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BEE-CULTURE.

I. Advice to Beginners.
II. Practical Notes.
III. Acts and Regulations.

By Apiary Instructors F. A. JACOBSEN, G. V. WESTBROOKE, and E. A. EARP.

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PREFATORY NOTE.

THE present revised edition of "Bee-culture" has been prepared by the Apiary Instructors, Messrs. F. A. Jacobsen, G. V. Westbrooke, and E. A. Earp, in conference.

The remarkable progress made since the New Zealand Department of Agriculture considered bee-culture worthy of recognition has fully warranted the assistance it has received. Nothing contributed more to this advancement than the passing of the Apiaries Act, which, for efficiency in dealing with foul-brood and the cause of its spreading, surpasses all similar Acts in existence at the present time. It put new life into the industry, by encouraging the legitimate bee-farmer to look forward to the time when the chief source of his trouble hitherto, the common box hive, shall have been swept out of existence.

There are now three Apiary Instructors, who are also graders of honey and Inspectors, in New Zealand. Instructor Westbrooke carries out the duties in the Auckland Provincial District; Instructor Jacobsen in Wellington, Taranaki, Hawke's Bay, and Poverty Bay; and Instructor Earp in the South Island.

Beekeepers who are in any doubt as to disease in their apiaries, or who require expert advice on matters in connection with bee-culture, should write to the Director of the Horticulture Division, Department of Agriculture, Wellington, or to the Instructor for their district.

T. W. KIRK,

Director of the Horticulture Division.

July, 1920.

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BEE-CULTURE.

PART I.—ADVICE TO BEGINNERS.

INTRODUCTORY.

THE advice here given, though it concerns chiefly beginners who contemplate taking up bee-culture as a business, applies also to those who merely wish to keep a few hives of bees as a hobby and to work them successfully.

Any person may become a beekeeper, but to become a bee-master the aspirant must possess more than an ordinary share of patience and perseverance, and also be prepared to give the subject of bee-culture his most careful study. He should be discerning and resourceful, have good judgment, with keen insight to anticipate and be swift to take advantage of all circumstances likely to lead to success—in short, he should possess just such qualities as would contribute to his prosperity in any line of life. Procrastination is a serious imperfection under all circumstances, and especially so in bee-culture: bee-work cannot be put off without great loss; it must be done when needed; in fact, it should be anticipated—a bee-master always keeps a little ahead of his bees.

It must be distinctly understood that successful bee-farming cannot be carried on without a good deal of work and close application, but, as the work to a bee-master is both interesting and congenial, it is never irksome. All bee-masters are enthusiasts in their calling; hence, in a great measure, their success. It may be said of those adapted for bee-keeping that once a beekeeper always a beekeeper, for about the work there is undoubtedly, in spite of the stings, a charm which, once experienced, never loses its attractions.

Bee-culture is a rapidly progressive industry; new methods and appliances are constantly coming to the front, and things that are new to-day may be obsolete to-morrow. It therefore behoves the beekeeper to keep himself posted in everything going on in the beekeeping world through the excellent bee literature now at command.

WHO SHOULD NOT KEEP BEES.

All beginners suffer more or less from the effects of bee-stings, but in most cases the bad effects wear off gradually as the system becomes inoculated against the poison, until, finally, little more inconvenience is felt from a sting than would be caused by the prick of a needle. In rare instances, however, there are to be found people who suffer so severely that a sting is positively dangerous to them: their system never seems to become immune to the poison. It is scarcely necessary to say that such persons should not keep bees. Again, there are individuals too nervous to go among their bees without being clad in armour, as it were, from head to feet. There are many such who have kept bees for a long time, and yet have never been able to get over their nervousness. Such people should not keep bees. No

person who manages his bees properly can escape being stung occasionally, though it is often erroneously stated that there are individuals who can do anything with bees, without being protected in any way, and never get stung.

Beekeeping for Ladies.

Bee-culture offers a splendid opportunity for our settlers' wives and daughters and other ladies who would like an outdoor, healthy, and profitable occupation. As a result of the encouragement given to the industry by the Department, quite a number of ladies are taking up beekeeping as a business. In America they rank among the successful beekeepers, and peasants' wives on the Continent of Europe usually look after the household bees, from which they derive a considerable proportion of the family income. There is nothing to prevent a fairly healthy young woman, with a little assistance during the height of the season, from managing and doing the work of an apiary of a hundred hives.

The average farmer rarely attaches to his bees the importance that he should, yet their value as fertilizing agents is very great. Did he appreciate the possibilities in beekeeping as a side line to his farming operations, he could, by the exercise of a little care and thought, make them a good source of revenue. Many a farmer's wife has found a few hives an important means of providing the home with groceries and adding to the pleasure of the table. Instead of leaving the calm, clean, and healthy environment of the country for a city office or factory, the daughter of the farmer would probably find it better for body and soul to take up beekeeping—one of the most entrancing occupations when properly studied and carried out. The work carried out by the lady cadets at the Ruakura Apiary, where, in addition to their actual bee-work, they put together and paint the hives, make the frames, and do everything necessary on a bee-farm, affords practical proof that there is nothing connected with bee-farming that a young woman cannot accomplish.

Beekeeping for Returned Soldiers.

Many men who have returned from the front are taking a keen interest in beekeeping. It affords a good opening for those who prefer a clean, healthy, outdoor life. Student classes have been formed in various centres, and practical work in demonstration apiaries has been instrumental in starting these men on right lines.

Cadetship.

Where it can be managed, the very best course for a young person intending to adopt beekeeping is to go for a season as a cadet with some successful bee-farmer, beginning the season in September, when the bees are being prepared for the first of the honey-flow, and continuing until the honey has been prepared for market in the following autumn. Any young person with intelligence and application should be able to gain such a practical knowledge of the work as would enable him or her to start, confident of avoiding the mistakes usual in all new undertakings.

Cadets at the Government Apiaries.

Suitable applicants of either sex, for a course of instruction in bee-culture, are received at the Government apiary each season as cadets, with the opportunity of gaining a certificate at the end of their term.

They must conform to certain regulations, which may be learned on application to the Director of the Horticulture Division, Department of Agriculture, Wellington.

The Ruakura Apiary is open during working-hours to all persons desiring instruction.

Profits in Beekeeping.

It is but reasonable that the prospective bee-farmer should want to know the probable profits attached to the business, and the question is frequently asked. It is necessary to be very cautious in replying, and to guard against conveying a wrong impression, which might easily lead to disappointment and loss. All industries require the combination of three elements—capital, labour, and skill—and, although bee-farming cannot be carried on without the aid of the first two, it depends mainly upon the skill of the apiarist what the profits will be. It would be easy to show some surprising results that have been obtained in New Zealand, but it would be dangerous to quote these as a measure of success or failure in all cases. As an estimate, however, from a well-conducted apiary, in an average good district, the net profits per colony of bees should reach from £1 5s. to £1 15s. per annum through a number of successive seasons, and this estimate is well within the mark.

It is a rule in beekeeping that with largely increased operations, and the establishment of out-apiaries, the average profit per hive diminishes, though the aggregate profits may be very much larger. This may be accounted for, no doubt, by the inability of the apiarist to give each individual colony so large a share of attention.

Beekeeping Literature.

Beekeepers are well catered for in respect of literature. There are a number of excellent standard works. The periodicals devoted to bee-culture are also excellent, so that a beekeeper who falls behind the times with so much good literature within his reach has only himself to blame. Every beginner should not only secure and read up one or more standard works, but he should also subscribe to at least one good periodical. Any of the following may be recommended. They may be obtained through booksellers, or from those firms who cater for beekeepers.

Standard Handbooks.

" The A B C and X Y Z of Bee-culture," by Root.
" Langstroth on the Honey-bee." Revised.
" Cook's Manual of the Apiary."
" Fifty Years among the Bees," by Dr. Miller.
" The Australasian Bee Manual," by Isaac Hopkins.
" Beekeeping," by E. F. Phillips.
" Management of Out-apiaries," by G. M. Doolittle.
" Practical Queen-rearing," by Frank C. Pellett.
" Beekeeping for Beginners," by F. C. Baines.

Periodicals.

New Zealand Beekeepers' Journal. Monthly.
Gleanings in Bee-culture. Fortnightly.
American Bee Journal. Monthly.
British Bee Journal. Weekly.

Monthly instructional notes on bee-culture are published in the Department's *New Zealand Journal of Agriculture,* which may be secured on payment of an annual subscription of 4s.

THE HIVE TO ADOPT.

The keeping of bees in common boxes is not permitted under the Apiaries Act. The method was a most wasteful one, with the accompanying system of sulphuring the bees at the end of the season for the little honey obtainable. The practice was also dangerous, because the combs could not be readily removed and examined for disease.

The Langstroth Hive.

The Department, in giving advice in this matter, and selecting a particular hive for recommendation—the original Langstroth hive with modifications—does so for two distinct reasons: firstly, because the hive is generally considered to be the best of those now in use; and, secondly, because it is in general use in every part of New Zealand. The latter reason alone should be a very important one to beginners, as it enables the manufacturers to supply them cheaper on account of having to keep only one kind in stock, and, being of one standard pattern, they are changeable and saleable all over the Dominion.

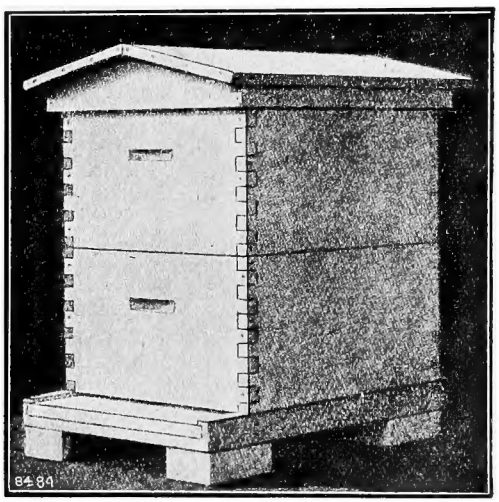

Fig. 1.—The Dovetailed Langstroth Hive.

