strongly developed, especially in points in which the sows show a tendency to weakness, that is, of course, comparatively speaking, for no weak-constitutioned animal should be retained in the herd or be permitted to reproduce his species.

Selecting the Herd Header.

A general outline of the points to be looked for in the selection of the "Herd Header" or sire would be (1) Robustness of constitution; (2) prolificacy of type; (3) symmetry of form and evenness of quality; (4) correct pedigree; (5) a mild and even temperament; and (6) a health declaration.

A Good Constitution.

(1) A good constitution, indicated by a general healthy condition of the skin and hair, which should be soft, pliable and silky (oily, if the animals have been sty-fed); width between the eyes and ears and along the back, with a wide and deep capacious chest; large girth and strong wide loins; evenness throughout with no sign of weakness at back of shoulders or in the region of the loins; the animal to be of good size for his age. Note his breathing to see that it is even and regular.

Prolificacy of Type.

(2) Prolificacy of type cannot be decided upon appearance, hence an animal's pedigree and stud records should be studied and as much information obtained from those conversant with the strain as is possible. There is an old saying, "It is useless buying a pig in a poke," i.e., buying a pig without first inspecting it and ascertaining of what type and quality it is; hence, careful inquiry should be made and, if possible, other stock in the herd from which he is to be selected should also be inspected and inquired of.

Select from large litters or strains of strong active stock, the boar you require for service a year or so ahead of the time you require his services and watch him grow and develop, and you will not regret your action. To secure the best results stock should only be selected from the very best and most reliable, healthy herds, where attention is given to careful feeding, management, and recording pedigrees or breeding.

Symmetry of Form and Evenness of Quality.

(3) Symmetry of form and evenness of quality is desirable, as also is trueness to type and good length and depth of body with wide capacious chest, strong legs and feet set on to the body in a way that suggests their capacity for carrying the animal properly when the condition is up. Fine, flat bone is preferable to the large, round coarse bone so common in some of the older strains. Other points to look for are strong muscular development with good width between the eyes and ears and continuity of width throughout the body; head to be characteristic of the type, medium, not too small or too large; eyes, bright and kindly; neck, medium length, set well into the shoulders, which should be compact and even, not heavy and coarse; ribs to be well sprung and broad; absence of a "Crease" behind the shoulders to be sought for, as this is a bad fault, sometimes referred to by pig breeders as "The Devil's Grip." This weakness should also be absent in the loins. Some pigs are very weak in this respect; the loin needs to be wide and fully fleshed, no sign of weak hollow back being allowed. The flanks must be deep and well let down (this is very important and a point too often overlooked, as a good bacon pig must be thick in the flank and belly); back to be level or slightly arched (indicating strength and robustness); the underline (belly) should be level and free from inflammatory areas or any indication of rupture or enlargements.

The quarters, both fore and hind, must be evenly developed, straight and wide. Development of the hams is one of the chief features to be looked to; they must be large, full, wide, deep, with flesh well let down on to the hocks; the legs strong, with flat fine bone, no weakness at the knees or in the region of the hocks being permitted. The pasterns should be strong and well set up, the feet neat, even, and not large or splayed.

Authentic Pedigree.

(4) An authentic and guaranteed pedigree, already registered or eligible for registration in the Herd Book is essential and is highly desirable. This pedigree should be backed up by individual excellence of the animals whose names are recorded thereon, more particularly in the near ancestry, as this is of far more importance than a lengthy pedigree in the absence of such excellency.

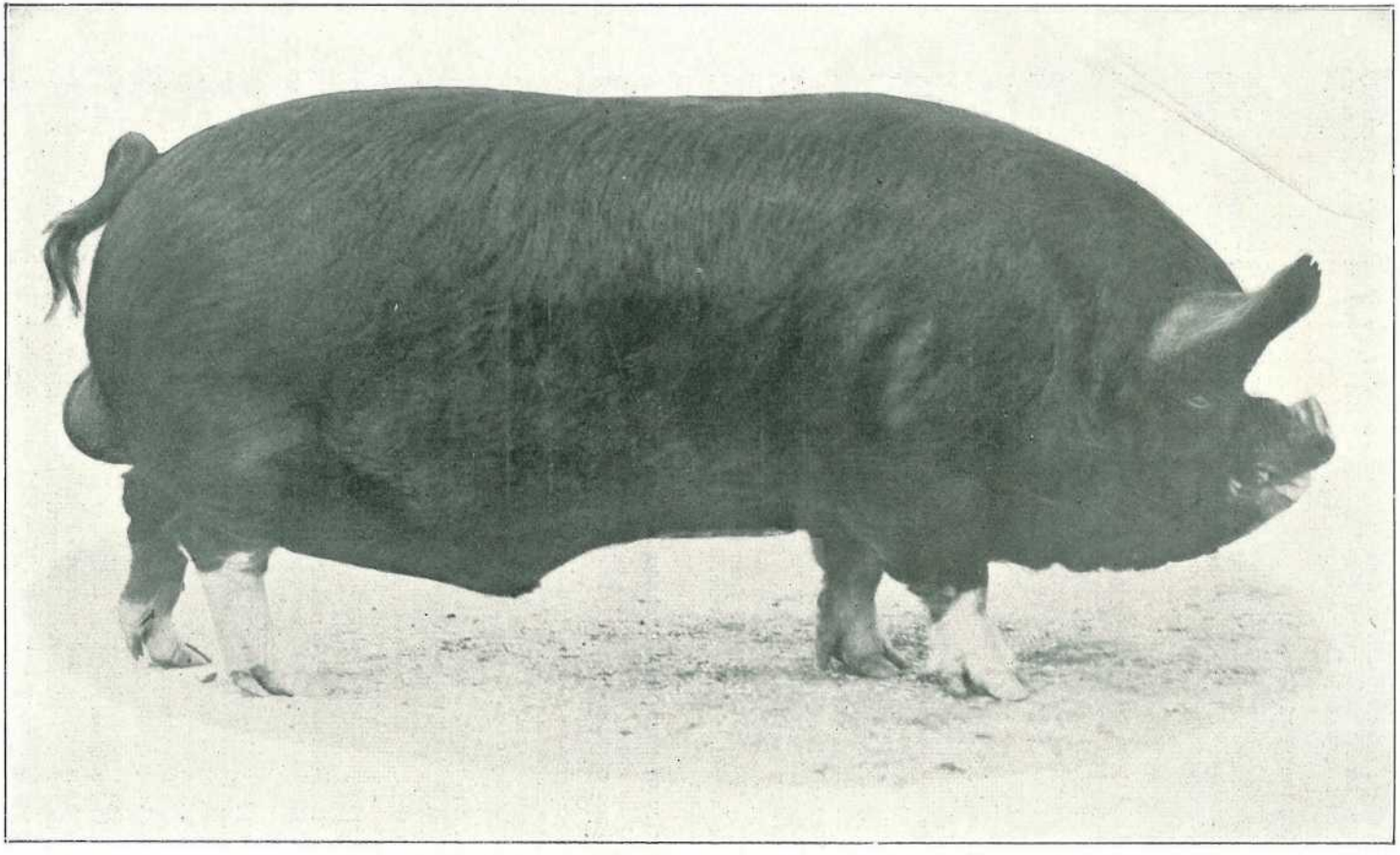


PLATE 55 (Fig. 3).—ANOTHER SUCCESSFUL STUD BERKSHIRE.

"Wilcannia Special" (3709), one of the most profitable Berkshire Boars Australia has yet produced. Owned by Mrs. E. M. Lennie, of Tongala, Victoria. This boar has not only won many championships but has produced many pigs that have been successful both at work on the farm and in the show ring. His great length and depth are his special features; they are both very valuable and desirable qualities.

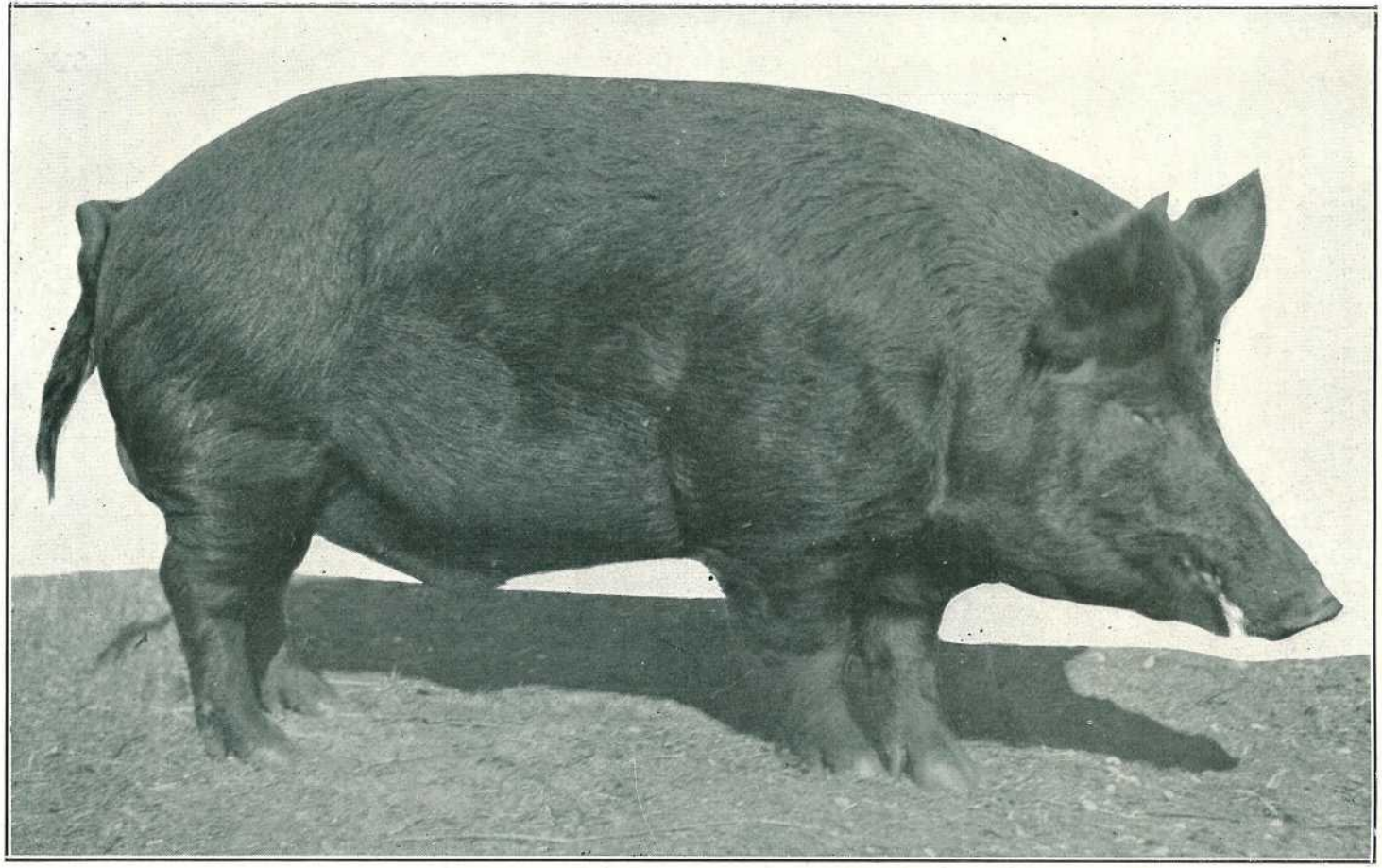


PLATE 56 (Fig. 4).—"SANDY MACQUEEN" (97).

A famous old champion winner, until recently the property of Mr. G. H. Whittaker, of the Broxburn Stud Piggery, Broxburn, via Toowoomba. "Sandy MacQueen" has left behind him more prize-winning Tamworths than any other Tamworth Boar yet produced in this portion of the world. He was constitutionally sound and of great vigour, ever active and alert. He did good service for more than ten years, yet was never pampered or overfed or otherwise incorrectly handled.

Even Disposition and Contentment.

(5) An even, gentle disposition, noted in the way in which the animal behaves himself upon the approach of farm folks or of visitors, and in his attitude generally, is also desirable. This is also indicated by a kindly eye and easy feeding disposition. A bad tempered boar with a white streak in the eye will not be long in advertising the fact that he is "Lord of the Harem."

Declaration of Health.

(6) It is a wise precaution to suggest that a Declaration or Certificate of Health should always be demanded when purchasing breeding stock. These are essential where stock are being transferred from one State to another or from one country to another. Declaration forms may be obtained from District Inspectors of Stock or from the Department of Agriculture. A simple declaration signed by vendor in every day language would be better than no declaration at all. This would not add additional cost, yet it acts as a verbal agreement that the animal and herd are and have been free from disease.