In 1851 the Rev. L. L. Langstroth perfected the hive which now bears his name, and gave it to the world. It is astonishing when we realize how perfect the principle must have been when it left his hands, for, notwithstanding the many attempts since made to improve upon it, the Langstroth hive remains to-day not only the same, but the foremost in use and popularity among the most experienced apiarists in the world. We rarely hear at the present time of such hives as the Quinby, Adair, American, and Gallup, yet these were favoured at various times; they have gone, and the Langstroth remains.

The Dovetailed Langstroth Hive.

A hive that is now finding much favour in New Zealand is the dovetailed hive. The inside dimensions are the same as those of the Langstroth, and carry the same frames. (See Fig. 1.)

Whether the beekeeper is working on a small or a large scale he should aim at uniformity, and, in building up an apiary, decide at the beginning on the style of hive and frame he is going to use, and

continue on these lines. Non-fitting supers and frames mean extra labour, and lead to endless trouble in the long-run. The hives principally in use in the Dominion are the ten- and twelve-frame Langstroth, and experience of his district will enable the beekeeper to decide as to the best one to adopt. He should make careful inquiries from beekeepers of long standing in the district as to the best style of hive to use.

The Bottom-board.

The bottom-board is a decided improvement on anything previously offered. The chief advantage of this style of board (invented by Danzenbaker) is as follows: It is reversible. During the busy season, when the bees require plenty of room, the board is placed with the wide entrance up; this entrance, being 14 in. by $\frac{7}{8}$ in., is large enough for the strongest colonies. When the bees are prepared for winter the board is reversed, and the entrance is then reduced to 14 in. by $\frac{3}{8}$ in.; this can be still further reduced when necessary by placing a block of wood of any desired length along the alighting-board. In the spring again the wide entrance is clear and sweet, having had a current of air passing over it all the winter. The bottom-board is $23\frac{1}{2}$ in. long. The cross-pieces are tongued and grooved, and make a complete solid bottom, which well deserves its world-wide reputation.

The Stories.

The dovetailed or lock-corner stories are so constructed that each part fits tightly into the other parts, forming when finished a perfectly water- and weather-tight job. There are no cleats or rabbets to get knocked off or broken, the stories sitting compactly and squarely one on top of the other. The dovetails should be given a thin coat of paint, and put together while the paint is still wet.

FRAMES.

There are several frames in general use in the Dominion. These are standardized to fit the Langstroth hive. Those in general use are the Simplicity, the Hoffman self-spacing, and the staple-spaced frame. The Hoffman self-spacing frame recommends itself when bees have to be moved from one location to another. The Simplicity frame has to be spaced by hand. This needs a great deal of extra labour when handling the bees. When using this frame care should be taken to accurately space them, or irregular combs will result.

FIG. 2.—THE STAPLE-SPACED AND THE HOFFMAN FRAME.
Photo, F. A. Jacobsen.]

The staple-spaced frame is recommended for its simplicity and efficiency. In districts where the bees gather much propolis the frames may be handled rapidly and without breakages, for it is impossible for the bees to propolize one frame to another. This feature alone in the

course of time will bring it into universal use, as in a large apiary a considerable amount of time is saved in manipulating colonies. In place of the wooden projecting shoulders for the purpose of self-spacing, as in the Hoffman frames, small staples are driven into the wood on alternate sides, the end bars being the same width from top to bottom. The staples are driven into the top bar on alternate sides about 1 in. from the ends, so that they project $\frac{5}{16}$ in.; thus, whichever way the frame is inserted in the hive, the correct spacing-distance is gauged by the staple.

The assembling of frames should receive every consideration. There are many plans for curtailing the labour involved, but whatever method is adopted strict attention must be given to proper nailing. Neglect to secure frames properly will lead to endless worry when brought into use.

Wiring Frames.

All frames bought from the manufacturers have three holes through each end bar. These holes are for the purpose of wiring, to prevent the foundation, and later the combs, breaking down on account of heat or when extracting. No. 30 tinned wire is used for this purpose, and the wire must be drawn taut and fastened. Good wiring will enable the beekeeper to handle the combs freely, and even in very hot days there is no risk of their falling from the frames, as is sometimes the case when wiring is not adopted. In using full sheets of foundation it is a distinct advantage to use wire. This holds the foundation in position, and good strong combs are produced. There are many methods of wiring frames, but perhaps the simplest and quickest is to lay the frame flat on the bench, having the spool of wire running freely on a spindle. Partially drive two small tacks in the edge of each end bar, one opposite the top hole and one opposite the bottom one. Now thread the wire through the top holes, starting by the top tack, then back through the centre holes and down through the bottom ones. The end of the wire is now twisted round the bottom tack, which is then driven home. After making the wire taut it is twisted round the top tack, which is then hammered in and the wire cut, thus completing the operation.

Fitting Foundation to Frames.

It is not desirable to put the foundation in the frames much before they are required in the hives, otherwise the wax is apt to become somewhat brittle, and the wedges sometimes become loose and allow the foundation to drop. It is important that the sheets of foundation should be well fastened right along the top edge. Care must be taken to see that this edge is perfectly straight, for if one end breaks loose the weight of the bees clustered on it will soon crumple it down, resulting in the ruin of that particular comb, and it will in all probability spoil the next one also.

The straight edge should be inserted into the centre groove of the top bar. In this, as in all manipulation, practice alone makes perfect. The best method is to hold the frame (previously wired) upside down with the outer groove towards one, then rest the sheet of foundation on the wires, and by taking it between the forefinger and thumb at the ends it can be easily inserted by a slight saw-like motion. Make certain the edge reaches the bottom of the centre groove right along its entire length. The wedge is then placed in the outer groove. If the wedge is examined it will be noticed that one edge is cut straight

and the other on the bevel. In putting in the wedge it will be found that by placing the bevelled edge towards the centre and the straight edge to the outside it can be pressed home much easier and will grip the sheet of foundation much firmer.

FIG. 3.—SPUR WIRE-EMBEDDER.

Another and perhaps a better method is to fasten the foundation to the top bar with melted wax; a wax-tube may be used for this purpose, but a spoon is equally effective. The method is to hold the frame upside down with the foundation in place at a sufficient angle to allow the melted wax to run down the top bar by its own gravity, thus fastening the sheet as it goes.

After having wedged the wax in, the wires should be embedded in the wax. Perhaps the best method is to use the Spur wire-embedder. The frame containing the wax is laid on a piece of board cut to loosely fit inside the frame. The latter is placed with the wires up, and the spur rolled along the wires, at the same time applying sufficient pressure to embed them in the wax.

MAKING HIVES.

There is no reason why a person handy with tools, and with spare time on his hands, should not make his own hives, but it must be understood that they should be made very accurately. On the other hand, a person may find it to his advantage to purchase all he requires from the manufacturers. In the former case one at least should be purchased, in order to have an accurate pattern to work from. The internal fittings, such as frames and sections, should certainly be procured from the manufacturers, as it is wellnigh impossible to make these accurate enough without machinery.

A very good plan when more than one hive is wanted is to get one made up, and the rest in the flat, in parts ready to be nailed together, and so save in cost of carriage.

MATS.

It is necessary for those using gable covers to place a mat over the frames in the top super; otherwise the bees will go up and build combs in the cover. These mats can be cut from clean sacks, canvas, or other suitable material. During cold weather it is advisable to place additional mats to keep the bees as warm as possible. It is also an advantage to place two sticks across the frames under the mats before winter sets in, to allow a bee-passage during excessive cold weather. When mats become damp remove them and replace with dry ones. Wood mats made of 3-ply material are sometimes used, but they are more expensive, and are not recommended where the bees gather much propolis.

COVERS.

The use of covers of any particular design must be left to the apiarist. Generally speaking there are two in use in New Zealand—the flat and the gable. It is claimed for the gable cover that it affords better ventilation, and is not so unsightly. The flat cover, on

the other hand, has distinct advantages and is coming into general use in the Dominion. The most important point is to see that the covers adopted by the beekeeper are not allowed to leak. Care should be taken to paint well, and in districts where excessive rains are experienced the roofs should be covered with zinc or waterproof material. " Keep your bees dry " should be the slogan of all beekeepers.

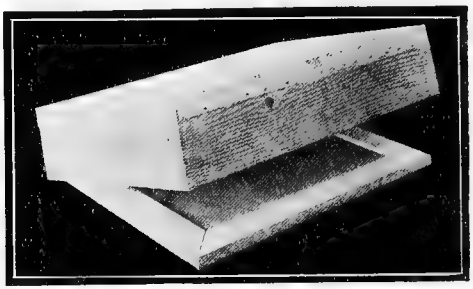

FIG. 4.—WOOD MAT WITH FLAT ZINC-COVERED TELESCOPE COVER
Photo, F. A. Jacobsen.]

SHALLOW FRAMES AND SUPERS.

Many beekeepers who go in largely for extracted honey now adopt the shallow super containing half-frames, or frames having a depth of about half the standard Hoffman frame. It is found that these are much easier to handle, being lighter than a full super. It is also claimed that such frames are much easier to uncap, as one slice of the uncapping-knife will remove all the cappings. Another advantage is that there is less need for queen-excluders, because the queen seems less inclined to lay her eggs in the shallow combs. Those intending to adopt such frames should, when purchasing the extractor, see that the baskets are sufficiently large to hold two such frames. Perhaps, however, the greatest advantage with these frames is that room can be given more gradually in the spring, and the bees are more inclined to work earlier in shallow supers. Also, they can often be finished towards the end of the season, where full-depth frames would be unfinished.

A CHEAP FRAME HIVE.

Though there may not be much gained in the long-run by making any other than good substantial hives in the first place, especially by those who can construct their own, there may be settlers to whom the question of saving a shilling or two upon each hive is a consideration. In such cases the following directions for converting a benzine-case into a frame hive of the same dimensions as the standard Langstroth, and which complies with the Apiaries Act, should be of service :—

Procure a complete and sound petrol-case and carefully take to pieces. Then rabbet the ends on one edge to a depth of $\frac{7}{8}$ in. by $\frac{1}{2}$ in. to carry the frames. A tin rabbet should be nailed on the inside, to stand $\frac{1}{4}$ in. above, on which the frames will rest. Now cut the sides so that they measure 20 in. Nail together, and this will give a hive the inside dimensions of which are $18\frac{1}{4}$ in. by $14\frac{1}{4}$ in. by $9\frac{5}{8}$ in. A loose bottom-board may be constructed 24 in. by 15 in. wide. Nail on the

board three strips of wood, $\frac{3}{8}$ in. by 1 in., running along two sides and one end, so that when the hive is rested on the bottom-board it will leave an entrance $\frac{3}{8}$ in. deep. Top or surplus boxes can be made in the same way.