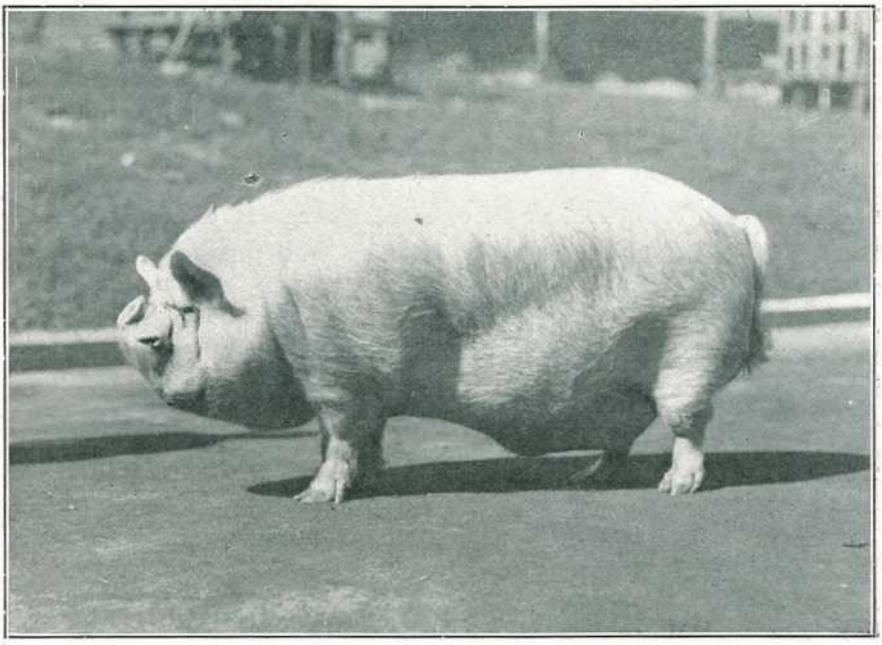


PLATE 57 (Fig. 5).—MIDDLE YORKSHIRE BOAR "DRAYTON'S CHIEF."

A prominent prize-winner owned by Mr. Ralph Joyce, of Kyabram, Victoria. A sire noted for quality, strength of constitution, and trueness to type. Note the strong yet fine bone of which his legs are composed and the length and depth of body. A typical sire of the Middle York breed.

Other Qualifications.

The boar should have a good set of embryo teats, twelve to fourteen in number, evenly placed, equi-distant along the line of the belly. As to the breed of the boar, that must be determined by local circumstances and requirements.

Compare the Strain.

When the prospective purchaser has satisfied himself that the animal he is about to buy is of guaranteed pedigree, and that the type or breed is right, he should compare the various animals in the herd that are representative of the same strain. This can, of course, best be done by inspecting on the farm the other animals from which the selected one is to be taken.

It is wise also, not only to be sure of the boar's qualifications (if such they might be called), but to see that he comes from a healthy, clean herd. In this connection one could keep an eye open to note the surroundings in which the boar

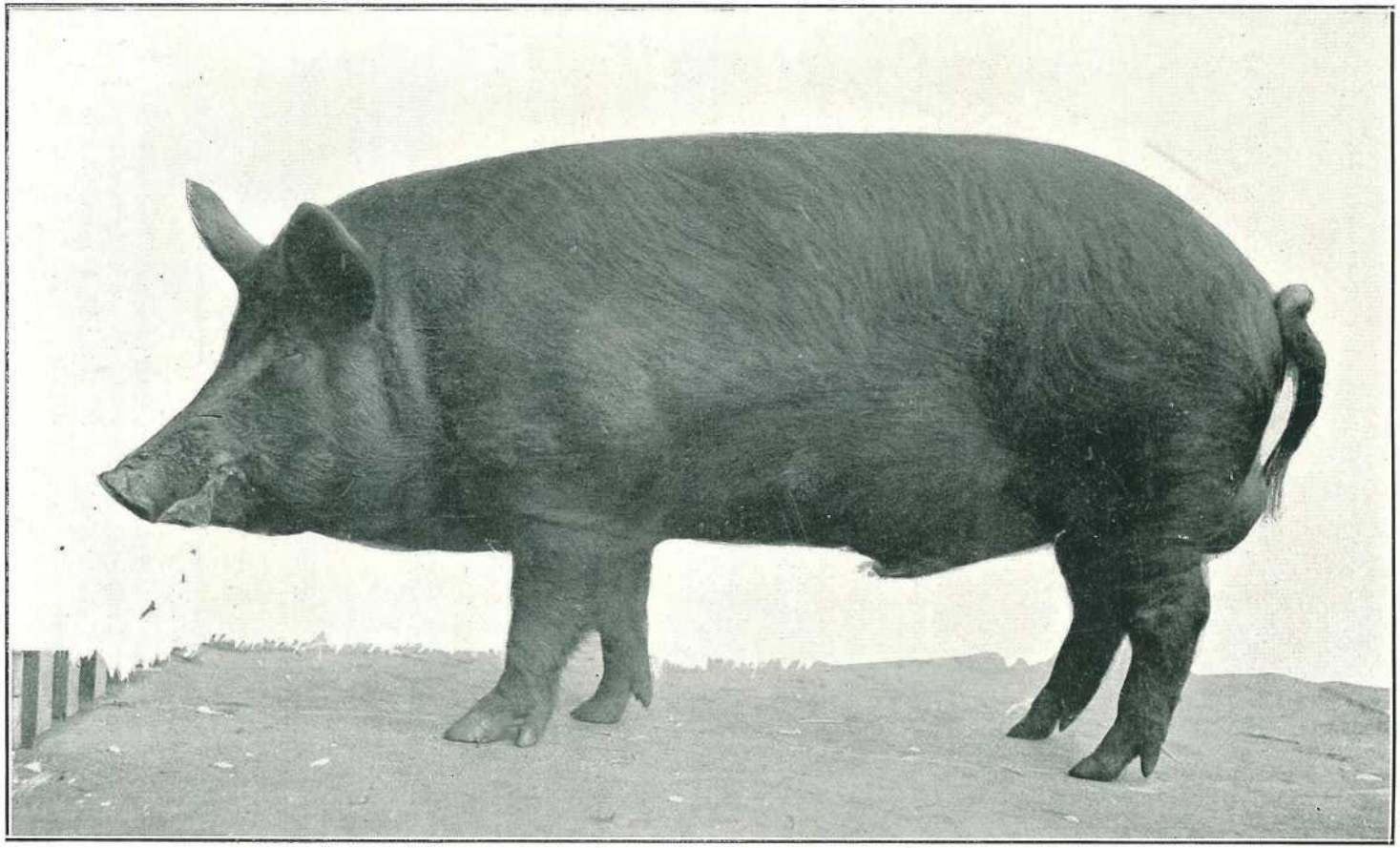


PLATE 58 (Fig. 6).—"BLAKENEY SYDNEY" (839).

A Champion Tamworth Boar, for some time the property of Mr. F. Gibbon, Macquarie Vale, Kelso, N.S.W.

This is a typical, well-developed, up-to-date Sire of the old world Tamworth breed, much in demand in these days for crossbreeding with the Berkshire for prime quality fleshy bacon pigs of the most popular type.

has been reared; ascertain also the nature of the food that the boar has been used to and how and where the pigs have been fed. Be sure to note the size of litters common in the herd. It is futile for a salesman to boast of the prolificacy of a certain strain, if, on inspection, one sees a big percentage of small, weedy litters.

The Skin and Hair.

The skin and hair are both indications of good health. Either fine or coarse breeding and good or bad health are indicated by the nature of the skin and hair. The hair should be glossy, soft, medium in length and thickness; a bristly mane is decidedly objectionable. Coarse hair shows a lack of refinement in breeding and denotes a slow-growing animal. A fine tail is an indication of refined breeding and it should be curled, not hanging limp and loose. A well-tasselled brush of clean, glossy hair on the tail adds much to an animal's appearance and value.

A distinguished carriage and a general healthy, thrifty, stylish appearance all give the animal the air of masculinity.

The genital organs are of great importance, and special attention must be paid to seeing that the animal is normal in this respect. Do not select boars showing any signs of rupture or uneven development, or an animal that shows only one gland. Note also that there is an absence of abscess formation, or malformation.

It is worth special note to remember it is possible for a boar to be permanently injured in service and to become quite useless as a breeder, hence this word of advice. It is also, of course, possible for an animal, otherwise perfect in appearance, to be sterile and useless as a sire. This, however, is the exception and by no means the rule.

Colour of the Hair.

Special note should be made of colour markings to see that these are characteristic of the breed to which the boar belongs. Improperly marked stud boars are not desirable, though colour is but a secondary consideration where the production of pork and bacon (not stud) pigs is the objective.

It is, however, to the advantage of the breeder to secure the very best value he can for the purchase price; hence, it is an advantage to have as a boar an animal "fit for the show ring." The stud breeder must place considerable store on an animal's colour markings for it is very important that colour standards should be closely observed.

Reliability.

It is certainly an advantage to secure a tried and proved animal, if possible, even though the price may be higher. Such a boar would be ready for service immediately, and could begin to repay his cost early. This is a matter largely dependent on local circumstances and capital.

Defects to Guard Against.

Points to be avoided in choosing a boar are an unduly long head, neck, and legs, as such a form indicates an animal that will require a large amount of feed to produce a pound of increase and he would be of a slow-maturing type. Weakness in the legs, pastern, and feet are bad points, indicating weak bone and constitution. Coarse, bristly hair with heavy, wrinkly skin is a fault, as also is a coarse heavy plate or shield on the shoulders.

Effeminacy or coarse masculinity are equally to be avoided. In pigs carrying some age, attention might well be given to the teeth, as occasionally "broken mouths" are a source of annoyance. The term "broken mouth" is a common one among sheep men, indicating animals with broken or overgrown or missing teeth.

HAY—STRAW—CHAFF.

By F. F. COLEMAN, Officer in Charge, Seeds, Stock Foods, and Fertilisers Investigation Branch.

Owing to many complaints received from buyers in different parts of the State, it has been necessary to take a series of samples, representing material sold at Roma Street or at other centres. A careful examination of these samples has been made, with the result that in most cases the buyers' complaints were fully justified.

Briefly, the findings were:—

(1) Excessive weight of battens on bales of hay.

(2) Excessive moisture in both hay and chaff.

(3) Poisonous weed seeds, such as *Datura* sp. (Thorn apple), *Ricinus communis* (Castor Oil plant), and in some cases leaves of prickly-pear that had been killed by some arsenical solution.

(4) An excessive amount of soil, Bathurst Burr, Noogoora Burr, Stagger Weed, Khaki Weed, and other foreign ingredients.

(5) Bags of mixed chaff and straw chaff, not marked in the prescribed form with the letters M.S or S.C.

In some cases it was found that material invoiced as HAY, principally consisted of straw, of little nutritive value. Some samples of so-called lucerne chaff consisted principally of weeds, which evidently had been chaffed to hide their identity.

The attention of producers and dealers is directed to the Stock Foods Act, which defines "Chaff" as being hay or straw cut into short lengths, and hay as any dried or cured cereal, grass, or legume cut before complete ripeness, and from which the grain or seed has not been removed; straw being defined as any dried, ripe, or mature cereal, grass, or legume from which seed or grain has been removed by any process or by any insect or by storm.

The serious attention of all concerned is therefore directed to the following extract from the legislation regulating the sale of hay, straw, chaff, grain, or seeds.

"THE STOCK FOODS ACT OF 1919."

AN ACT TO REGULATE THE SALE OF STOCK FOODS.

Sell.

"Sell" (with its derivatives) includes barter or exchange, and also includes agreeing to sell, or offering or exposing for sale, or having in possession for sale, or sending, forwarding, or delivering for or on sale, or causing, suffering, or attempting any of such acts or things.

Stock food.

"Stock food" includes hay, straw, chaff, grain, or seeds, mixed concentrated or prepared stock foods, and by-products.

DEFINITIONS OF HAY, STRAW, CHAFF, AND FOREIGN INGREDIENTS.

Hay.

"Hay"—Any dried or cured cereal, grass, or legume cut before complete ripeness and from which grain or seed has not been removed.

Hay chaff.

"Hay chaff"—Chaff consisting only of hay.

Straw.

"Straw"—Any dried, ripe, or mature cereal, grass, or legume from which seed or grain has been removed by any process or by any insect or by storm.

Straw chaff.

"Straw chaff"—Chaff made from straw.

Chaff.

"Chaff"—Hay or straw cut into short lengths.

Foreign ingredients.

"Foreign ingredients" includes—

(*a*) Any substance of whatever nature in itself deleterious to the life or health of stock;

(*b*) Any substance of whatever nature added for the purpose of fraudulently increasing the weight of the article sold; and

(*c*) All substances prescribed to be foreign ingredients in specified stock foods.

EXTRACT FROM REGULATIONS UNDER THE STOCK FOODS ACT.

3. The substances set forth in the second column of the Schedule hereunder are hereby prescribed to be "foreign ingredients" relative to the stock foods mentioned in the Act or these Regulations. The proportion or amount of such foreign ingredients which may be contained in any kind of stock food shall not exceed the proportion or amount set forth in the third column of the said Schedule opposite the name or description of such kind of stock food in the first column of the said Schedule.

SCHEDULE.

Kind of Stock Food.	Substance (Foreign Ingredients).	Proportion or Amount Allowed.
"Stock Foods"—Any kind mentioned in the Act or these Regulations	*Claviceps purpurea* (Ergot) or any substance of whatever character in itself deleterious to the life or health of stock; plants, parts of plants and seeds of *Cuscuta spp.* (Dodder), *Datura spp.* (Thorn Apple), *Ricinus communis* (Castor Oil Plant), *Jatropha spp.* (Physic Nut), *Papaver spp.* (Poppy)	None
Ditto	*Tilletia tritici* (Bunt), *Ustilago spp.* (Smut)	0·1 per cent. (one-tenth of one per cent.) by weight
Ditto ..	Any substance of whatever character added for the purpose of fraudulently increasing the weight of the stock food	None

SCHEDULE—*continued.*

Kind of Stock Food.	Substance (Foreign Ingredients).	Proportion or Amount Allowed.
Hay and chaff ..	Moisture	13 per cent. by weight
Maize	Moisture	14 per cent. by weight unless the actual amount is declared in the invoice
Grains and seeds other than maize	Moisture	13 per cent. by weight unless the actual amount is declared in the invoice
Grains and seeds (whether whole or crushed)	Any cultivated grains or seeds other other than the kinds of grains or seeds in question	5 per cent. by weight unless the amount is declared in the invoice
Ditto	Weed seeds other than those of a deleterious character	1 per cent. by weight
Hay	Any hay other than the kind of hay named in the invoice	10 per cent. by weight unless the actual amount is declared in the invoice
Straw	Any straw other than the kind of straw named in the invoice	10 per cent. by weight unless the actual amount is declared in the invoice
Chaff	Any chaff other than chaff made from the kind of hay or straw named in the invoice	10 per cent. by weight unless the actual amount is declared in the invoice

Marking on chaff bags.

7. All packages containing straw chaff or mixed chaff shall be distinctly stencilled or marked by the person in possession of the same in letters not less than two inches in length—

(*a*) In the case of straw chaff, with the letters—S.C.;

(*b*) In the case of mixed chaff, being a mixture of hay chaff and straw chaff in any proportion, with the letters—M.S.

Definitions of lucerne meal and cracked maize.

"Lucerne Meal" shall consist of the entire lucerne hay ground, without any admixture of straw or other foreign materials.

"Cracked Maize" shall consist of the whole grain coarsely crushed, and shall not be made from low-grade, or spoiled, or mouldy maize.

Penalty for offences.

11. Any person who commits a breach of these Regulations shall be liable to a penalty not exceeding twenty pounds.

Answers to Correspondents.

BOTANY.

The following replies have been selected from the outward mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Scrub Bottle Tree.

J.N.R. (Kilcoy)—

Your specimen is *Sterculia discolor*, sometimes known as the Scrub Bottle Tree. In the "scrub" it attains the size of a large-boled, soft-wood tree, but in cultivation is of a more spreading habit and is very floriferous. The tree is propagated from seeds, but I think cuttings are also worth trying. The leaf you sent is from a young tree; they change a good deal from this on the larger trees. The seed pods you sent contained several good seeds.

"Tamaran"—Bald or Swamp Cypress.

J.G.A. (Southport)—

Cupania anacardioides is a native tree fairly common about Southport. It is sometimes know as "Tamaran," but for the main part it has no local name. It often grows in small coastal scrubs, such as Myers' Ferry and Roe's Camp. Planted, it makes a good shade or street tree for seaside localities.

Taxodium distichum is the Bald Cypress or Swamp Cypress, a native of the warmer parts of the United States. In the swamps of Florida the trees produce the well known "Cypress Knees" you may have read about. In ordinary soil the knees are absent and in cultivation the tree makes quite good growth and is of very distinctive appearance.

A list of Queensland trees would be rather a lengthy one. Unfortunately, F. M. Bailey's little book on "Queensland Timbers" is out of print. The Provisional Forestry Board might have a copy available of their Bulletin No. 2, "Principal Commercial Timbers of Queensland." It lists all the trees the timbers of which are cut at the various mills.

"The Wheel of Fire."

H.J. (Brisbane)—

The leaves from Mount Mee, sent by you for identification, belong to *Stenocarpus sinuatus*, the "Wheel of Fire," one of the most beautiful of our native flowering trees. It belongs to the silky oak family and possesses a white wood with a quiet silky oak figure. Sometimes in the adult trees the leaves are quite undivided.

Plants from North Queensland.

N.P. (Townsville, N.Q.)—

1. *Lyonsia eucalyptifolia.* A vine with a variable reputation. It has been recorded as a fodder and a poisonous plant.
2. *Atalaya hemiglauca.* White Wood. This tree has attracted some notice in connection with the "walk-about" trouble, being blamed by one authority as the cause.
3. *Pittosporum phillyræoides.* Cattle Bush.
4. *Santalum lanceolatum.* Sandalwood (true).
5. *Acacia sentis.*
6. Mixed material of *Eremophila longifolia* (?), *Berrigan,* and *Pittosporum phillyræoides.*
7. *Cassia oligophylla.*
8. *Canthium oleifolium.*
9. *Denhamia obscura.* Called "Wild Orange" in parts of North Queensland.
10. *Capparis lasiantha.* Mulpup. Produces an edible fruit.
11. *Salsola Kali.* Russian Thistle. A "Roly Poly."
12. *Denhamia obscura.* A "Wild Orange."

Wild Lime.

R.W. (Biloela)—

We have no doubt the plant you refer to is *Eremocitrus glauca*, commonly known as the Wild Lime. It produces small berries about twice the size of a pea, largely used for making drinks.

1. The tree grows to a height of about 15 feet, or perhaps more in favourable situations.
2. When ripe? —About November.
3. Can the seeds be used for planting?—Yes.
4. How long would it be before full size?—No information on this point, but the tree is slow-growing. It fruits, however, before full grown.
5. What the plant looks like when 4 to 6 feet high?—A thorny bush, often of straggling growth.

A Nut Grass Enemy.

R.F.C. (Ayr)—

The Chief Entomologist, Mr. R. Veitch, advises that the nut grass enemy you refer to is a species of moth introduced to Hawaii in recent years. The information available regarding its progress in Hawaii does not indicate that it has achieved any marked measure of success. Under the circumstances, Mr. Veitch is of the opinion that it would be unwise to consider the importation of this insect until such time as definite proof of its beneficial activities is available. Even then, the dangers inseparable from the ordinary plant-feeding insect introductions would require very careful consideration before any steps could be taken to introduce it to Australia.

Introduced Grasses in Inland Areas.

F.P. (Dirranbandi)—

The Director of Agriculture, Mr. H. C. Quodling, advises that it is certain that the price is probably too high to admit of giving practical effect to your idea of resuscitating natural grass pastures. Something might be done with limited quantities of grass seed sown on small netted-in nursery areas for the purpose of collecting the resultant seed to gradually bring about a better distribution through your paddocks of the better and more favourably known varieties. It is not to be expected that country, which has suffered to such an extent as yours has, will recover rapidly unless there are fair quantities of grass and herbage seeds lying dormant in the soil. If it is possible to spell paddocks and allow for reseeding of the grass, the carrying capacity of the country will be gradually improved. There are few introduced grasses which will stand up to the conditions common to the more inland parts of the State. One grass which may give satisfactory results is Rhodes grass, the seed of which is procurable from almost any seedsman. This grass has the capacity to spread by throwing procumbent stems which, under good growing conditions, root from the joints. It is not, however, a good winter grass, although once established it will provide a fair amount of seed until heavy frosts occur, and will restart into growth during the following spring or early summer. If sown in paddocks it can be reserved. Three to four lb. of seed per acre would provide a fairly good dressing, but for a more even distribution the seed should be mixed with damp sawdust merely as a distributing agency. If the surface is naturally bare of any vegetation cultivation should not be necessary. Grass seed could be sown in the spring. Brush harrows will provide sufficient covering for the seed, or if so desired, the ground might be harrowed if such is practicable after the sowing of the seed. Any seedsman should be able to quote you for Rhodes grass seed, but it would be as well to inquire as to its percentage of germination by Departmental test.

Another method which may be worthy of attention is the sowing down of appreciably sized areas in the paddocks with wheat or barley. To effect this little or no cultivation would be required on soil which has been subjected to dry conditions. A quick-maturing variety of wheat like "Florence" can be sown up to, say, the first week in August. A similar method could be applied in the case of a summer-growing fodder like Soudan grass, and it could be sown any time from September right up to

the end of January, providing sufficient rain is experienced. Ordinarily, it would require about 6 lb. of seed per acre when sown thinly in drills spaced 14 inches apart. Soudan grass is particularly hardy and will provide a lot of grazing for sheep. Being a sorghum it may contain a poisonous principle, hydro-cyanic acid, in its young stages, but if sheep are put on to feed of this sort when their stomachs are fairly full and gradually accustomed to the change of diet, there should be little danger of loss on this account. On parts of the Downs, Soudan grass is used to a considerable extent and is grazed off at all stages of growth, but once stock are introduced to the pasture it is customary to give them regular access to it.

Plants from Central Queensland Identified.

G.F. (Clermont)—

A.G. 1. *Eragrostis leptostachya.* A Love Grass. The Love grasses are, on the whole, useful grasses in the mixed native pasture.

2. *Pappophorum nigricans.* White Heads. A very common grass in Central Queensland of no particular fodder value.

A. 1. *Eriochloa punctata.* Early Spring Grass or Dairy Grass.

2. *Cynodon tenellus.*

3. *Andropogon sericeus.* Blue Grass.

4. *Cynodon tenellus.*

5. *Arthraxon ciliare.*

6. *Cyperus rotundus.* Nut Grass.

7. *Andropogon sericeus.* Blue Grass.

A.A. 1. *Tritaphis mollis.* Purple Heads.

2. *Aristida calycina.* A 3-awned or 3-pronged Spear Grass.

3. *Pappophorum nigricans.* White Heads.

B.B. 1. *Crotalaria juncea.* A species of "Rattlepod."

2. *Adriana acerifolia.* Herbaceous shrub, said to be liked by stock.

3. *Phyllanthus simplex.*

4. *Cucumis* sp. Wild Melon. Fruits required to determine the species.

5. *Ipomœa heterophylla.*

6. *Spermacoce* sp.

7. *Pimelea hæmatostachya.* Often called Native Poppy; reputed poisonous, but not usually eaten to any extent. No definite feeding tests have been carried out with it.

8. *Wedelia spilanthoides.*

9. *Rhynchosia minima.* A useful native leguminous fodder. I do not know a common name.

10. *Phaseolus Mungo.* Mung Bean.

11. *Ipomœa reptans.* Said to be a good fodder; a native vine of the Convolvulus or Morning Glory family, allied to the Sweet Potato.

12. *Corchorus trilocularis.*

13. *Sida corrugata.*

14. *Bœrhaavia diffusa.* Tar Vine or Sticky Weed. Reputed good feed.

B. 1. *Pratia erecta.* Milkweed. This plant has been suspected of poisoning sheep at various times. No definite feeding tests have been carried out with it, but it belongs to a dangerous group of plants—the Campanulaceæ.

2. *Polygala arvensis.*

3. *Rhynchosia minima.* Both specimens belong to this species. The plant is rather a good native leguminous fodder.

B.M. 1. *Enchylæna tomentosa.* A plant of the salt-bush family—eaten by stock in dry times.

2. *Trichinium exaltatum.*

B.G. 1. *Cassia occidentalis.* Coffee Senna. This plant has been accused of poisoning stock, but feeding tests showed to simply act as a purgative. As "senna leaves" of commeree, are the product of several species of Cassia this might have been expected. The plant is a native of Tropical America, and only occurs here as a naturalised alien. The local name "Coffee Senna" refers to the fact that the seeds have been used to adulterate coffee.

C. 3. *Salsola Kali.* One of the plants commonly known in Queensland as Roly Poly. It has a wide distribution over the sub-tropical and warm temperate regions of the globe. In America it popularly goes under the name of Russian Thistle, and is regarded as rather a bad weed. It is very common in Queensland; stock seem rather fond of the flowering and fruiting tips of the branchlets, and these probably have a fair nutritive value.

The Indigo Plant.

A.C. (Yelarbon)—

The plant sent is in leaf only, bearing no flowers or pods, but we think it belongs to *Swainsonia lutcola*, a species of "Indigo." This particular species has been proved poisonous by definite feeding tests. Sheep poisoned by this plant have a staring, dull look in the eyes, and keep their necks fixed and high. They become thin and the wool becomes hard and dry looking. Taken off the Swainsona, however, they often recover.

SITES FOR FARM BUILDINGS—IMPORTANT CONSIDERATIONS.

A very considerable proportion of disease and mortality can be more or less directly traced to errors in constructing the buildings in which animals live all or part of their time. Although for each kind of animal different considerations carry weight, yet there are certain principles common to the proper construction of all buildings intended to house stock. Primary considerations are those of site and aspect.

In selecting the site for stables, cowsheds, and pig and calf pens, some freedom of choice is generally offered to the farmer. These structures should not be placed on low-lying swampy ground or on ground liable to be flooded, or they will always be damp and probably associated with chills and rheumatism, while the animals, having to expend so much of their food in maintaining bodily warmth, will not thrive so well as those in drier and better situated buildings.

Buildings are better on higher land, which can more readily be drained. It is also desirable to take into consideration the dryness of the soil. A shallow soil with a clay subsoil, for example, is not the most suitable, and alluvial flats and "made" soils are unsuitable places on which to place buildings for stock.

This is often important—partly in relation to its effect on the health of stock and partly because it affects the comfort, not only of the animals but of those working among them. Whenever possible, in most parts of this State, a southerly or westerly aspect should be avoided and shelter from the south and west secured. Despite the great heat of summer in many parts of the State, more loss is certainly occasioned by the cold of winter, and anything in the housing of stock that tends to protect them from southerly and westerly winds is of advantage. Continued exposure to cold westerlies when the animals are confined in small pens which prevent them exercising themselves will rapidly lower their vitality and disease-resisting power, especially in the case of young stock, and will retard their development by forcing them to devote so much of their food toward the maintenance of temperature. In like manner, the sudden changes of temperature which occur with southerly winds and winter storms are liable to produce catarrh and pneumonia in all classes of stock exposed to them, particularly when such exposure follows recent shearing or clipping, detrucking after a long railway journey, sudden release from close confinement in a hot atmosphere, or overheating from some other cause. After sudden falls in temperature or cold rain, semi-starvation often leads to heavy losses. Penned animals have no chance of taking advantage of shelter afforded by the ground and suffer accordingly.