FIG. 5.—PETROL-CASE HIVE.

Photo, F. A. Jacobsen.]

Beginners should purchase Hoffman self-spacing frames from the manufacturers, as they need to be very accurately made, and are difficult to make by hand. If it is desired, however, to construct frames the following are the dimensions :—

Cut the top bar $\frac{15}{16}$ in. wide by $\frac{3}{4}$ in. deep, and $18\frac{3}{4}$ in. long. Shoulders should be cut out on ends $\frac{7}{8}$ in. long, leaving a thickness of $\frac{1}{4}$ in. to rest on the fillets. The ends should be $8\frac{1}{2}$ in. long, the same width as the top bar, and $\frac{3}{8}$ in. thick; bottom bar $17\frac{1}{2}$ in. long, $\frac{3}{4}$ in. wide, and $\frac{1}{4}$ in. thick. There are ten frames to each hive.

The best roof to use is a flat one, and may be made from the surplus timber from the benzine-case, and should telescope to a depth of 3 in. over the hive. Cover the top with ruberoid or other waterproof material, and let it overlap the edges. A capital waterproof covering can be made by first giving the wood a good coat of thick paint, and, while wet, laying on open cheese-cloth (not butter-cloth), letting it overlap the edges, and painting over it. The paint on the wood will ooze through the cloth, and the covering will last for years—no tacks are needed. Light-coloured paint is best, as with this the hive will keep cooler when exposed to the sun than if painted a dark colour.

The actual outlay for such a hive, allowing 6d. for the box, would be approximately 1s. 6d., providing the person made his own frames. With the additional comb-foundation, which is necessary to complete the hive, the total outlay would be about 10s. There are a large number of these hives in use at the present time, but they are not very durable. When setting the hives out, keep them raised 5 in. or 6 in. off the ground on bricks at each corner, so that there may be good ventilation underneath.

WHEN AND HOW TO START BEEKEEPING.

One of the questions most frequently asked by the would-be beekeeper is, "When should I start beekeeping?" Probably no time is better than when the bees are swarming. If the beginner procures a good prime swarm, leaves it in a clean box for three days, and then hives it in a new hive, on new frames, with full sheets of foundation, he has made the best start it is possible to make in beekeeping. The leaving of the swarm in a box for three days is purely a preliminary measure in case there is any disease in the apiary from which the swarm is procured. By the end of three days the bees will have consumed the honey they brought from their old home, and at the same time have disposed of the foul-brood germs (which are innocuous to the adult bee), and be ready and willing to be transferred to their permanent home to start brood-rearing in earnest.

As the bees will have become used to their box by the end of three days, it is as well to carry out the transfer with care. It should be done at sundown on the third day. The hive should be placed in position, a clean sack spread over the alighting-board and surrounding ground, and the hive-body raised from the bottom-board about an inch or so by means of a stone or piece of wood. The box should be firmly grasped with both hands, inverted over the sack as near the hive as possible, and the bees dumped with a brisk movement on to the alighting-board. One shake will dislodge the greater part of the cluster, and the few remaining bees can easily be shaken out and the box taken away. Be sure the queen is out of the swarm-box, and the bees will crawl in a steady stream into the entrance—their progress becoming more rapid as soon as the queen has entered the hive. When the queen is safely inside, the hive-body should be lowered and the entrance slightly contracted.

It is advisable to place a feeder inside the hive. Even if the weather is good and a fair supply of nectar available a few pints of good warm syrup fed for a day or two after hiving will work magic with the new colony, and enable it to build up in time to yield a surplus when the main flow sets in.

The beginner should always start in the spring, and on no account should he attempt to commence with established colonies unless they are purchased from a breeder who guarantees his bees to be clean. Old colonies are too apt to be homes of disease, and are only fit to be handled by the experienced apiarist.

If swarms are unprocurable, which may be the case in some seasons on account of weather conditions, arrangements can be made to purchase sufficient three- or four-frame nuclei to make a start. These are procurable at almost any time during the working season. The advantage of nucleus colonies is that a good start can be made, as when they are received all that is necessary is to transfer the combs to the full-sized brood-chamber. Nucleus colonies are usually quoted without queens, so that it is necessary to arrange for sufficient queens at the time of ordering.

Generally, Black bees are the most convenient to start with. Once the beekeeper has made some headway and gained experience he can then Italianize the apiary by purchasing queens from some reliable queen-breeder. Italian bees are quieter, more vigorous, and better honey-gatherers.

Sections and Extracting-frames.

The raising of section honey by beginners is more difficult than the production of extracted honey; yet it is usually advocated because it saves the initial outlay for an extractor and its attendant necessities. It is more difficult because the bees are loath to enter the small section boxes, whereas when full or half frames are adopted the workers more readily take to them. If the honey is not meant for sale it is suggested that the ordinary frames be used, as the combs may be cut from the frames and the liquid strained through cheese-cloth, or if it is preferred in the comb it may be used in this way also.

The most popular section box is $4\frac{1}{4}$ in. by $4\frac{1}{4}$ in. square, but these are always purchased in the flat and are put together by the beekeeper. There are three grooves made for folding purposes, which must be made wet, or at least damp, before folding, otherwise they will break. A saw-cut divides the top end of the section for the convenience of fastening the foundation. An effective method of inducing the bees to start work in sections is to place one or two "dummies" or "bait sections" in each super. These are partially finished sections that have been held over from the previous year, and generally produce the desired result.

All sections should be removed from the hives as soon as they are filled, as they are less liable to be daubed with propolis or "travel-stained" by the bees. To produce section honey most suitable for marketing, separators between each frame are used. These are of tin or very thin sheets of wood. In attaching the separators to the section frames tack on one side only.

Cost of a Beginner's Outfit.

One hive in the flat, with foundation, bee-smoker, and veil: Approximate price, £2 6s. 3d.

Five up-to-date hives in the flat, all complete, with sufficient medium brood-foundation (100 sheets), one bee-smoker, and veil: Approximate price, £8 5s. 3d.

THE APIARY.

Location of First Importance.

Those entertaining the idea of establishing an apiary must first look for a suitable location. The etiquette of the bee world prohibits encroaching on another person's site—that is to say, do not place your bees near anybody else's, especially if the other person has fully stocked the district. Find some country rich in clovers and bee-forage, and free from any restriction as above, and there secure a site and establish your plant.

Perhaps there is no more important question for the beekeeper than location. Upon his ability to select a suitable district in which to start beekeeping will depend his future success. There are few districts in the Dominion where bees cannot be kept in small numbers, but successful establishment of a commercial apiary will largely depend upon the beekeeper's knowledge of the nectar-secreting plants. It is generally recognized that the main nectar-flow in New Zealand is produced from white clover and catsear, but it will be found to be a distinct advantage if the apiary is established in a district near patches of native bush or

where the golden willow is abundant. Most of the indigenous trees and willows flower early, and the nectar from these sources is very valuable to the beekeeper, as it provides stores in the spring.

In districts where the beekeeper has to depend entirely upon white clover a careful watch must be kept on the stores, and very often artificial feeding has to be resorted to in the spring and carried on until the appearance of the clover-bloom. This is often expensive, and can be usually avoided by selecting a site where at least a moderate spring flow may be anticipated. The rich dairy pastures of both the North and South Islands, and localities where cattle-raising is carried on extensively, provide suitable sites for commercial apiaries, while country which is used for sheep-grazing is not profitable, as the clover pasture is usually eaten bare. Instances have come under notice where abnormal crops have been secured in purely sheep-country; but they are too infrequent to be taken into consideration, and consequently this class

Fig. 6.—Tagasaste Hedge (only Four Years old).
Photo, F. A. Jacobsen.]

of country should be avoided. Essentially the main requirements are feed and shelter; and if the apiarist is fortunate enough to locate his bees in a position where there is an abundant supply of nectar-secreting plants, good shelter can be easily provided.

Site and Shelter.

Slightly undulating country is much better than a flat open site for a bee-farm. The natural shelter obtained in the former is a great advantage, as it affords the bees protection when on their foraging expeditions. In any case, the apiary should be well sheltered, and in the absence of shelter of some kind it should be erected at the start. A depression in the ground will assist, and a temporary fence 6 ft. high of boards, or of tea-tree brushwood, on the windy sides will do while shelter trees or a live fence are growing. The advantages of a properly sheltered apiary cannot be too favourably commented on, as the apiarist can work his bees in almost all weathers and in greater comfort.

If the hives are protected the bees can take exercise every sunny day during the winter months; and this exercise is very essential to their well-being, as it is only in flight that bees can properly rid themselves of their excreta. Where sufficient shelter is not provided numbers of bees are lost through being beaten down by cold winds and rendered unable to return to their hives.

High trees near an apiary are sometimes objectionable, as they afford an opportunity for swarms to settle out of reach, and also create considerable draught that has a tendency to make the bees vicious. For a rapid-growing shelter-hedge giant privet and tagasaste (commonly called "tree-lucerne") are to be recommended, where cattle cannot get within reach of them. Tagasaste grows very rapidly; but it can be considered suitable only for a temporary hedge, as it is likely to become a prey to the borer. Still, it is worth planting at the same time as the more permanent hedge-plants are put in, as it affords shelter

FIG. 7.—A WELL ARRANGED AND SHELTERED APIARY.
Photo, F. A. Jacobsen.]

very rapidly and abundance of bee-forage at times when it is most valuable. If a double hedge of tagasaste and giant privet is planted the rows should be 6 ft. apart. In any case, plant plenty of tagasaste in waste places for bee-forage.

Where the surrounding country is hilly the apiary should be situated in the lowest part, if possible, so long as it is not swampy or wet, in order that the bees when coming home loaded will have to fly down instead of upward.