The selection of an easterly, north-easterly, or northerly aspect has the further advantage of catching the morning sun in winter and allowing sunlight to enter freely into buildings all the year round. The top of a ridge is never a good place for housing stock or placing cow-bails; on such a site the buildings are exposed to all the winds that blow.

General Notes.

Australian Dairy Breed—Question of Name.

Mr. R. S. Maynard, of the Illawarra Milking Shorthorn Society of Australia, writes—Breeders of that great Australian breed of dairy cattle known by two names, as Illawarra Milking Shorthorn and, until recently, Milking Shorthorn, but now Australian Milking Shorthorn, have come together on all except name. What shall it be?

The I.M.S. men say that the breed is an Australian breed, equal to any dairy breed in the world; that all Australians should be proud of it, anxious to let the world know its origin and how it was evolved by the pioneers of Illawarra a century or so ago. They want to give the breed a name which will indicate clearly that it is a distinct breed, and they wish the name of Australian Illawarra Shorthorn.

The A.M.S. men, on the other hand, while equally proud of the fact that it is a distinct breed, and of its great achievements, want to persist in giving it the name of an overseas breed which has never had much of a reputation as a dairy breed. They want the name of Australian Milking Shorthorn.

Now, the contention of the I.M.S. men is that the name of Australian Milking Shorthorn is misleading and confusing to breeders in other countries, for it means something different to what it appears to mean, that it is derogatory to our high producing cattle, bad from a business point of view.

What advantages do the A.M.S. men think will come to breeders by adopting this other breed's name? This is what has to be considered between now and Easter when the conference is to be resumed. Why call the cattle Milking Shorthorns when it has been agreed between the parties that Milking Shorthorns (or Dairy Shorthorns as thy are called in England) shall not be eligible for registration in the new Amalgamated Herd Book? Why call them Milking Shorthorns when there is hardly a man amongst the advocates of the name who would use a Milking Shorthorn bull in his herd if you imported one and gave it to him?

Why not end all the confusion and argument of the past fifteen or more years, now that we have the opportunity of starting afresh, by giving the breed a name that will not be confused with any other lesser breed?

Staff Changes and Appointments.

The following officers of the Sugar Experiment Stations have, in addition to their original appointments, been appointed inspectors under and for the purposes of the Diseases in Plants Acts:—

E. Jarvis, Entomologist; R. W. Mungomery, Assistant Entomolcgist; J. H. Buzacott, Assistant to Entomologist; W. A. McDougall, Cadet Student; F. Keogh, Chemist in Charge; E. J. R. Barke, Chemist in Charge; G. Wilson, Cadet Student; and A. P. Gibson, Field Assistant.

Mr. T. E. Tuck, inspector of Slaughterhouses, Coolangatta, has also been appointed inspector under the Diseases in Plants Acts.

Mr. H. J. Cole, greenkeeper of the Yeerongpilly Golf Links has been appointed an officer under and for the purposes of the Animals and Birds Acts.

The Mining Warden and Police Magistrate, Charters Towers, has been appointed Government representative on the Dalrymple Dingo Board.

Constable R. Askin, Bedourie, Constable A. McSween, Marlborough, Mr. H. J. Walker, Stock Assistant, and Mr. P. J. Short, Stock Inspector, have been appointed inspectors of Slaughterhouses.

Mr. J. J. McLachlan of Annerley, South Brisbane, has been appointed Inspector of Poultry.

Constable T. R. Herman, Jericho, has been appointed Inspector of Slaughterhouses.

The Officers in Charge of Police of Millmerran and Mma-den have been appointed Acting Inspectors of Stock.

Messrs. C. S. Shaw and E. Bloomer of Redland Bay have been appointed Officers under and for the purposes of the Animals and Birds Acts.

The resignation of Mr. F. Bostock, Assistant Instructor in Pig Raising, has been accepted as from 20th January, 1928, as tendered. Mr. Bostock has secured the position of Instructor in Pig Raising at the Hawkesbury Agricultural College, New South Wales.

The Value of Top-dressing Pastures.

Excellent results have followed the top-dressing of native grass lands on Goonambil Station, near Urana (N.S.W.), and are regarded as proving definitely that this method of pasture improvement can be applied profitably to light-carrying country in localities of comparatively limited rainfall. Goonambil, the property of Messrs. W. A. Macpherson and Son, lies a few miles south-west of Urana. The rainfall records at Urana over a period of fifty years average 1,715 points annually. At Goonambil the average would be about the same.

In top-dressing, superphosphate was applied during March, 1926, at the rate of 112 lb. an acre, 1,000 acres of a paddock of 1,700 acres being treated. This particular paddock was chosen, as being of a low stock-carrying standard, when compared with some of the rich black plains on the holding. From March to December 1,421 points of rain fell, and from January to May last, inclusive, a further 312 points was recorded on the station. Normally this paddock, known as the island, was rated as being able to carry one sheep to two acres. After the shearing, from September last this 1,700-acre paddock has maintained 2,000 dry two-tooth ewes, and from that date to the end of May the total rainfall recorded was 834 points. These ewes are now in good order and condition and equal to, if not better than, any other stock on the estate.

The manager (Mr. R. Macpherson) said that the results from the application of super. were better than he thought possible. He intended to extend this work on the lighter-carrying section of the property. On the other hand, he was of the opinion that the heavy-carrying lands on Goonambil, with Merino sheep as the primary objective, carried on the average all the feed necessary for such sheep. Had he a small holding, and if he were going in for crossbred sheep and fat lambs, he would not hesitate systematically to top-dress every acre of his grazing land, irrespective of its natural richness.

Obituary.

A wide circle of friends throughout Queensland will learn with deep regret of the death of Mr. John Payne, M.L.A. for Mitchell, and one of the pioneers of the Labour movement in Queensland, who passed away at a private hospital in Brisbane on 14th January, after a long illness.

The late Mr. Payne was born in Spring Valley, Goulburn, New South Wales, on 9th November, 1860. He was educated at public and private schools. Coming to Queensland in 1882, he worked as a shearer and general bushworker, and occasionally at mining, until 1885, when he started a business as blacksmith and wheelwright at Arrilalah. There he remained only one year. After spending about a year at Croydon, he resumed shearing, and was engaged on the Flinders, Barcoo, and Thompson till 1890. In October, 1891, he started business as a blacksmith and wheelwright in Longreach, and this he carried on for about four years. He was returned as a Labour member for the Mitchell at a by-election in 1905, and represented the Mitchell electorate continuously thereafter. On many occasions Mr. Payne was unopposed. For over twenty years he was trustee of the Australian Workers' Union branch at Longreach. For some years he had been a member of the Public Works Commission and chairman of that body. He possessed a wide knowledge of land matters, and any of his speeches on the land question in the House were always worthy of attention. His prominent association with industrial matters gave him a solid grasp of questions pertaining to labour and industry. Of a cheerful and breezy temperament, Mr. Payne was a popular figure in the House, and in every sense a big Australian. His favourite seat was on the front cross-bench with Mr. E. M. Land, M.L.A., another pioneer who has passed the Great Divide. Mr. Payne was an ardent worker, and was scrupulous in his attendance to the requests of his large constituency, which had an area of 28,000 square miles. He was a student and deep thinker, and his work earned for him widespread affection and appreciation.

Sugar Levy.

Regulations have been approved under the Primary Producers' Organisation and Marketing Act, to provide for a further levy of one farthing per ton of cane supplied to sugar mills, for the purpose of augmenting the Canegrowers' Defence Fund. Provision is made, however, for a poll to be taken before the levy is made, and if at least 100 growers of sugar-cane make, in writing, before the 21st February, 1928, a request for a poll on the subject, a poll will be held.

Mill Suppliers' Committees—Appointment of Deputy.

A further Regulation has been approved under the Primary Producers' Organisation and Marketing Act providing for the appointment of a deputy in the case of absence of a member from a meeting of a Sugar Mill Suppliers' Committee or District Canegrowers' Executive. In the case of a Mill Suppliers' Committee, the deputy must be a bona fide cane supplier to the particular mill represented by that committee, and in the case of a District Canegrowers' Executive, any other member of the Mill Suppliers' Committee of which the absent member is a member.

School of Instruction in Pig Raising.

Arrangements are being made between the Queensland Department of Agriculture and Stock and the Department of Public Instruction for a School of Instruction in Pig Raising to be conducted at the Queensland Agricultural High School and College (Gatton College). The course will cover two weeks, from 25th June to 8th July, 1928, inclusive, and will be open to farmers and to young men interested in the pig industry, and will be of immense practical value in focussing attention on improved methods of breeding, feeding, management, accommodation, and marketing of both market and stud pigs. A further announcement will be made in our next issue in regard to fees, and to the nature of the various lectures, demonstrations, and practical talks, as well as to the evening lectures, cinema, and social aspect.

Chilled Meat from Australia.

The Minister for Agriculture, Mr. W. Forgan Smith, informed the Press recently that some months ago the Government had arranged to grant ½d. per lb. up to £150 on a consignment of beef to be treated by the Perfect Food Process Pty., Ltd., prior to shipment, and on the understanding that the profits, if any, on the consignment, were to go to the growers of the beef.

Pursuant to this arrangement, a shipment of 150 hindquarters and fifty crops of beef were loaded on to the "Port Huon," which left Brisbane on the 1st September and arrived at Hull on the 19th October.

The meat was unloaded and distributed at Hull. Sixty hinds and thirty-five crops being despatched to the Smithfield Market, London, the remainder being retained and sold in the Manchester and Leeds districts. The meat despatched to the Smithfield Market was inspected by the Agent-General and others, and although the quality was not all that could be desired, it was agreed by those interested that the consignment had carried remarkably well, and as chilled meat it compared favourably with, although somewhat below, the usual quality of Argentine beef. The hindquarters required practically no trimming or wiping and were free from mould. The appearance of the crops was almost equally good.

The engineer who had charge of the "Port Huon" consignment is of the opinion that the problem of shipping chilled meat from Australia to Great Britain has been solved. Assuming this to be so, there are, however, two other equally important problems still to be dealt with, namely, (*a*) regular supplies, and (*b*) uniform quality.

The shipping freight for chilled meat is somewhat higher than that demanded for frozen consignments. The chilled article, however, will always find a ready market whereas the frozen meat frequently remains unsaleable for varying periods.

The average prices obtained on the whole shipment were as follow. The comparative Argentine prices of that date are also given:—

	Queensland.	Argentine.
Hinds	5 1/16d. per lb.	5 3/4d. per lb.
Crops	3.53d. per lb.	4d. per lb.

Had this particular consignment consisted of frozen meat, it is doubtful whether it would have been possible to dispose of it promptly upon its being placed on the Smithfield market.

The Cow and the Plough.

If the Australian dairy cow is to have her wants supplied, her owner must use the plough to a much greater extent than at present. If he finds that the situation can be met by growing a succession of fodder crops there should be no great need to conserve fodder as silage; but in times of drought, though they may hold out longer than the pastures, the crops, too, may fail, and it is safer to have a reserve.

Although some parts of our coastal districts are amongst the very best in the world from a dairying point of view, our average yield of milk and butter-fat is often low in comparison with that of other countries, largely owing to the periods of semi-starvation through which the majority of the cows have to pass all too frequently. Because of the geniality of the climate and the abundance of succulent pastures in good seasons, insufficient preparation is made for dry spells. Some dairy-farmers have found it profitable to hand-feed their milking-cows whenever the pastures go off, and when a really dry time comes these men certainly score if they have a sufficient reserve to see them through. If it were the general practice, and more attention were paid to breeding for high production, the average yield of butter-fat per cow could be increased 50 per cent. in the next ten years. The desired change may come about through the multiplication of herd-testing societies; for, if the records of the herds were published, the owners would see to it that their own particular herds were well looked after in the matter of feeding.

It is rather a reflection on our average dairy cow that Melba XV. of Darbalara gave, in the eleventh month of her lactation period, a greater quantity of butter-fat than the average cow does in a year.

The average cow might quite reasonably reply that she was not allowed to choose her parents, and that her owner is less generous as to her diet than the breeder of the champion mentioned, and less punctilious as to her general care.

Causes of Inferior Cream—Careless Washing of Utensils.

In a large percentage of the cases where inferior cream is supplied to factories, the trouble, when investigated, is found to be caused by faulty methods of washing the utensils. Often it is found that warm water only is used for washing purposes, and that the separator parts and utensils are left with a greasy surface, which, when exposed to the heat of the day, often produces a tallowy smell, and immediately affects the cream at the next separation. To remedy this fault all separator parts and utensils should be washed in cold or luke-warm water, then again in hot water that contains a quantity of washing soda, and finally, they should be rinsed by being plunged into a can of boiling water or placed in a vat in which the boiling water is poured over them. It is essential that the water be boiling, for not only is the germ life then destroyed, but the utensils dry almost immediately, and the liability of rust formation is lessened.

Where the same lot of boiling water is used for several cans in succession, there is a very rapid loss in temperature. In an American experiment on this point, when 6 quarts of water at 210 deg. Fah. was used to scald or rinse four 10-gallon churns in succession, the water was found to be only 138 deg. Fah. after the fourth churn. In some English experiments, boiling water was carried as quickly as possible from an ordinary farm copper to the churns, which were nearly 20 yards away, and records of the temperature showed that the water lost from 11 to 17 deg. Fah. during the time that it was being carried from the copper to the churns. These instances are quoted merely to show how important it is to make certain that the water is at boiling point when used—it is not sufficient to know that it was at boiling point some little time before being used.

In quite a number of cases where milking machines are used, trouble is caused by insufficient attention being given to cleanliness. Very often it is found that the milk rubbers contain on the inside surface a coating of stale, cheesy milk, which results in the immediate contamination of the warm fresh milk as it passes through the vat at the next milking. Sometimes the trouble is caused by neglect to dismantle the vacuum tank. To avoid trouble with machines they should have pumped through them after each milking (1) cold or luke-warm water, (2) hot water to which has been added a tablespoonful of caustic soda to every 4 gallons of water, and (3) boiling water. After each milking the vacuum tank should be dismantled and washed.

Badly-tinned vessels, such as benzine tins, often result in a metallic flavour being imparted to the cream; and the faulty placing of the exhaust outlet from the engines, so that fumes come back through the open door or window, are other frequent causes of inferior cream, the remedies for which are obvious.

Maize Storage—Southern Trials.

The New South Wales Department of Agriculture has undertaken to try out the storage of maize in galvanised iron silos on various State Experiment Farms, particularly on the North Coast of that State, where weevil infection does enormous damage to the grain. Experiments are also to be conducted in treating seed maize with dry copper carbonate to determine the resistance of the grain to weevil infestation.

In indicating this forward move to the Press, Mr. A. H. E. McDonald, Director of Agriculture in New South Wales, emphasised that the department already had proved that maize storage in iron tanks was a safe and payable proposition if carried out on the lines that were advocated. As a matter of fact, maize stored on Trangie farm in an iron tank had kept sound for a couple of years. The trials that will now be made, however, will afford more advice and convincing proof of the value of maize storage, especially if undertaken on the North Coast, where the bulk of the State's maize is grown, and where the weevil menace is so troublesome.

Referring to the fact that maize, when stored in watertight tanks, did not become weevil infested, Mr. McDonald said this probably was due to the generation of natural gases given off by the maize, and apparently these gases prevented the development of the weevils. In the trials to be made, tanks will be filled with shelled maize, and the grain will be left undisturbed for two years.

The economic aspects of maize storage enter very largely into the questions that the trials are intended to demonstrate beyond the shadow of a doubt. For, if the coastal growers can successfully store maize, they will not only protect the grain from weevil infection, but they will no longer be forced to sell at unprofitable prices. Thus maize storage is a question vital to the progress of the maize-growing industry.

Colic in Horses—Common Causes.

Perhaps the commonest cause of colic is giving horses food to which they are not accustomed. A sound physiological reason exists for not doing this. It has been proved that the character of the food influences the quantity and quality of the gastric and pancreatic juices. A definite and constant diet produces juices capable of digesting it, but utterly incapable of dealing with sudden changes of food. Under proper conditions, no food will cause colic, although some (as for example, wheat and barley) are more indigestible than others; but many foods will do so if given in excess, or at the wrong time, such as giving lucerne to a horse that has been starved for a time. Horses can be made to exist on practically any food that is digestible, provided they are gradually accustomed to it; but to give a horse a full feed of, say, maize, if he has never had the grain before, is to invite digestive troubles that may cause death. Again, grass-fed horses suddenly put on to dry feed on being taken on a long journey get colic, owing to the sudden change of food.

If you wish to avoid colic, give food at regular intervals, and see that the food is of good quality and of proved dietetic value. Mouldy corn, damaged oats, or musty hay, very often produce colic, while proprietary foods of unknown composition, and frequently of doubtful feeding value also, often do a great deal of harm. Do not give green forage in an immature, fermented, or over-ripe condition.

Bran mixed with maize is a favourite food, but it is much too laxative for a horse in work, and is a frequent cause of an attack of colic.

Do not give large quantities of bran to a working horse. Bran is a good food to maintain the contents of the bowels in a soft condition, and to keep them acting, especially during periods of rest; but its nutritive value is practically nil owing to all the flour having been extracted from it.

Do not suddenly alter the amount of food given. It is a common practice to have horses fed up for a day or two prior to severe work, and this causes much intestinal trouble, such as stomach staggers.

Never forget that young horses cannot digest as much corn as old ones. Horses when rested, even for a day or two, should have their food, especially corn, reduced. Failure to do this is the cause of much colic.

Another common cause of repeated slight attacks of colic, especially with working horses on farms, is the dry, rough, coarse, and indigestible nature of the herbage found in many paddocks. Too much coarse food prevents digestion by reason of its irritative effect on the stomach. A certain amount of bulky fodder increases the digestibility of the more concentrated foods, such as oats, but too great a quantity of such food greatly weakens the power to digest.

Ants in the Beehive.

Although the little black ant rarely disturbs a colony of bees to any extent, it is as well to have them removed if they are inside the hive. The ants should be brushed out, the hive set up on pegs, and a tarred rag wound around each peg to prevent their re-entry. For the destruction of these ants in their nests when on the ground, mix 1 oz. borax and ½ lb. sugar boiled for three minutes in sufficient water to produce the consistency of thin honey. Small quantities of this mixture can be placed anywhere in the track of the ants, and they will generally disappear, as it appears to act as a poison to the young. The bees will not take the mixture, owing, it is believed, to its being repellent to their taste.

Honey-yielding Trees.

There are considered to be thousands of species of flowering plants which are of assistance to the apiarist, but the value of only a proportion of these has so far been determined. The following list is taken from the Farmers' Bulletin, No. 129 (The Beginner in Bee Culture), issued by the New South Wales Department of Agriculture, and contains the names of trees and plants that have been definitely proved to be of value to the apiarist:—

For Inland Districts.—Yellow box, white box, red box, red gum, white gum, sugar gum, stringybark, apple box, peppermint, and wollybutt, all of which are eucalypts. Other useful trees, plants, and scrubs are tree lucerne, black thistle, pepper tree, Cootamundra wattle, golden wattle, silver wattle, blackberry, fruit trees of all kinds, Cape weed, clover, lucerne, maize, and pumpkin vines.

For Coastal Districts.—Grey ironbark, broadleaf ironbark, grey gum, spotted gum, white gum, flooded gum, swamp mahogany, red mahogany, bloodwood, and tallow wood are the best of the eucalypts. Other trees, plants, and shrubs include silky oak, tea-trees, orange trees, clematis, maize, pumpkin vines, clover, black thistle, wattles, and dandelion.

Fodder Trees.

Some of the best of our fodder trees will grow on a variety of soils and under varying conditions. Although a number of them—particularly the kurrajong—is a slow grower, growth may be accelerated somewhat by cultivation, and it will be found that any additional care given in this direction is amply repaid by the production of a bulk of very valuable fodder, amounting to many tons per acre. Not only are such trees as the wilga, myall, mulga, and others valuable for the fodder they produce, but they are also useful for shade and shelter, although it is wise to depend on other trees for shade and shelter, as fodder trees when lopped cease to be useful as shelter trees, and this at a time when shade is urgently required, i.e., during droughty periods.

Dry years are so regular in their occurrence in parts of the State that it is only common sense to give some attention and care to these trees that nature has so thoughtfully provided as a standby when pastures are scanty. Apart from the conservation of existing trees, there is much to be gained by sowing plantations of the best fodder trees. The labour involved in starting a plantation is not great, the chief items being the preparation of the ground and protection of the young trees from stock by a permanent fence. In certain parts where conditions are very unfavourable towards tree growth, the failure of planted trees may prove disappointing, but in such districts only those species which occur naturally in the surrounding country should be planted, together with some species which have proved their hardiness.

Lopping necessitates a certain amount of care and labour, but any trouble taken is amply repaid by conserving intact the source of supply for future years. Many of the native fodder trees will stand fairly heavy lopping, but the degrees of severity varies with different species. Some trees require two or three good leaders to be left uncut, whereas other species will stand a general pruning. Cuts should be made as cleanly as possible, in order to prevent undue injury to the tree and the subsequent entry of fungus and insect enemies. Lopping can also be made a method of improving the shape of the tree and increasing its future yields of leafy material.

Another point of importance when lopping is to cut from a number of different fodder trees at the same time so that the stock will get something in the nature of a mixed ration. If fed solely on one species, and where there is no succulent feed to be had, the animals frequently suffer from constipation and impaction. The following lick is recommended for stock that are being fed on scrub:—Epsom salts 5 to 15 per cent. bonemeal 5 per cent., and the balance Liverpool salt. If available, molasses may be added to increase the palatability of the lick.

The Slaughtering Act—Additional Regulation.

An additional Regulation has been approved under the Slaughtering Act providing that, when an inspector is satisfied that any stock is in a diseased or moribund condition or that its flesh is unfit for the food of man, he shall condemn the same and order the owner to destroy same by such method as the inspector may direct. If the owner fails to observe such direction he shall be guilty of an offence and the inspector may, at the expense of the owner, do all things necessary for the disposal of such stock or flesh.

Butter Fat and Butter.

Some dairy farmers who submit their cows for testing experience some little difficulty in converting the weight of butter-fat shown on the test sheets into commercial butter. In practice it works out that 83 lb. butter-fat is required to make 100 lb. commercial butter, and accepting that as a basis it is not a difficult problem to work out, mathematically, the amount of commercial butter that can be manufactured from any given quantity of butter-fat. It simply means multiplying the weight of the butter-fat by 100 and dividing by 83, the resultant figure being the weight of commercial butter.

The simplest method of converting butter-fat into commercial butter, and one that is approximate enough for all general purposes, is to add one-fifth to the butter-fat figure, the result being very near to the exact weight of commercial butter.

Write to the Under Secretary of the Department for a copy of these commercial butter tables if you are interested.

Cold Storing of Potatoes.

Down in Sydney a civic commission has been inquiring into the problem of cold storing tubers. This is the substance of the Commissioner's (Mr. W. J. Williams, F.C.S., Manager of the Municipal Cold Stores) report:—

Cold storage of potatoes must come. This is the definite opinion of Mr. Williams, whose advice on cold storage problems was recently sought by the West Australian Government. His report shows that his last experiment, when bagged potatoes were placed in temperatures of 36, 38, and 40 deg. Fah. for seventeen weeks, was a great success.

The best results, he states, were obtained from tubers taken from the room at 36 deg., as the loss of moisture was only 3.3 per cent., represented by a loss of 25 lb. on a total of 743 lb. In this room, the shrinkage of the Factor variety was exceptionally small, total weight of 459 lb. losing only 2.8 per cent. in store. The average loss on the whole experiment, including Factor, Surprise, Manhattan, Guyra Blue, Brownell, Satisfaction, and Dakota Red, was approximately 4 per cent., as against 15 per cent. when the potatoes are dry stored for the same period.

The edibility of the cold stored potatoes, the report adds, was found not to have been marred in the slightest. Upon being cut, the potatoes had a good white colour. The Surprise variety is considered to be too "soft" for cold storing. The experiment confirms, Mr. Williams declares, the fact that potatoes stored for about sixteen weeks at a temperature of 36 deg. lose in weight only from 3 to 3.5 per cent. weight, equal to about 67 to 78 lb. on a ton, as against a loss in common storage of about 336 lb., or 3 cwt.

"After forty days," the report states, "it was found that, though living larvæ and pupæ were present, the caterpillars had become torpid and had ceased feeding. This proved that the lower temperature had the effect of inhibiting the work of the potato moth. A checking effect was also noticed in regard to fusarium fungus. An examination, after about two months, showed that the cold had caused all the larvæ to leave the tubers. . . . After about seventeen weeks it was discovered that there were no living forms of the potato moth, all stages being totally destroyed. The fungus was also found to be inoperative."

The potatoes, when sold after having been in cold store for just over four months, were favourably commented upon by the selling agents, who secured good prices.

"There is no difficulty in storing local potatoes, provided the produce is in good condition, free from disease, and the conditions of the cold store are complied with. There is no reason that the method of keeping by cold storage should not be used in preference to common storage, and become a universal aid to producer, merchant, and consumer."

Surplus Honey Production—Lessons from New Zealand.

The New Zealand Honey Control Board has succeeded in standardising New Zealand honey, before shipping, to a quality or qualities which were suitable for the English market, and had made such arrangements that a continuity of supply could be assured. This honey, which is light in colour and of excellent quality, is brought over in bulk, is bottled in London, and distributed by a wholesale firm to retailers.

New Zealand honey is only sent on to the London market in a set condition, whereas Australian honey is frequently in liquid form, and the tins on landing are frequently leaking. The most popular varieties of honey are pale to white in colour, though in some quarters (opinions among merchants still vary) the amber-coloured product is now preferred. Indeed, one firm which some few years ago asked for New Zealand honey to be as white as possible have now made requests for the amber colour.

New Zealand honey is only distributed through one house, and as far as possible the price is fixed, the goodwill attaching to it in consequence of care in preparing, advertising and other charges. It has a ready sale, and is now recognised as being one of the best honeys, if not the best, imported by English merchants.

Broom Millet—Trade Requirements.

The soil, climate, and cultural methods largely determine the quality of the brush produced, but even a poor crop can be made attractive to the buyer by harvesting at the correct time, proper curing, careful hackling, honest grading and baling.

In the manufacture of brooms three classes of brush are required—"inside," "cover," and "hurl."

"Inside" millet is used for forming the inside of the broom, and for the best brooms is generally not more than 17 inches long. There is a type of dwarf broom millet, largely used for "insides" and for small brooms in America, which local manufacturers say they could do with here, but the yield is small, and it has not yet been decided by experiment whether it will be profitable to grow this class of millet under any conditions in this country. In the meantime, "inside" millet is generally made up by the manufacturers from some of the poorly developed brush of the long White Italian variety.