All large apiaries should be established a good distance from a public thoroughfare, especially from a main road where there is horse traffic, otherwise there are pretty certain to be complaints sooner or later, and everything should be done to avoid giving offence. From 100 to 200 yards from a main road should be ample, but much depends on the locality, and the safe distance can be best judged on on the spot.

Honey-producing Hedge-plants.

Common Privet.—A good hardy hedge-plant that blooms white from the middle of November onwards. The scent from this plant is so strong that some object to it close to dwellings.

Escallonia pterocladon.—The best of this kind for hedge-planting. It makes quick growth and blooms freely. A valuable honey-plant, forming a useful and ornamental hedge.

Escallonia macrantha. — Blooms bright-red flowers. A valuable honey-plant, and forms a good hedge.

Escallonia rubra, Escallonia exoniesis, and *Escallonia montevidensis* may also be mentioned. The last named has large spikes of white blooms, and is useful as an ornamental hedge-plant.

Black-wattle (Acacia decurrens). — A fast-growing tree, excellent for general shelter, but not suitable for hedge-planting. Valuable in supplying pollen for bees.

Berberis Darwinii.—Makes a good evergreen hedge for small gardens. Requires clipping twice annually.

Sallow Willow.—Forms a strong hedge and is very valuable to bees. Blooms about the time fruit-trees are in blossom.

Acacia lopantha.—A good honey-yielder in winter.

Tagasaste.—As previously mentioned.

Area of Ground for a Bee-farm.

Half an acre will afford space for a good-sized apiary and the necessary buildings; but if renting a site, as many do, it would be as well to rent an acre, so as not to be cramped for room in case of extending operations. A good substantial cattle-proof fence around the site should be provided.

Water.

In the spring months, when brood-rearing is at its height, bees require a good supply of clean water in the apiary. If this is not provided they are apt to become a source of annoyance at drinking-troughs and by congregating round the domestic supplies. Brood requires a great deal of water in addition to pollen and honey. The amount depends largely on how much is going on and to what extent nectar is being gathered in the fields. If water is not close at hand many bees are lost in trying to obtain it, more especially as the weather is often changeable and boisterous in the spring. Water should be provided in troughs with floats or filled with pebbles, and placed in a shady spot near at hand; or, where water is laid on, a long board covered with sacking sloping from the top to the ground, allowing the water to drip on this sufficient to keep it damp, may be adopted.

Laying out an Apiary.

The site for the hives should be as level as possible, for convenience of taking appliances and combs to and fro. It should be laid down in grass, which should be kept closely cut, especially near the hives. The best arrangement of the hives in every respect is in straight rows, with entrances facing the north or north-east. Occasionally there is a departure from this form of arrangement, some preferring to place their hives in clusters of three or more, with their entrances in different directions. This is sometimes advisable where queens are

being raised in the main apiary, so as to allow the young queen to locate her hive when returning from flying out ; but in all cases avoid placing them so that the prevailing winds would blow in at the entrance.

A serious mistake is often made in placing hives too close together. Fighting and robbing among the bees is much more likely to take

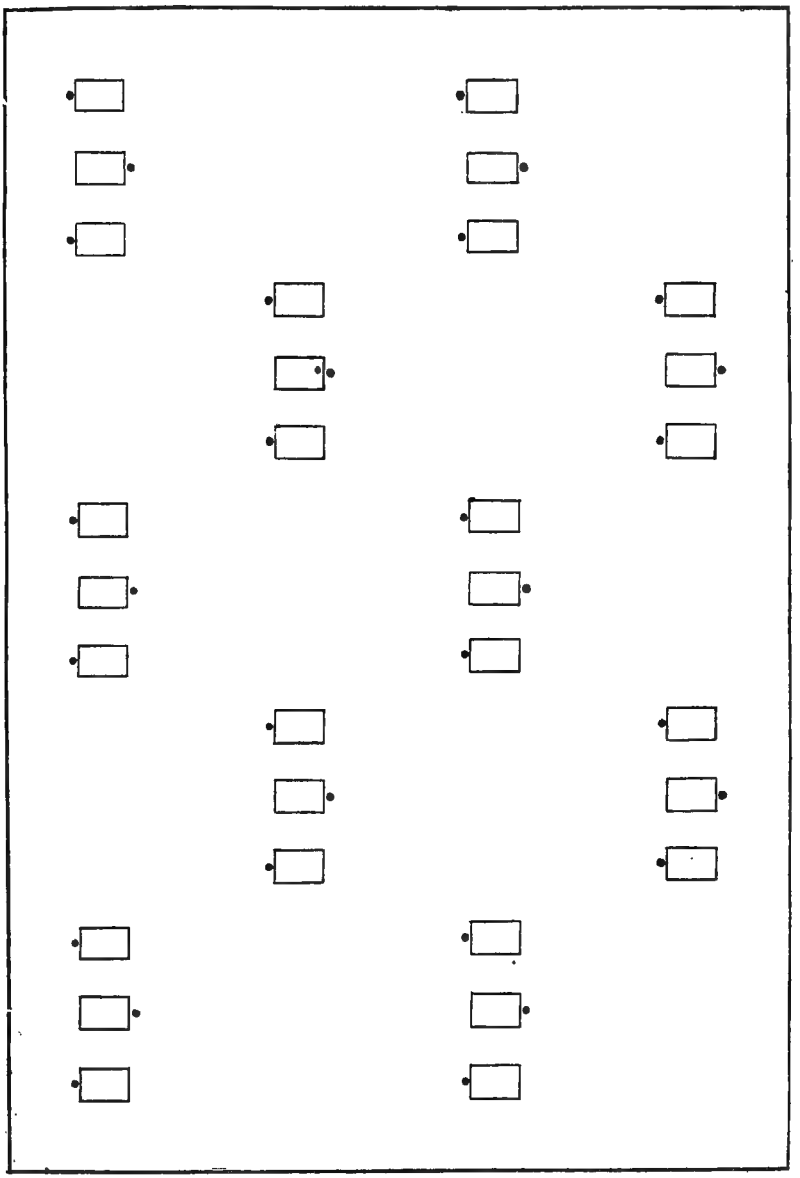

FIG. 8.—ARRANGEMENT OF HIVES.
(Dots denote entrances to hives : middle hives reversed.)

place under such conditions than when the hives are a suitable distance apart. They should be 6 ft. apart in the rows, and the rows 8 ft. apart. There is thus ample space to work at any hive without standing in the line of flight to or from any other hive, and a lawn-mower or scythe can be used anywhere about the apiary.

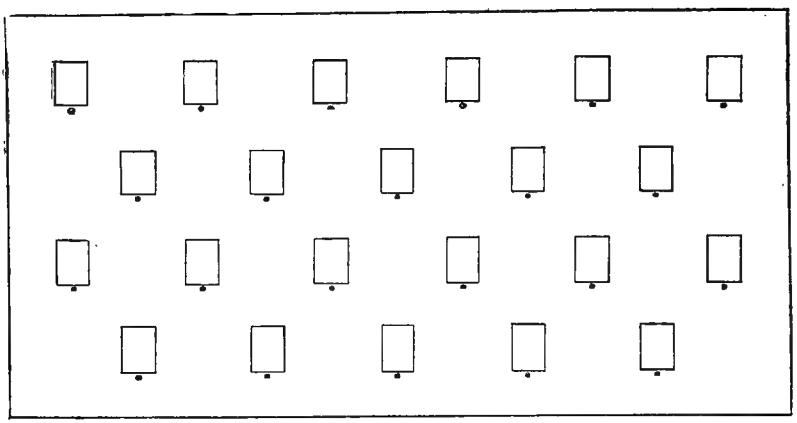

FIG. 9.—ARRANGEMENT OF HIVES.
(Dots denote entrances to hives, which are all on one side.)

KEEPING THE HIVES FREE FROM GRASS.

Long grass and weeds immediately around the hives not only look unsightly, but also form shelter for insects which find their way into these in cold weather. Woodlice are disgusting insects which may often be found in neglected hives in winter by thousands; but by keeping the hives clear of all growth, and changing the mats occasionally, neither these nor other insects will be troublesome.

In no case should hives be placed directly on the ground, or the bottom-boards will soon rot and have to be replaced. The hives should stand sufficiently high above the ground to avoid dampness, and it is an excellent plan to stand them on four half-bricks placed one at each corner of the bottom-board.

Should the apiary be in a permanent situation no better plan can be followed than to provide concrete hive-stands. These stands have been used in New Zealand for quite a number of years, and have saved the users a great deal of labour by preventing the growth of weeds and by affording protection against insect-life. They are expensive to lay down in the first place, but, being permanent, will remain in position indefinitely. If concrete stands are adopted they should extend a few inches in front of the alighting-boards, so as to prevent vegetation from growing too close to the entrances of the hives. In all cases the hives should have a slight cant towards the entrances, in order to permit of the water leaving the bottom-boards readily. The presence of moisture will lead to much loss to the bee-keeper, besides causing the hives to become sour and foul-smelling.

SHADE.

Many amateur beekeepers imagine that hives containing bees need shading, and forthwith place them under trees in dense shade. No greater mistake could be made in bee-culture. Bees love sunshine, and they should be in the open where they can get all the benefit of the sun, summer and winter. Though the shade of fruit-trees—being deciduous—might not be objectionable, there is no need for it. The hives, if painted white or a light colour, and the ventilation

from the entrances properly attended to, are better out free from all obstruction to rapid work. After bees have been located in dense shade for awhile they become very vicious and difficult to handle; and in continuous wet weather, and also during the winter, the inside of the hives becomes damp, and the combs mouldy, which is injurious to bees. Bees themselves indicate when the ventilation is insufficient. When they are seen near the entrance with heads down and their wings vibrating—understood as "fanning"—they need more ventilation, and it should be given by enlarging the entrances.

Apiary Buildings.