"Cover" is the class used for covering the inside and also for forming the shoulders of brooms. For the best brooms it should be 17 to 20 inches long.

"Hurl" is the longest brush, ranging from 20 to 25 inches for good brooms. The best "hurl" is fine, even, straight fibre, and forms the outside of the broom to give it a nice finished appearance. About 1½ lb. of brush are required to make an ordinary broom, and the three grades are used in about equal proportions.

The manufacturer and the farmer need to be brought into closer touch, for many improvements could be effected by the farmer when he knows the manufacturer's requirements. Some of the most important of these are:—

(1) Complete removal of the seed.
(2) Grading out inferior, broken, or badly bent or very coarse brush.
(3) Uniform length of stem cut with heads.
(4) Uniform and good colour.
(5) Regular sized bales, well packed and pressed.

It is also to be deplored that dishonest practices exist among farmers, such as facing the outsides of bales, filling with inferior material and rubbish, watering bales to increase the weight, &c. Unfortunately, manufacturers have been compelled in some instances in the past to import millet from Italy rather than risk the poor get-up of the local product, but a noticeable improvement has taken place in recent years, though, as the imported article is usually of very good quality, our growers should bestir themselves still further in the direction of improving their product for market.

A fairly good market exists at times in New Zealand for locally grown broom millet, but this can only be maintained by a uniform high standard, and good honest growers have at times to suffer low prices because of the negligent or dishonest farmer in the neighbourhood.

Grading is a process that farmers seldom practise, the millet being put up into bales which are called "self-working," being composed of all three grades as well as bent and inferior brush. Grading into separate bales on the farm involves much extra labour, and the growers contend that the extra price received for the graded article is not sufficient to justify the grading. At the same time, a rough grading out of all millet which does not come up to the manufacturer's requirements is usually worth while, and is reflected in a sufficiently increased price to justify the practice.

Marketing Millet Broom Brush.

The brush is prepared for market by the removal of the seed, a hackling machine being used for this purpose. This machine consists of a roller studded with small narrow iron spikes mounted in a drum, which is turned rapidly either by hand or power. The brush is not fed into the machine, but it is held in small handfuls in such a manner that the upper portion of the brush containing the seed comes in contact with the roller, which strips the seed off cleanly.

Many farmers make their own hacklers, and they answer the purpose quite well for small crops at any rate. However, there are firms which will supply these machines for a small figure.

After hackling, the brush should be packed back in deep layers on the shelves where it had been drying prior to hackling. Curing will then continue until baling time. Keep all the butts level so as to facilitate handling when baling.

Grading is a practice that farmers do not practice enough, the millet being put up into bales which are called "self-working," being composed of all grades—"insides," "covers," and "hurl," as well as bent and inferior brush. The extra prices obtained for graded brush, or at least for brush that is free from rubbish, makes the work well worth while.

A lucerne or hay press can be adapted for baling broom millet. The best type is a box press (resembling a wool press), which keeps the butts even. The brush is packed with the butts outward and the heads overlapping in the centre. A good pressure is desirable to reduce the bulk for the saving of freight on rail. Battens are placed on the top and bottom of the bales, being secured by four to six strands of stout wire. A convenient size of bale is about 46 x 30 x 24 inches, weighing about 300 lb.

Millet Cultivation.

So much stress is often laid on the importance of the early preparation of the soil prior to the sowing of broom millet, that the after-cultivation of the growing crop is sometimes neglected. A high yield of good quality broom millet is almost impossible unless the winter rainfall has been conserved in the soil, weeds destroyed, and the seed bed made firm by careful, early cultivation. Important as is this aspect of broom millet growing, it is no more important than after-cultivation, which has as its main object, not only the conservation of moisture and the keeping down of weeds, but the maintenance of warmth in the soil in order that the crop might be kept moving.

If heavy rain falls shortly after sowing, the germination will be affected, owing to the formation of a heavy crust on the surface, and the field may require replanting, especially if the seed has been sown in furrows. If sown on the flat, light harrows can be run over the land to break the crust. If done in furrows, this harrowing might cover the seed too deeply.

Owing to the slow growth which broom millet makes, especially if sown early in spring, harrowing is one of the most important operations in the cultivation of the crop, as it has the effect of warming the ground and inducing faster growth. The crop may be harrowed till it is six or eight inches high, and this should be done during the warmth of the day when the plants are supple.

The first cultivation is best given with a narrow tine cultivator, working as close to the rows as possible to get rid of the young weeds. It is usually found necessary to go twice up the rows with this first cultivation, and it is required to be done carefully to avoid injury to the young plants. The cultivation should be continued until the crop is about half grown, and should be shallower with each succeeding cultivation to avoid damage to the roots. A double-row cultivator should be used for the later cultivation on larger areas. The amount of cultivation necessary is determined largely by the rainfall, and the growth of weeds. Keeping down the weeds is the most important object of cultivation.

"Don't Argue."

How foolish it is to try and cure by argument what time will cure so completely and so gently if left to itself. As I get older, the anxiety to prove myself right if I quarrel dies out. I hold my time, and time vindicates me, if it is possible to vindicate me, or convicts me if I am wrong.—Mark Rutherford's "Deliverance."

Wheat and Sheep—and Oats: Experiences of Southern Farmers.

Progressive wheat farmers have long ago learned the value of a flock of sheep, which not only turn the stubble and the weed growth on the fallows to account, but which are also helpful in compacting the soil, and can be used for the purpose of checking a too-forward crop. The past dry season in the north-western wheat districts introduced still a further problem for solution. When the feed failed the farmer had to decide between feeding off his wheat crop and thus greatly reducing the ultimate yield, or letting the sheep die. Generally the choice was in favour of feeding off to sheep, and to the detriment of the wheat crops.

These facts should turn farmers to the question—"Is there any other crop that will provide the same or more grazing, and will enable the wheat to be harvested to the best advantage?" To that question the Department of Agriculture has an answer—it is the one word, "Oats." Oats are a better crop for feeding off because they give a greater bulk of feed of better quality. And experience is beginning to confirm this with many farmers in the Gunnedah section.

Messrs. Wood Bros., of Curlewis, for instance, had 30 acres of Mulga this year, on which they fed 400 ewes for one month and also ran twenty-three horses at intervals; the stock were removed for five weeks, and were then turned on again, and the large stock have been there intermittently ever since; early in October, following rain during the last week in September, there was again a nice shoot. Mr. J. Cavanagh had a series of experiment plots with this cereal, which had been sown at the rate of 1 bushel per acre on 22nd April after a short fallow. The plots were fed off twice and rolled between, and early in October they presented a most attractive appearance. Buddah was the earliest variety of all, but Myall and Mulga were not far behind, and Guyra was still green enough to promise good development. Messrs. Stanger Bros. pointed out a pure-seed plot of about 3 acres of Mulga on which they shepherded seventy sheep per acre for one week in June, and a little later the same sheep again for two days; yet a yield of 9 to 10 bags of grain was expected at the time of the inspection. Not far away the same farmers had 22 acres of the same variety, on which they lambed 120 ewes, grazing them over it for some six weeks, and also ran twenty head of draughts every night, four milking cows, and nine poddies. In October the large stock were still on this crop, which had been well worth sowing for its grazing alone.

"I'd always have a bit of oats now, especially for feeding off for sheep," said Mr. C. Boyer, on whose farm at Wynella oat variety trials were grown this year. Belar, Mulga, and Gidgee in that order were the best-looking at this centre, but the crop has made an impression upon him as feed that he will not forget.

Farmers, particularly those who had to sacrifice their wheat crops this year, should need little urging to convince them of the profitableness of sowing a few acres of oats ahead of their wheat next year. Even on the low rainfall of the past season it provided weeks of grazing for both sheep and larger stock, at a minimum of cost, and in greater abundance than a wheat crop.—A. and P. Notes, N.S.W. Dep. Ag.

The Need for Care in Handling Fat Lambs.

The New Zealand Meat Producers' Board draws attention in its annual report for the year 1926-27 to the losses that result from the careless handling of fat lambs in transit. "It may not be generally known," reads the report, "that a great many lambs graded second class are put into this grade on account of bruising; and from investigations made by officials of the board it has been found that a good deal of this bruising has been caused by pulling the lambs by the wool, particularly in trucking. The loss that takes place from this cause should be a matter of concern to every farmer. As an illustration of the damage that takes place in this direction it may be noted that in a report received from one of the Board's graders he mentions that in a lot of lambs inspected at a freezing works, he counted 101 second class, forty-three of which would have gone into the prime grades but for the bruising, whilst a number of second-quality lambs were also bruised, and out of ten rejections, seven were on account of bruising."

Confirming the correctness of this statement, the Government Sheep and Wool Expert (N.Z.) states that not only by pulling the lambs by the wool is damage done, but if lambs are caught by the hind legs—a very common practice—there is a big chance of one of the joints being wrenched and a swollen and bruised leg is often the result, which may not have time enough to assume normal condition before the lamb is offered in the market. The proper way to catch a lamb is around the body just behind the shoulders.

Beeswax—Melt the Damaged Combs.

The market for best quality beeswax is almost invariably good, yet there is much waste of this valuable product in many localities because apiarists neglect to melt up unsatisfactory or damaged combs; or, if the melting is undertaken, it is not carried out properly, and the result is a poor quality wax for which there is very little demand. Moreover, the careless beekeeper often spreads disease to a neighbouring apiary by leaving about old damaged combs, frequently allowing combs attacked by wax moths to go to waste, and afterwards purchasing foundation comb at a high price. In seasons after drought more care than usual is necessary to keep the apiary free from disease. The Department of Agriculture points out that under the Apiaries Act the wax moth is a proclaimed pest, and with infested combs on hand apiarists are sure to meet trouble when the inspector calls.

The natural colour of beeswax is yellow, but by bleaching it can be lightened in colour even to pure white. Wax can be bleached by moulding it into thin sheets and exposing these in the sunlight. Dark colour in wax may result if rusted iron or galvanised vessels are used for melting.

Melting the Wax.—Where a patent cappings reducer is used, the wax is melted and separated from the honey as the work of uncapping the honey proceeds. In this case, where the blocks of wax so produced are cool, they should be put through a refining process before being sent to the market. Where no cappings reducer is used, a wax extractor is useful for melting the wax from the strained cappings.

Melting the combs is considerably more difficult than the treatment of cappings, but it pays to make a good job of it. For the ordinary apiarist, or where only a small number of combs have to be melted annually, the only plant required would be a few kerosene-tin buckets and a small wax press. A fair-sized vat with a tap or gate at the bottom is also desirable. A good supply of water should be available; clean, fresh water of any description will do provided it is not mineralised.

Stand the kerosene tins on bricks built up about a foot so that a fire can be built under the tins; then a little more than half-fill the tins with water and proceed to heat. Put in the tin sufficient comb to make a free mush, and allow this to stand at about boiling point, stirring occasionally until melted up; then pour a quantity into the press, which has previously been kept warm and which contains a straining cloth. Small quantities of the melted mass, with a fair supply of hot water, give the best results. When a sufficient quantity is in the press, fold the straining cloth neatly over and apply the screw pressure gradually.

After apply the first pressure and allowing to stand for a time, ease the screw sufficiently to allow the hot water to get over the slum gum; then apply the pressure again, leave the hard pressure on for a few minutes, and tip the press forward, draining the water and wax into a bucket, which is then emptied into the vat. The slum gum is removed from the press and the remaining quantities of melted comb treated.

When the melted comb from the tins on the fire has been treated, the hot water can be drained from the vat into the melting tins again, and a start made with a fresh lot of comb. After completion of the day's work the wax can be drained from the vat into the moulds, which should be placed in warm water and covered to allow the necessary slow cooling. To obtain a high-grade wax, the blocks of wax from the moulds, when cool, should be cleaned at the bottom and then properly refined.

How to Refine Beeswax.—A fair-sized tinned vessel is quarter filled with water, and the blocks of wax, which have previously undergone the treatment already described, are added. The vessel is then heated, and the wax melted slowly but thoroughly, the fire withdrawn, and the wax allowed to stand (well covered) in a warm room for a few hours. It is then drained off from the top into suitable moulds until the underlying impure matter is reached. The moulds should have flanged sides previously smeared with glycerine, and when containing the wax should be placed in warm water to ensure slow cooling. When properly cooled off the wax is removed from the moulds and any adhering impurity scraped off.

To expedite the work of cleaning wax from utensils, kerosene will be found of service where its use is practicable.

Persons have sometimes tried to sell adulterated wax—usually a mixture of tallow or paraffin—but since the adulterated article is easily detected under the specific gravity test, and generally results in a loss to the seller, very little adulteration is carried on nowadays.

Good Use for Old Iron Tank.

An effective orchard burner can be made so cheaply that it is rather surprising that so few fruitgrowers are using them to dispose of prunings, fallen fruit, &c. In Victoria some enterprising foundries manufacture orchard burners, but there is really no necessity to go to the expense of purchasing one of these handy devices, it being a comparatively simple matter to construct one. A discarded square iron tank answers the purpose readily, and much of the material for the under-carriage can often be recovered from the farm scrap heap. The advantages of having an orchard burner are many. Burning the prunings, fallen fruit, and other rubbish that accumulates in the orchard, is quicker and cheaper than carting them away. The danger of spreading disease throughout the orchard is minimised by the destruction of all this rubbish, while the ashes, which contain, among other things, potash and lime, can be returned to the soil.

Lucerne Seed.