A good extracting-house properly equipped is an important adjunct to every apiary. Special attention must be paid to the construction of the building, or the tedious work of extracting and tinning the honey will cause the beekeeper a good deal of anxiety during the working season. It is highly important that ample room should be provided for extracting the honey, uncapping and tinning the honey, also for storing surplus combs during the winter months. Too often sufficient space is not provided, consequently extracting operations are hampered and the work of handling the crop is largely increased. It is essential that good ventilation should be provided. The windows and doors require to be screened to prevent the entrance of the bees, which are liable to become a nuisance during operations. The windows should be hung on centre pivots so that they will swing from the centre, thus allowing them to be revolved. Where bees are kept in small numbers the question of economy may have to be considered, but it is poor policy to work without a certain amount of convenience. The advantages of working in a roomy well-ventilated bee-proof house are many, and the question of expense should not deter the beekeeper from providing the best extracting-house possible. A separate room should be provided for making and painting hives and other necessary operations.

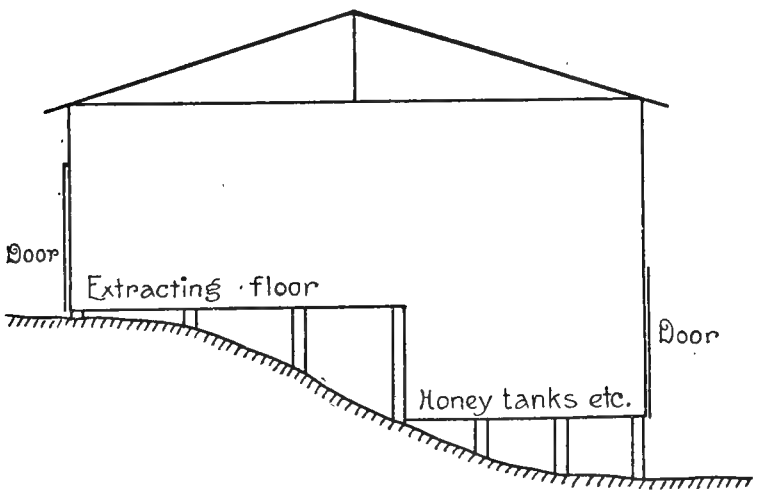

Fig. 10.—End Elevation of Extracting-house built on a Hillside.

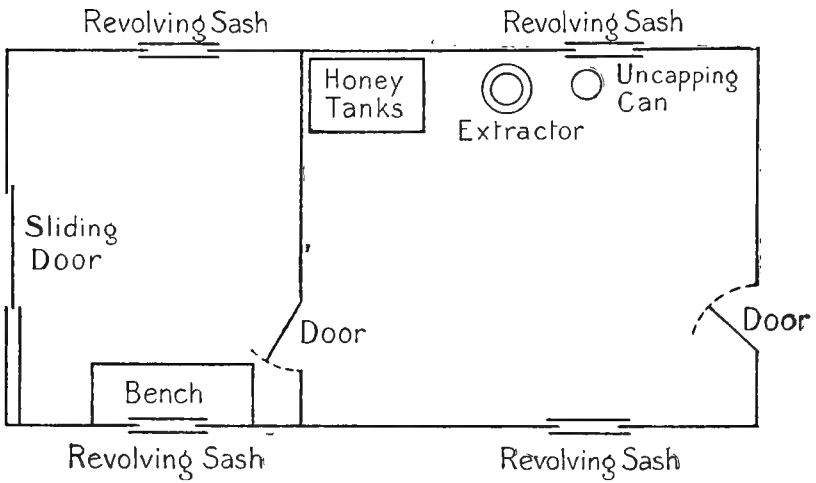

FIG. 11.—FLOOR-PLAN OF EXTRACTING-HOUSE BUILT ON THE FLAT.

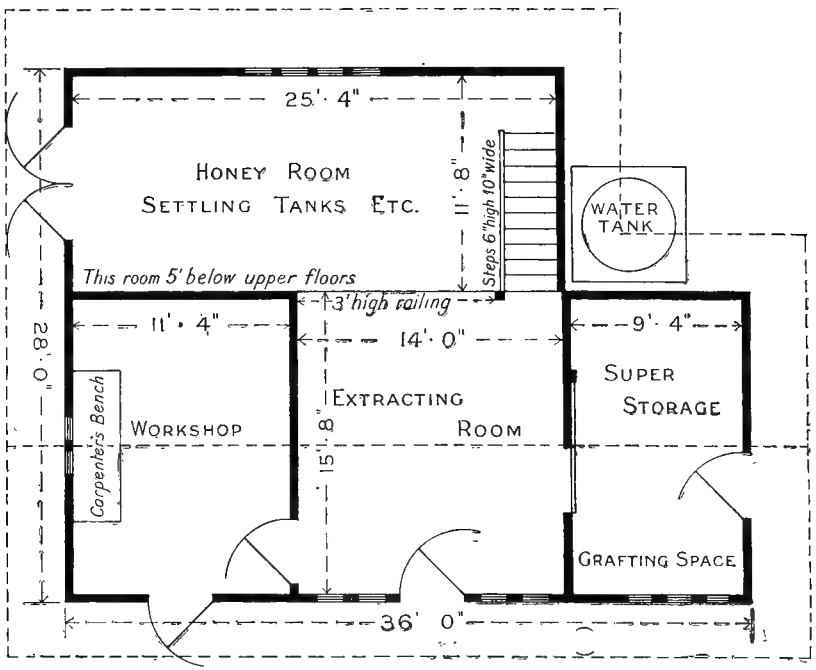

FIG. 12.—PLAN OF HONEY-HOUSE AT TAURANGA HORTICULTURAL STATION (SLIGHTLY ALTERED).

F. A. Jacobsen, del.]

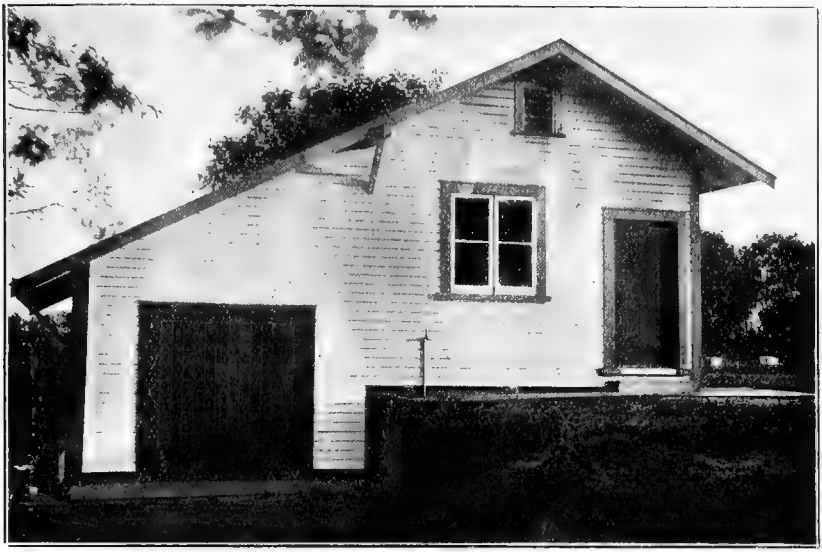

FIG. 13.—TAURANGA HORTICULTURAL STATION HONEY-HOUSE.

Photo, F. A. Jacobsen.]

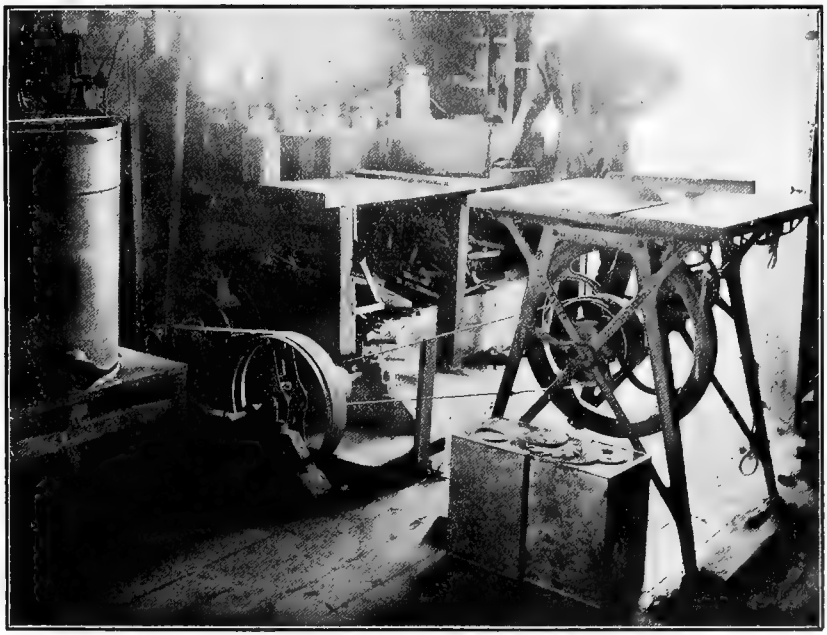

FIG. 14.—INTERIOR VIEW OF AN EXTRACTING-HOUSE AND WORKSHOP WORKED BY ELECTRIC POWER.

Photo, F. A. Jacobsen.]

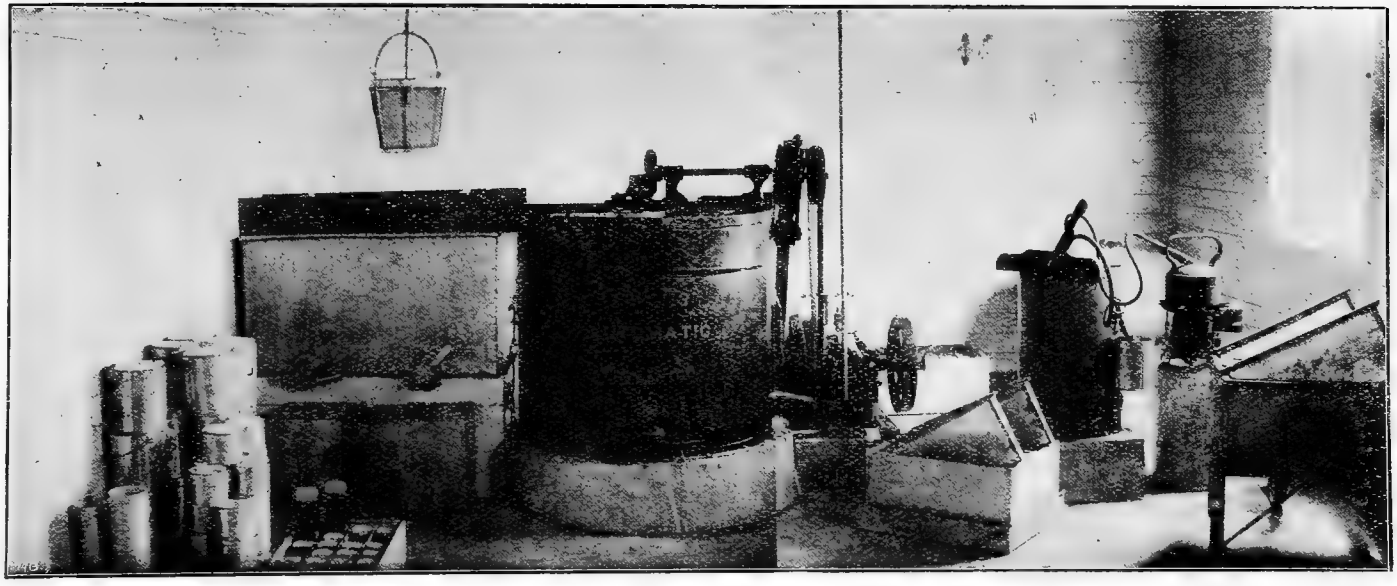

FIG. 15.—INTERIOR OF EXTRACTING-HOUSE OF R. GIBB, SOUTHLAND.
Showing method of arrangement with honey-pump and horse-driven extractor.

Photo, F. A. Jacobsen.

FIG. 16.—A BUSH APIARY WITH EXTRACTING-TENT.
Photo, F. A. Jacobsen.]

HANDLING BEES.

Before any person can be successful with bees he or she must be able to handle them fearlessly. It is to be expected that the beginner will feel some timidity at first, but a little experience should enable him or her to overcome this. A lesson or two from an experienced beekeeper will prove the best help. Do not credit the oft-repeated statement that bees have a particular aversion to some people. A person who thinks this of himself will feel nervous when near bees, and in that condition is likely to do something to irritate them, and unconsciously cause them to attack him. There are other influences which may cause bees to be irritable and sting without apparent reason—viz., a threatening shower, dull days, a temporary stoppage in the flow of nectar, rough handling, killing bees, and quick actions. Experience should bring confidence; if it does not within a reasonable time, it would be better for the person to drop out of beekeeping.

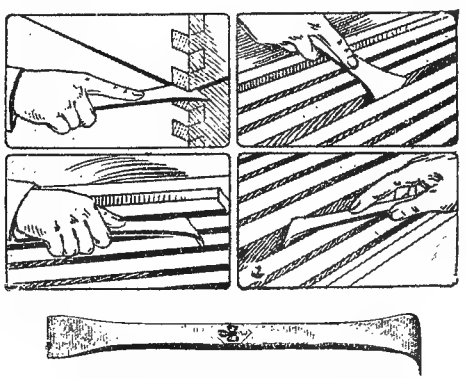

FIG. 17.—HIVE TOOL.

Bee-veil and Smoker.

All beginners should protect themselves with a bee-veil; and a smoker is absolutely necessary, both to the beginner and to the old hand, if he wishes to get through his work rapidly without unnecessarily killing bees. Gloves may be worn until such time as the novice has gained confidence. There are specially oiled cotton mittens supplied now that might be much better than gloves, as the ends of the fingers are free. Gauntlets alone, or elastic bands around the sleeves, when a person is not working with bare arms, are useful to prevent the bees crawling up the sleeves.

Beware of using soft-leather gardening-gloves, as they do not protect the hands completely from stings, and they have the serious disadvantage that after being in use for a time they become more or less saturated with the poison of the sting, which is liable to be absorbed through the pores of the skin when the hands are warm, and so cause irritation of the cuticle in different parts of the body.

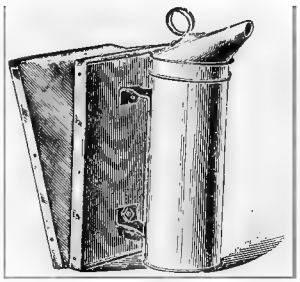

Fig. 18.—Smoker.

Fig. 19.—Home-made Bee-veil.

Smoke is the best and handiest bee-quieter known; a puff or two of pungent smoke will send the bees to their honey, and when they have filled themselves they are docile, and can be handled readily if one is careful. The handiest fuel for the smoker is old sacking rolled up loosely.

How to manipulate a Hive.

The smoker should be well alight and the bee-veil fixed. Blow a few puffs of smoke into the entrance of the hive; then wait for half a minute or so. Next remove the cover without jarring the hive. It may be well to remark here that all movements about the hive should be quiet and deliberate, and there should be no jarring of any part of it, as nothing irritates the bees so much as knocking their hive. Lift one corner of the mat, and blow another puff or two down between the frames while removing the mat. By this time the bees should be generally quiet; but keep the smoker near-by, and if they begin to come up over the frames give them another puff or two of smoke. Care should be taken not to overdo smoking; bees will boil up over the sides of the supers and also out at the entrance. The frames may now

be prised apart, and one of the side frames removed to make room to get at any of the others. When finished the frames can be replaced in their original position and the hive closed.

The best time to handle bees is on fine bright days, when they are flying freely and gathering nectar. The beginner should never interfere with them on dull days if it can be avoided.

Handling Frames of Comb.

When a frame of comb for any reason is lifted from a hive it is usually desired to see both sides of it. To the experienced hand it is an easy matter to reverse it, but the beginner without some instruction would find it very awkward to do so, and with a new comb heavy with honey, and not well fastened to the bottom bar, he might turn it in such a manner that the comb would fall from the frame.

The illustrations show (1) the first position of the frame while examining one side of the comb: (2) the second position; the left hand has been lowered and the right hand raised, while the frame has been partly swung round: and (3) the hands have been brought back to the first position, but the frame is upside down, and the other side of the comb has been brought in view; the same movements are reversed to bring the frame back to its first position. By handling the frame in this manner there is no strain whatever put upon any part of the comb, and nothing is done that will irritate the bees.

Fig. 20.—Handling Bees: Preparing to open Hive.
Photo, F. A. Jacobsen.]

FIG. 21.—REMOVING THE MAT.
Photo, F. A. Jacobsen.]

FIG. 22.—HANDLING FRAMES: FIRST POSITION.
Photo, F. A. Jacobsen.]

FIG. 23.—HANDLING FRAMES: SECOND POSITION.
Photo, F. A. Jacobsen.]

FIG. 24.—HANDLING FRAMES: THIRD POSITION.
Photo, F. A. Jacobsen.]

The Inmates of the Hive.

Drone-bees are the males of the hive, and are reared at the approach of the swarming season to fertilize the young queens. They have no sting, are larger than the workers, and do not provide anything for the support of the colony. When the honey-flow ceases, food is withheld from them by the workers, and they are driven from the hive to perish.

The worker-bees are undeveloped females, and they provide the essentials for the well-being of the colony. They secrete the wax, build the combs, gather nectar and pollen, attend to the requirements of the queen and drones, care for the larvæ, and guard the colony against aggression. They live under the stress of summer work only about six weeks, but during the winter the young bees hibernate and carry the colony through until the spring, when brood-rearing commences.

The queen is the mother of all the inmates of the hive, and lives from two to five years. She will lay her own weight in eggs daily—approximately 2,500—during the breeding season. A remarkable feature of the queen is that she is only fertilized once. She always heads the first or prime swarm issuing from the colony.

The Development Question.

Many seem to be in doubt as to exactly how long it takes the three different eggs to hatch and mature. The exact periods are as follow :—

—	Egg.	Grub.	Pupa.	Full Period.
Drone ..	3 days	6 days	15 days	24 days.
Worker ..	3 ,,	5 ,,	13 ,,	21 ,,
Queen ..	3 ,,	5½ ,,	7 ,,	15½ ,,

Fig. 25.—A Taranaki Apiary with all Machinery worked by Electric Power.

Photo, F. A. Jacobsen.]

PART II.—PRACTICAL NOTES.

THE USE OF COMB-FOUNDATION.

THE success of modern apiculture hinges almost entirely in the first place on securing complete control over the breeding, and this can be obtained only by compelling the bees to build whatever kind of comb is desired. Under natural conditions, or when in hives and allowed freedom to construct their combs, they invariably build a goodly proportion of drone-comb, which is subsequently utilized for breeding drones. This accounts for the large number of drones in hives where no attempt has been made to control breeding. Drones, as previously indicated, are non-producers—that is to say, they do not gather nectar, or even, so far as we know, do any work in the hives. They consume a large quantity of food gathered by the workers; and where many are present the yield of honey from that hive, and consequently the profit, will be considerably curtailed. Some drones are needed for the impregnation of young queens, but it is found in practice that a sufficient number for this purpose will be bred, even when the breeding of them

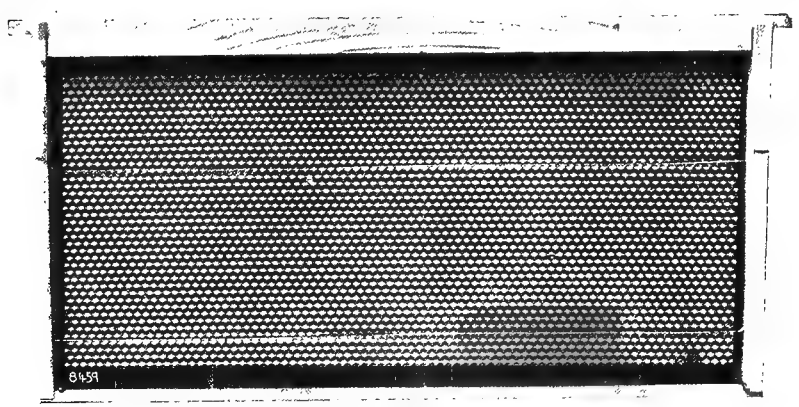

FIG. 26.—FRAME FITTED WITH FOUNDATION.

is restricted as much as possible, by making the fullest use of worker-comb foundation.