Test for Purity before Sowing.—The wise farmer never takes for granted the quality of lucerne seed. It pays to test all seed for purity and vitality before sowing. The tests are simple, and are carried out as follows:—

Testing for Germination.—Take a piece of blotting-paper about 6 by 8 inches in size, fold across the middle and place on an ordinary dinner plate; moisten the blotting-paper with water, and spread 100 seeds evenly over one-half of the paper; turn the top flat down, and invert another dinner plate over the lower one so as to serve as a cover. The plates should then be set in a warm place, where the temperature can be approximately maintained at about 80 degrees Fahr. The blotting-paper must not be allowed to become dry, and every twenty-four hours the germinated seeds should be removed and the number recorded. There should not be less than 85 germinable seeds in every 100.

Testing for Purity.—Take a given weight, say 1 oz., of the seed; spread it out on a sheet of white paper and pick out all impurities. These may consist of sand, dirt, vegetable matter (small twigs of the plant, for instance), mouse dung, weed seeds, or insect remains. These should be carefully weighed, and the proportion in the sample computed. Lucerne seed should not contain more than 1 per cent. by weight of impurities and weed seeds, with no dodder or harmful weed seeds present—i.e., it should have a purity standard of 99 per cent.

The weighing can be done with very little trouble. If the individual cannot manage it, no doubt the local chemist would oblige, the simplest weights to use being avoirdupois—437½ grains to 1 oz., or 7,000 to the lb. The calculations are then easily made.

If it is found that seeds of noxious weeds exist (more especially dodder), the bulk should be sifted, using a mesh that will retain the lucerne whilst allowing the dodder and other small things to pass through. Broken and small seed may pass through also, but this will be no loss.

Other Points in Selecting Seed.—In addition to testing up to the standards of purity and germination mentioned, good lucerne seed should be sound, mature, plump, bright, well saved, and reasonably even in size. A further point to remember is that lucerne seed of local strains gives better results than the imported seed. This locally grown seed is generally sold by seedsmen and growers under the names of the districts in which it is produced, such as Hunter River, Tamworth, Mudgee, &c.

Dodder.—In selecting lucerne seed special precautions should be taken to see that it contains no dodder seed. Dodder is the greatest enemy of lucerne, the young dodder plants attaching themselves to the lucerne seedlings. As soon as the thread-like vine is firmly attached to the lucerne plant, the stem connecting it with the ground withers away, and the dodder draws its sustenance from the lucerne by means of tiny suckers, which enter the tissues of the host plant. The dodder flowers are a beautiful golden colour. As the parasite develops, the tangled masses in which it occurs have the appearance of ringworms, working from the centre outwards.

On no account should dodder be sown with the lucerne seed. Fortunately the removal of seeds of dodder is a simple process, as they are much smaller in size than lucerne seeds, and can be removed by screening through a mesh sufficiently close to retain healthy lucerne seed, whilst allowing the dodder to pass through. If dodder appears in a lucerne paddock it should never be allowed to seed, but the affected growth should be removed as soon as possible. The plants should be chipped to the crowns, or straw should be carted on to the patches and burned. The patches should be mown and treated before the general crop is cut, as otherwise the parasite may be distributed throughout the field by the machinery. Burning is the safest remedy, and will not injure the lucerne plants.—"A. and P. Notes, N.S.W. Dept. Agr.

The Spiritual Values.

"Never before has there been such an overwhelming demonstration, in every sphere of life, of the hopeless futility of any system of civilisation which is based upon the rejection, or the but qualified acceptance, of the spiritual values upon which human wellbeing depends. The insolence of every such system has been visited by a judgment which will serve as a warning to all succeeding generations. The incompetence of all efforts to rebuild the shattered fabric of the world upon any other than the best spiritual foundations is being exhibited daily in every province of human life. Never before has there been such an opportunity, created both by the conscious helplessness and by the truer vision of mankind, for advancing to the acceptance of higher ideals and for a concerted attempt to apply them in all directions to the problem and task of human progress."—Dr. SCOTT LIDGETT.

The Citrus Harvest—Wisdom of Early Preparation.

Growers are advised to plan well ahead for their citrus harvest. If not already done, the picking boxes should be thoroughly overhauled and cleansed, and any loose boards on the cases should be securely fastened and protruding nails removed. To secure the best results it is necessary to keep the skin of the orange in a sound condition—free from abrasions or punctures.

When sizing machines are used they should be thoroughly examined and any necessary adjustments made. The advent of sizing machines has done much to assist the grower, and those growers who have not yet installed a sizing machine in their packing shed should do so as soon as possible. Hand-sizing is a slow, costly, and not altogether an accurate way of carrying out the work. Sizing by machine is far more accurate, considerably quicker, and much more economical.

Though citrus fruits do not show injury from bruises for some time after picking, in reality the oil cells of the skin are very easily damaged, and it is through such injuries to the skin that decay germs, such as those causing blue mould, make their entrance; hence great care is necessary when picking and packing for market. Gloves should be worn or the finger-nails kept extremely short, and the fruit should be picked or clipped with the button adhering but no length of stalk that will come into contact with and puncture other fruit. The fruit should be placed right into the picking receptacle, and not dropped in from the top, and the same care should be exercised in all subsequent handling between picking and packing.

The grower should make arrangements now to secure sufficient case-lining paper to be used in the packing of his fruit. Though paper-lining, by checking the circulation of air in the case, may tend to produce conditions favourable for the development of blue mould, the rough timber of the unlined case injures the skin and allows infection by the disease, so that lining-paper is an advantage when packing citrus fruits, unless the inside of the cases are planed, as is done in some other countries.

Feeding Fowls, Wet or Dry Mash—Which?

Many successes have been obtained with both the wet and dry mash systems of feeding, but according to the New South Wales Department of Agriculture neither experiment nor observation has shown dry mash to be the equal of wet mash either for growing chickens or for egg production. On the other hand, it is recognised that there may be circumstances which would justify the adoption of dry mash feeding. Indeed, where the attendant is not a skilful feeder, dry mash might be his salvation because of the fact that it is not sufficiently appetising to induce the birds to eat to repletion. Wet mash is much more palatable.

Ration Formula.—The following mash can be used either dry or wet:—Pollard 60 lb., bran 20 lb., lucerne meal 15 lb., and M.I.B. meat meal 5 lb. This formula will make 100 lb. of morning mash. Bran is of approximately the same food value as lucerne meal, and can be used instead of the latter, but then lucerne meal gives variety to the ration. In lieu of M.I.B. meat meal, 5 to 7 lb. Compo. meal can be used if desired. While the mixture given above may be regarded as a standard, it is advisable to reduce the meat meal somewhat for breeding hens, while for laying stock 1 or 2 lb. more to every 100 lb. of mash is permissible.

When the mash is mixed wet, 22 oz. of common salt should be dissolved in the liquid with which the mash is mixed. If the mixture is used dry, it should be fed in hoppers, and only half the amount of salt used, while great care should be taken to see that it is thoroughly mixed right throughout the ration. Oil cake might be used sparingly in mashes, say, up to from 2 to 5 per cent. Any change of this nature should be brought about gradually.

Quantity to Feed.—The evening ration of grain consists of two-thirds wheat and one-third crushed maize. If desired, the maize may be increased so that it represents

half or more of the ration. Good plump oats or barley, free from awn, might be substituted for a portion of the wheat.

In practice, 100 lb. wet mash will feed approximately 800 laying hens, but this is not definite enough to be relied upon always. It is better to feed all the birds will eat. If they eat too much, feed less until it is noticed they are keen for their food at the regular feeding hour. Of dry mash the adult birds will not eat too much and the chickens will not eat enough. Hence the advice to feed only wet mash to the latter.

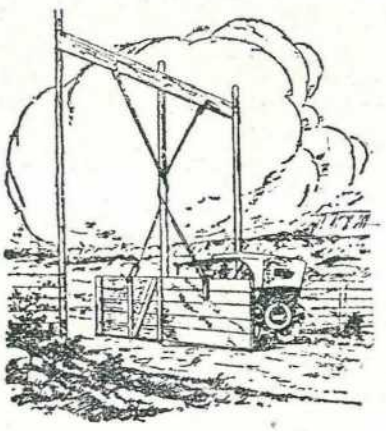
Greenstuff and Shell Grit.—Succulent green feed, chaffed up for preference, should be given daily, preferably at midday. If a little pollard is mixed with it, and it is wet, the green stuff is eaten up more readily. Among the best crops to use are lucerne, Bokhara clover, barley, rape, chou moullier, thousand-headed kale, and green maize while young and tender. This range of green crops will provide feed throughout the whole year. Chaffed up green lucerne, clover, or barley may take the place of as much as one-third of the entire bulk of ingredients of the morning mash.

The importance of a plentiful supply of seashell grit should not be overlooked. Oyster shell is a good substitute, but is rather soft in itself. The best material for this purpose is a mixture of two-thirds sea or beach shell to one of oyster shell, crushed to a size that it can be eaten. Although the primary purpose of supplying this material is to furnish lime for shell-making purposes, poultry farmers are warned that burnt lime is injurious to poultry when eaten; nor will it in any form take the place of shell grit.

AUTOMATIC GATE.

The following illustration and description from an American paper gives details of construction of an automatic gate in use in the States where ranching operations are carried on. The idea is that the car pushes open the gate, there being no need for the driver to dismount for the purpose. The twist, imparted to the suspension chains, causes the gate to swing back to the closed position when the car has passed through.

Two pipes, 4 inches in diameter, and extending 16 feet above the ground, are set at the ends of the opening, in line with the fence. A third pipe, usually 6 inches in diameter, is also set vertically midway between them. These three



pipes are connected by a length of 2 inches by 8 inches timber, from which chains are attached with links crossing at the centre post, then down to each side of the gate, as shown. When the front bumper of the car strikes one side of the gate, it is swung open. The chains wrap about the centre pipe, causing the gate to lift. But when the car has passed, the gate swings back into place. The gate is attached to the centre post with U-bolt so that it will turn freely. The larger the centre pipe is the harder the gate will be to open and the quicker it will close.

The Home and the Garden.

THE CARE OF THE BABY.

Far more babies die during the hot months than during the cool season. Let no one blame the Queensland climate for this. Babies thrive and keep healthy in hot weather when proper care is taken. With a little knowledge of infant management all our unnecessary summer mortality might be prevented. During hot weather the baby should not be overclothed. He should have plenty of fresh air day and night, but should be shaded from the direct rays of the sun when he is out of doors, as he ought to be every day. During hot weather he is more thirsty and should be given a drink of water whenever he wants it. As he uses very little body fuel to keep up his body temperature, he needs rather less food, and is not so hungry as in cold weather. Any excess of food is more likely to upset him, and if the hot weather comes suddenly it is wise to cut down the quantity or strength of his food slightly, but he should have as much as he needs. Food that agreed with him before may upset him now, and advances in diet should be made cautiously. It is wise to wean babies in the cool months rather than in the hot months, though this is not always possible.

Last year the infantile mortality of Queensland rose from 45.4 per 1,000 to 50.4 per 1,000, or, to state the truth more simply, there were 100 more deaths during the first year of life. Every one of these hundred babies were needlessly sacrificed. Every summer we have outbreaks of dysentery amongst our babies, no years are free from them, but last year the epidemics were worse than usual. Dysentery is an entirely preventable disease. It is characterised by loose motions, containing blood and slime, often passed with much straining. There is rapid wasting and there may be high fever and great prostration. In many cases death ensues. It is sometimes called gastro-enteritis or summer diarrhœa, but its right name is dysentery. It is caused by dysentery bacilli, which are contained in the motions passed. Dysentery bacilli during epidemics are found also in the motions of many people who are only slightly indisposed or perhaps not ill at all. They may be conveyed by the mother's hands from the baby's napkins to the food of other children. From one house to another they are conveyed by flies which visit the closet-pans and infect the babies' food or the teats of their bottles or their dummies. Dysentery epidemics occur during the fly season.

The best preventive of dysentery is breast feeding. Flies cannot convey dysentery to the food of a breast-fed baby, but they are very fond of settling on the baby's dummy. The present fashion of using dummies and pinning them outside babies' frocks is a direct invitation to disease. It is exposing healthy babies to a serious risk of death. If a mother wishes to keep her baby safe from this dread disease she will put its dummy, if it has one, into the kitchen fire. If the baby is bottle-fed, she will take the utmost care to protect its food, its bottles, and teats, after scalding them, from flies. The lives of Queensland babies depend on the care taken by Queensland mothers. Are we to have 100 unnecessary babies' deaths this year?—Dr. A. TURNER, Director of Infant Welfare.

RAISING SEEDLINGS.

The soil for the seed-bed or seed-box is prepared by mixing good garden loam with sand. Such a soil holds moisture well, allows the young plants every opportunity of pushing their way to the surface, and encourages a large root development. Too rich a soil in the seed-bed or seed-box has a tendency to produce long, spindly plants, while if the soil sets hard it is quite unsuitable for its purpose, and where the garden loam used in the mixture gives it such an inclination more sand should be used.

The seed-box need not be more than 4 to 6 inches deep. It is important that drainage be allowed for, and although the chances of successful seed-raising are very remote without good drainage, the provision is one which beginners often neglect to make. Unless the bottom boards of the box are divided by a well-defined space, it will be necessary either to replace them by narrower ones or to bore holes in them with an auger, so that the water may have an easy get-away. Small openings between the bottom boards are of little use, as the swelling of the timber after watering may make the box practically watertight. The bottom of the seed-box should be

spread with a layer of pieces of broken pots or small stones. Over this should be placed (if available) a layer of leaf mould, and finally the sandy loam mixture in which the seed is to be sown. The surface should be pressed down with a piece of board before sowings are made.