The difference between worker and drone comb is in the size of the cells, the former measuring slightly over five to the inch, and the latter a little over four. The proportions are shown in the illustration. The comb-foundation obtained from manufacturers is impressed with the bases of worker-cells, so that it is seldom, unless by accident some portion has stretched, that the bees build other than worker-comb on it. The illustrations will make this clear. Fig. 27 shows a perfect worker-comb built out on a full sheet of comb-foundation, while Fig. 28 exhibits the result of the breaking-away of a portion and the stretching of another portion, due to careless fixing of what was originally comb-foundation. These are very interesting reproductions from photographs taken specially for the purpose of this bulletin. To the right of Fig. 28 can be seen where the bees took advantage of the accident to build drone-comb, and also where on the upper left centre the original worker-

cells have stretched and been utilized for breeding drone-cells. At the lower right-hand corner of Fig. 27 a small portion of the original sheet of comb-foundation upon which the comb is built can be distinctly seen.

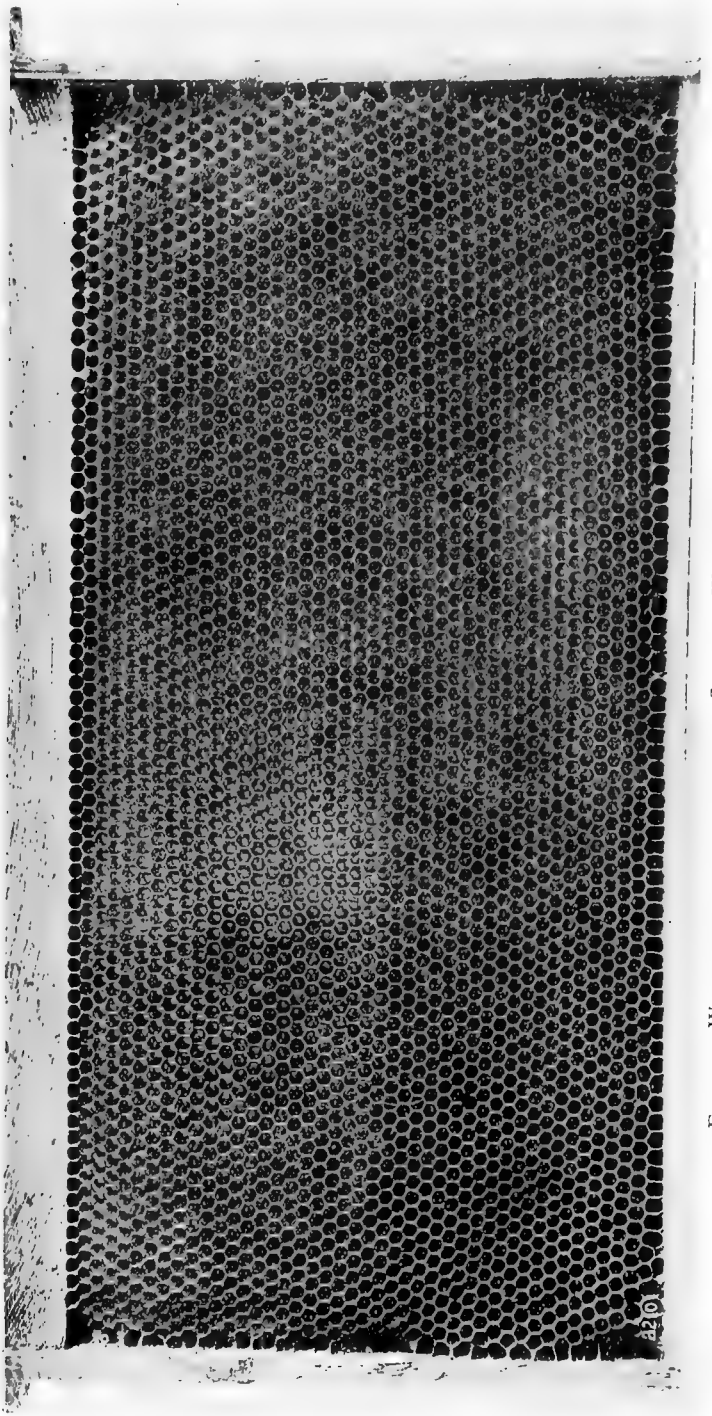

FIG. 27.—WORKER-COMB, BUILT OUT ON A SHEET OF WORKER-COMB FOUNDATION.

Securing control over breeding is not the only advantage gained by a free use of comb-foundation. For instance, a fair swarm of, say, 5 lb. weight hived upon ten sheets of comb-foundation will have in thirty-six hours, in an average season, several of the sheets partially

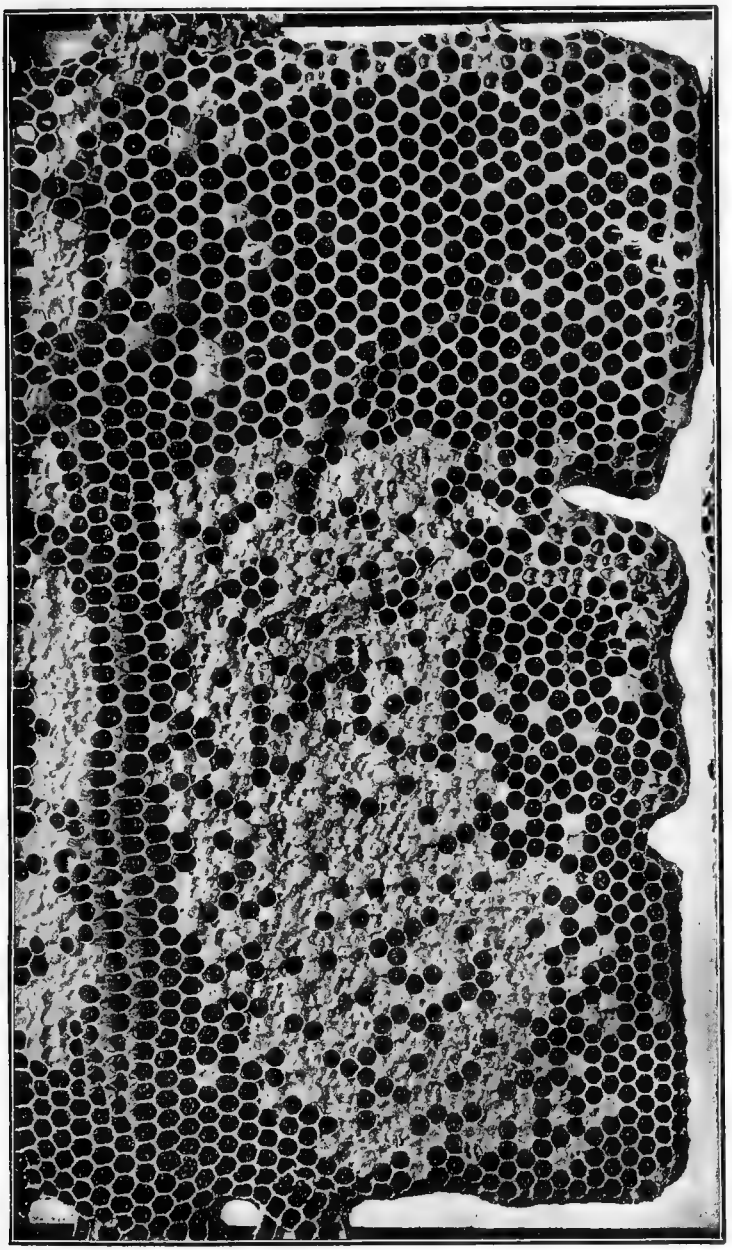

FIG. 28.—COMB SHOWING DRONE-CELLS TO THE RIGHT AND UPPER LEFT CENTRE, AND DISEASED (FOUL-BROOD) WORKER-CELLS IN THE REMAINDER.

worked out and a goodly number of eggs deposited in the cells, and in forty-eight hours the queen can henceforward lay to her full extent. In from a week to nine days (depending upon the weather) the whole ten sheets will be worked out into worker-combs and a great deal

occupied with brood and honey, and the hive will then be ready for the top or surplus honey super. In twenty-two or twenty-three days young worker-bees will begin to emerge, and from this on the colony will grow rapidly in strength from day to day.

Contrast this favourable condition of things with what takes place when only narrow strips of comb-foundation are furnished. It will take under the same conditions a similar swarm from four to five weeks to fill the hive with comb, and then there will be a large proportion drone-comb, which is the very thing to guard against. Consider what the difference in time alone will make in the profitable working of a hive, especially in a short season. Then, again, with regard to the difference in the initial expense between using full sheets and strips, which seems to influence many beginners in favour of the latter system: even in that there is a gain in favour of the method advocated. For instance, the cost of filling the ten frames with sheets of best comb-foundation would be (including the expenses of getting them) about 6s., and with strips—say, two sheets—1s. 5d.: an apparent saving in the first instance of 4s. 7d. We must then consider the matter from another point of view.

The consensus of opinion among the most experienced beekeepers is that there is an expenditure of about 12 lb. of honey in making 1 lb. of wax—that is, the bees consume that quantity of honey before secreting 1 lb. of wax. The ten sheets of comb-foundation weigh 1½ lb. and cost 6s. For this there would have to be an expenditure of 18 lb. of honey, which, at the average wholesale price of 6d. per pound, is 9s., so that there is a saving of 3s. in favour of the full sheets, to say nothing about all the other advantages gained.

This shows clearly enough the advantage of making the fullest use possible of comb-foundation.

New Zealand Comb-foundation.

It has been asserted that there is a danger of introducing disease by using comb-foundation made up from local wax. This is contrary to fact, and it would be an easy matter to quote instances of foul-brood being eradicated from large apiaries where only locally made foundation had been used. The heat that the wax is subjected to prior to its being converted into foundation is in itself sufficient to destroy the destructive germs of foul-brood, and the beekeeper need have no fear of introducing disease by using the locally made article, even though the wax has been won from bees that have died from the disease. So satisfied was one of our large beekeepers that the destructive bacteria of foul-brood are killed when preparing the wax that, although for several years he has not had the slightest trace of the disease, he readily consented to allow his apiary to be used for the purpose of carrying out a series of exhaustive experiments to determine that it is quite safe to use foundation made in the Dominion. The claim that the locally manufactured article is free from bee-diseases is quite justified; moreover, the experiments which have been carried out are sufficient to put the mind of the users at rest.