To sow small seeds, whether in boxes or in the garden bed, make very shallow drills—just slight depressions—across the surface of the soil and sprinkle the seed evenly along them. For light seeding the seed should be picked up between the finger and thumb and dropped with a slow rubbing movement. After sowing, shake a little prepared soil over the surface and again press down lightly with a block of wood.

The watering of the seed-box or seed-bed must at all times be carried out with care, so that the flattening of the plants and the washing of the soil from their roots may be prevented. The boxes should be on a level, so that the effects of watering may be uniform. Unless the rose of the watering-can is an extremely fine one, it is preferable to immerse the boxes in water in a suitable receptacle in which the water is deep enough to percolate upwards to the surface of the soil, but not so deep that water will lie actually on the surface of the soil. If the original seeding has been too thick the young plants should be thinned out or pricked off into other boxes. Pricking out into a second set of boxes or a seed-bed has the effect of producing well-rooted, stocky plants which can be transplanted untimately into the open with the least risk of failure. The young seedlings should not be pricked out until they have thrown out their third leaf.

THE PLANTING AND CARE OF HEDGES.

When properly planted and kept in good order, a hedge is a great shelter and a lasting ornament to any place, and will add considerably to the value of a property.

It is advisable in this State to plant hedges on the level ground, on account of the long spells of dry weather and the hot winds which prevail during the summer. Where the ground is swampy, however, it is necessary to form a bank or what is generally called a turf wall, two or three feet above the ground level, tapering on both sides, and about two feet broad on top. A line is run along the centre of the bank, and a little trench cut out, and the rooted cuttings are planted against the back of the trench, where the line is set. Where the turf has been removed to form the bank will now act as a drain.

The trench should be about 18 inches wide and a good spade deep. Some manure should be put in the bottom, and covered with a light layer of soil, and the plants placed up against the straight solid wall. The roots are covered with a little soil and well watered, and the trench filled up with the remainder of the soil. When this is done it is advisable to look along the row of plants to see if any are out of place. When the plants are made firm, cut them each to six or eight inches from the ground, and dig the ground for about three feet on each side of the hedge.

Hedges that are exposed to cattle must be fenced as soon as planted, either with a temporary stake and bush hedge, with hurdles, or with a light post and wire fence for four or five years, till the hedge grows up, care being taken not to place the fence too close to the hedge. The hedge must also be duly weeded while young, especially during the first two years.

In order to preserve hedges in proper form, they must be clipped on the sides and tops at least once a year, and, if possible, oftener. The best time for the first cut is midsummer, with the second cut in April or May. The shoots should always be cut the same season while in leaf, and before they become hard. The work may thus be performed more expeditiously and with greater exactness, as the cutting should be as even as a wall on the sides, and the top as straight as a line. After the hedge is formed to its proper width, the growth should be cut as nearly as possible to that of the former cut, particularly on the sides. It should never be allowed to grow more than a foot or 18 inches wide, or too much on the top.

When the cutting cannot be carried out more than once in the year, the clipping should not be performed until the end of April or May in this State, for if cut sooner it will shoot again, and appear almost as rough all the winter as if it had not been touched.

High hedges are very troublesome and expensive to keep in proper order.

BUDDING FRUIT TREES—NO TIME LIKE THE PRESENT.

Following the rains in December and January, the sap should be running freely, and the present month is likely to be most suitable for budding both old trees and nursery stock. Old trees which were cut back at the end of the winter with a view to being worked in the summer should by this time have made quite sufficient mature young shoots to bud into. It is by far the best policy to work many more of these young shoots than will be required for the ultimate formation of the new tree, as there is likely to be some loss from heavy winds and other causes. Moreover, the leaf surface of the tree is very much reduced by the cutting back in the winter, and it is to the benefit of the tree to allow as much new foliage to grow as possible. The development of shoots from several points round thick stumps keeps the bark healthy all round, whereas if only a few shoots spring from one side the bark often dies away on the other side. The thinning out of superfluous shoots can be spread over several years.

There are three seasons—spring, summer, and autumn—when budding can be carried out, but autumn finds most favour with nurserymen for budding citrus trees. The operation is best carried out on fine days, avoiding wet days.

Insert the buds in the young stock about 4 to 6 inches above the ground, but when old trees are being worked over the buds may be inserted in the branches close to the trunk of the tree, and just where a limb is required. This will give the tree a good shape. It is generally found best to put the bud on the under side rather than on the top side of the limb, as, by inserting the bud on the top of the limb in an old tree, the growth tends to be all inwards, thus unduly crowding the centre of the tree.

Medium-sized shoots afford the best buds, and well-developed buds are the best to use. The buds towards the top of a shoot are not usually well-developed, and those near the base are, as a rule, also small and poorly developed; and, while they might grow all right, the chances are they will not make such fruitful trees as those grown from buds which are large and well-matured, and which have clustered around them two or more fruit buds. This applies more particularly to peaches, apricots, nectarines, and plums.

As soon as the bud stick is cut from the tree, the leaves should be cut off just close to the bud, and the quicker the latter is inserted the better. This, together with tight wrapping, is the reason why men accustomed to the work have better success than amateurs, as they never mutilate a bud when cutting it, and from the time it is cut until it is inserted is only a matter of a few seconds. It is a good idea to carry the bud stick wrapped in wet sacking during hot weather to keep it from wilting and spoiling.

To make the cut in the stock, preparatory to inserting the bud, take a *sharp* budding knife and make a vertical cut from 1 to 1¼ inches in length, then a horizontal cut directly across the top of the first cut, allowing the knife to press back, so that the bark is cut and slightly raised with the one operation. If the sap is flowing freely these two cuts extending through the bark are all that is required. As the bud will have to be slipped downwards into this cut, we must cut the bud from the bud stick by commencing the cut below the bud and finishing above it. This leaves the bottom portion of the bud in a very smooth condition, and allows it to keep its shape while being forced underneath the bark of the stock. It will be observed that the bark has not been loosened, except when making the horizontal cut, and then only sufficiently to allow the lower point of the bud to enter the bark, preparatory to being forced down with either knife or thumb.

To cut the bud from the bud stick, insert the knife half an inch below the bud, cutting through the bark into the wood, pass the knife under the bud and bring it out half an inch above it, thus severing the bud with a thin slice of wood adhering to it. The bud is now placed in the top of the cut made on the stock and forced down with the thumb or the blade of the budding knife. The bud is now ready to be tied, and if raffia is used it should be moistened before being used.

Care must be taken to see that the bud is tightly wrapped and securely fastened, for if the wrapping becomes loose the chances are the bud will not take. The bud will not be damaged even if it is completely covered by the wrapping, but if it is large it is as well to leave it slightly exposed. If there is any reason to expect rain about budding time, it is best to use a waxed cloth, and by starting the wrap from below the bud and finishing at the top it can be so wrapped that very little moisture will find its way underneath the waxed cloth.—A. and P. Notes, N.S.W. Dept. Agri.

Orchard Notes for March.

THE COASTAL DISTRICTS.

As soon as the weather is favourable, all orchards, plantations, and vineyards that have been allowed to get somewhat out of hand during the rainy season should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

The cooler weather will tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892, and which has again proved its superiority in the recent shipments of oranges from the Southern States to England. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The

half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—*i.e.*, spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

CAPE GOOSEBERRIES.

When making the tomato bed and sowing seed, sow also the cape gooseberry. The cape gooseberry is a member of the same family group as the tomato, and the treatment that suits one suits the other. The plants like a fairly light soil, which has been well manured with either thoroughly rotted cow manure or well treated with meatworks manure and superphosphate. When the young plants are put in they should be well firmed into the ground, and given a good watering. It may be desirable, for a day or two, to give them a little shade. One who has had great success with the cape gooseberry recommends the following treatment:—"Although the cape gooseberry is a perennial, I find that it does best with us in Queensland when treated as an annual. It fruits very heavily in its first season, and I think far more heavily than in subsequent seasons. I like to sow the seed in large pots of fairly rich soil, though the soil must be light. The seed is quite big enough to let me put out each seed separately, and in that way I am able to ensure that the young plants are not crowded together. I sow the seed, water it, and then stretch a piece of white paper right over the pot. I put this pot out in the sun. It is not many days before the seeds show signs of breaking through the soil. I then remove the paper covering, and all I have to do is to see that the soil is kept moist. The plants grow very quickly, and soon as they develop their second pair of leaves I put them out in the beds where they are to grow. I have a neighbour who, being an Englishman, and an old-time gardener, pricks his seedlings out. That is to say, after removing them from the seed pot he puts them into a small pot, and lets them develop in that pot before he transfers them, soil and all, into the bed. I think he probably has better results than I have, but then he has a lot more work."

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February, 1928.		March, 1928.		MOONRISE. Feb., 1928.	MOONRISE. Mar., 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.26	6.46	5.47	6.23	2.40	2.40
2	5.26	6.45	5.48	6.22	3.45	3.38
3	5.27	6.45	5.48	6.21	4.46	4.30
4	5.28	6.44	5.49	6.20	5.42	5 16
5	5.28	6.44	5.49	6.19	6.34	5.54
6	5.29	6.43	5.50	6 17	7.18	6.30
7	5.30	6.42	5.50	6.16	7.56	7.2
8	5.31	6.42	5.51	6.15	8.30	7.31
9	5.31	6.41	5.51	6.14	9.8	8.0
10	5.32	6.40	5.52	6.13	9 31	8.30
11	5.33	6.40	5.52	6.12	10.1	9.4
12	5.34	6.39	5.53	6.11	10.30	9.49
13	5.34	6.38	5.54	6.10	11.3	10.15
14	5.35	6.37	5.55	6.9	11.37	10 58
15	5.36	6.37	5.55	6.7	...	11.48
					a.m.	a.m.
16	5.36	6.36	5.56	6.6	12.20	...
17	5.37	6.35	5.57	6.5	1.7	12.41
18	5.38	6.34	5.57	6.4	2.0	1.39
19	5.38	6.34	5.58	6.3	2.57	2.41
20	5.39	6.33	5.58	6.2	3.56	3.45
21	5.40	6.32	5.59	6.0	5.1	4.49
22	5.40	6.31	5.59	5.59	6.6	5.55
23	5.41	6.30	6.0	5.58	7.10	6.59
24	5.42	6.29	6.0	5.57	8.14	8.6
25	5.42	6.28	6.1	5.56	9.19	9.14
26	5.43	6.27	6.1	5.55	10.23	10 24
27	5.44	6.26	6.2	5.53	11.28	11.39
					p.m.	p.m.
28	5.44	6·25	6.2	5.52	12.35	12.33
29	5.45	6.25	6.3	5.51	1.40	1.32
30			6.3	5.50		2.26
31			6.4	5.49		3.13

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

6 Feb.	○	Full Moon	6 11 a.m.
14 ,,	☽	Last Quarter	5 5 a.m.
21 ,,	●	New Moon	7 40 p.m.
28 ,,	☾	First Quarter	1 20 p.m.

Apogee 13th February, at 2 6 a.m.
Perigee 24th February, at 9 30 p.m.

An occultation of Eta Leons (magnitude 3·6) by the full moon will take place on the 7th at about 2·15 a.m. at Townsville and about 2·25 a.m. at Warwick. At the latter place its reappearance will occur about 10 minutes later; both disappearance and reappearance being on the upper edge of the Moon, somewhat to the right.

The elusive planet Mercury will be at its greatest distance east of the Sun (18 degrees) on the 9th.

An occulation of Nu Scorpii (magnitude 3·9) should occur at Warwick at about 12·45 a.m. on the 15th while the Moon is rather low down in the east.

Venus and Mars will be in proximity to one another, especially on the 14th and 15th, when seen about one and a-half hours before daybreak, above the eastern horizon.

Saturn will be two degrees north of the Moon at 5 a.m. on the 15th. An interesting spectacle will be formed by these bright objects an hour or two earlier in the east, before the sunlight dims the effect.

There will be an occultation of a small star in Sagittarius (Magnitude 4·8) in Southern Queensland, where it will be only just covered by the northern edge of the Moon, at about 2·45 a.m. on the 17th at Warwick.

Early risers on the 19th will find a pretty sight awaiting them; the crescent-shaped Moon and the beautiful star Venus will be displayed in juxtaposition well above the eastern horizon, about 24 degrees, or four times the length of the Southern Cross, south of east.

The conjunction of Mercury and the Moon on the 21st will be invisible on account of their nearness to the Sun.

Mercury, instead of passing directly between the Earth and the Sun on the 24th, will be three and a half degrees below it, well avoiding a transit.

The Southern Cross will again be coming into view a good deal east of south during the evening hours, especially during the end of the month.

6 Mar.	○	Full Moon	9 26 p.m.
16 ,,	☽	Last Quarter	1 20 a.m.
22 ,,	●	New Moon	6 29 a.m.
28 ,,	☾	First Quarter	9 54 p.m.

Apogee 11th March, at 1 6 p.m.
Perigee 23rd March, at 8 36 p.m.

The occultation of Kappa Geminorum, a little before 7·30 p.m., will be obsevable at Cairns, and should form an interesting spectacle at Townsville, though the star will hardly disappear but skirt the upper edge of the Moon.

The occultation of Gamma Sagitarii should be observable at Brisbane, Warwick, and Toowoomba so soon after moonrise that it will be interesting to watch at these places for the reappearance of this star above the southern edge of the Moon.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.