SWARMING.

Leading authorities are mostly agreed that the instinct for natural increase is the cause of swarming. Many beekeepers attribute swarming to overcrowded brood-chambers, lack of ventilation, and poor queens; but it will often happen that swarms will issue when none of these conditions is present. On the other hand, bees will refuse to swarm when everything is apparently conducive to their doing so. It must

be left to the beekeeper to decide whether he will increase his stock by natural swarming or artificially. If the former plan is adopted it will be wise to only allow strong colonies to swarm. If a weak hive is showing symptoms of swarming—*i.e.*, if the bees are building numbers of queen-cells—these should be removed and the colony prevented from swarming until such time as it can be requeened. A swarm from a weak hive is not worth encouraging, because it consists simply of a poor queen, probably failing, and a small cluster of bees.

If, however, a strong colony has made up its mind to swarm, the best thing to do is to allow it to throw a prime swarm, and then to most rigorously guard against after-swarming. This can best be done by cutting out all the queen-cells save one after the prime swarm has issued. Even then it is wise to carefully watch the parent hive for about ten days after the departure of the prime swarm, because there will be eggs in the old hive, and the bees may continue to raise queen-cells.

Hiving Swarms.

When a swarm issues, if headed by a laying-queen, it will, after circling in the air for a short time, settle probably on some tree or shrub. As soon as the swarm has settled into a cluster shake all the bees into a box. Place the box on its side and cover with a clean sack, leaving a small opening for the bees to fly in and out. The swarm may be left alone until late in the afternoon. If by that time it has formed a compact cluster in the box the beekeeper will know that all is well and that it contains a queen. Have the hive in readiness, placed in position where it is to remain. Place a clean sack in front of the entrance, having propped up the front to allow the bees a good space to enter the hive. Dump the bees on the bag as close to the entrance as possible, and very soon they will make their way into the hive. The bag can then be removed and the hive lowered into position.

In districts where foul-brood is present, or if the beekeeper is suspicious of his own colonies, it is wise to leave the swarm in the box for at least three or four days. At the end of the period place the bees in the hive as described above, always choosing the late afternoon for settling them in their permanent home. The object of this practice is to induce the bees to utilize the honey in their sacs to draw down comb, and thus rid themselves of honey from the parent hive; if it is followed there will be far less trouble from disease, and swarms will invariably start clean.

Unless there is a good honey-flow, or if bad weather sets in, the swarms should be fed inside the hive. This is to give them a good start, and to provide them with material for producing wax. Excellent combs can be produced from sugar-syrup. It is advisable in all cases to hive the swarm on full sheets of foundation, and thus take advantage of the natural instinct of the bees to produce wax after swarming. Very little time will be gained if the bees are put on to drawn-out combs. In the course of a few days it is advisable to examine the frames to note if the queen is laying and to see if the foundation is being drawn out. When the swarm is placed in the hive do not forget to put a mat on top of the frames. It often happens that unless precaution is taken to confine the bees they will commence operations in the roof of the hive, more particularly if gable roofs are used.

Prevention of Swarming.

Frequent examinations of the colonies—every week or ten days during the swarming season—for the purpose of cutting out queen-

cells is a help; but this requires considerable work, and since it frequently fails in spite of every care it is not usually relied on.

The occurrence of swarming is largely due to overcrowded brood-chambers; hence give the queen plenty of room to lay. A suitable plan is to give a new brood-chamber comprising two drawn combs and the rest frames of foundation. Secure the queen and confine her in this new chamber below a queen-excluder, placing the old brood-nests directly above, thus giving additional work for the young bees and plenty of room for the queen to lay. If for some reason this plan is not desirable, the brood may be equalized by robbing the stronger colonies for the benefit of the weaker.

A young queen in the hive is an outstanding factor of success, as bees are rarely inclined to swarm with a young queen if they have *reared her themselves under natural conditions*. This feature, however, is not always satisfactory to the beekeeper, as he frequently buys young queens in large numbers from a queen-breeder. He still has to contend against the swarming impulse, although in a lesser degree. A beekeeper rearing his own stock should select not only prolific queens to produce from, but those that have previously shown the least tendency to swarm. There are also other reasons why young queens should be employed, and the practice of introducing them in the spring before the swarming season commences, at intervals of not longer than two years, is a very excellent one. Autumn introduction is also commendable, as the full tide of a queen's maturity is gained from the commencement of the following spring. In order to follow the lives of the mothers as closely as possible and avoid mistakes, some system of recording the various ages must be employed. In addition, notes should be taken of their general behaviour, such as tendency to swarm, prolificness, and gentleness. Such notes will prove of great value in selecting a mother of future queens.

Ventilation also plays an important part in controlling the natural inclination to swarming, and care should be taken to provide sufficient at all times of the season. A well-known and effective method is to place blocks 1 in. in height under the two front corners of the brood-chamber. In the very flush of the honey-flow additional ventilation may be given by drawing one of the supers forward over the rest, which forms two additional entrances and permits the workers to escape to the field without having to traverse the whole depth of the hive.

No single system will be found universally effective. Climatic conditions also frequently play an important part in bee-behaviour. It will, however, be found that the methods here given, or variations of the same, employed either singly or in combination, will materially assist in the prevention of swarming.

Prevention of After-swarming.

In many cases a prime or first swarm is desirable, and in others they often issue in spite of all precautions. It is a simple matter to hive the swarm, but to combat the results in the parent colony arising from this condition entails special action. Persistent after-swarming is one of the discouraging features of natural increase, and is often hard to stop. A good plan is to place the swarm on the old location, removing the parent colony to a new stand some distance away. The immediate result is for all the flying bees to join the swarm, and thus the parent colony is still further weakened; this encourages them to tear down all queen-cells but one, or to destroy all embryo queens after the first young queen has emerged from her cell.

Treatment of Swarms.—Provision of Supers.

There is little doubt in the minds of many of the beekeepers who have been accustomed to box hives as to the surplus to be obtained from a swarm. It is not uncommon to find swarms put into frame hives, and not provided with room for surplus. Unless supers are given to strong early swarms from ten to fifteen days after they are established these colonies will often swarm again, and no surplus will be obtained. It must be understood that the season plays an important part in the returns netted, but large amounts are yearly lost through the beekeeper neglecting to give ample room for the swarm to store honey. When a swarm has been established a few days a hurried examination should be made to note progress, and from this the beekeeper will be able to form some idea as to the time at which the super will be required.

ARTIFICIAL INCREASE.

Many methods are in vogue relative to what is commonly termed "increase." The word "increase" in this case means adding to the number of colonies. Strong stocks are built up by early feeding, and are then divided, the portion containing the old queen being removed to a new location. As nearly as possible an equal part of brood and stores is given to each, and the remaining space is filled with frames of foundation. Early queens must be reared and introduced to the half that is queenless, or, failing this, a ripe cell should be inserted. For rapid increase this method is perhaps the best known in bee-culture, and is highly recommended. Always remember a good spring is necessary to ensure the young queens mating in time. If a large number of colonies are required, those already divided may be further fed with sugar-syrup or sealed stores until sufficient strength has been gained for a second division. Just here judgment is required as to whether some stocks are too weak for a second division, for only the very strong should be so broken down.

Nucleus Hives.

During the summer months every attention should be paid to raising a stock of young queens to replace old and failing ones. To buy new queens each successive season is too expensive, and with a little attention and care good queens can be raised by the beekeeper in his own yard. An apiary should be requeened each year, and queens should not be tolerated for more than two seasons at the most. In the long-run it is the queens that tell in the production of big crops, and unless the beekeeper takes the trouble to requeen in the summer only a small percentage of the stocks will yield a surplus.

In order to facilitate the work of queen-rearing a few nucleus colonies should be run in conjunction with every apiary. In these small colonies queens can be raised and cared for until they are mated and laying. It is an easy matter, once the queens are laying, to transfer them to the larger hives in the apiary. Perhaps no branch of apiculture receives less attention than the production of young queens; and yet if the beekeepers who get the big crops of honey are asked what counts most in their production the reply is invariably "young queens." In New Zealand it has been proved over and over again that the best months for raising queens are from November to February. During this period everything is favourable for the operation, as the hives are at their highest state of prosperity. Under normal conditions the workers and drones are at their best, this being the swarming-peroip.

The best style of nucleus hive to adopt is the four-frame one. This size will give the young queen a chance to lay once she is mated, and will, besides, hold sufficient bees to care for relays of queen-cells throughout the season. To form a nucleus colony take one frame of well-capped brood with adhering bees, and one frame containing honey and pollen, the remaining space being filled with an empty comb and feeder. If the number of bees on the comb is not sufficient to form a good cluster, one or two frames of young bees may be shaken into the nucleus, this being done to replace the field-bees which return to the old hive. Place the frame of brood in the middle of the hive and close the entrance until the following day, when the bees may be released. In the course of a day or two the small colony will settle down, and will then be ready to receive the first queen-cell.

No better plan can be followed by the beginner than to utilize queen-cells produced naturally—*i.e.*, under the swarming impulse. In removing cells from the hives select the largest and most corrugated ones, and cut well into the combs so as not to injure the queens. Care must be taken not to shake the combs containing the queen-cells, as

FIG. 29.—NUCLEUS HIVE: A GOOD STYLE OF HIVE FOR QUEEN-REARING.

the sudden jolt jerks the larva from its base and the embryo queen will be destroyed. Before inserting the cell in the nucleus hive be sure and examine the comb, in case eggs were transferred with the frame of brood. Should queen-cells be found, destroy these, and the cell can then be grafted with safety. A hairpin makes an excellent tool for holding the cell in position. If the weather conditions are favourable the queen should be laying within a week after hatching, and when eggs appear in the hive the beekeeper may conclude that she is safely mated. Leave the queen in the nucleus hive until she has proved her laying-capacity, when she may be taken to replace an old or failing one in the apiary. If more queen-cells are available, which is almost certain to be the case where swarming is in full swing, a ripe one may be inserted to take the place of the young queen, and this can be repeated at intervals until the necessary number of queens are raised.

REASONS FOR REQUEENING.

It may be asked, Why do beekeepers follow a system of requeening at all? Why not let the bees supersede their old queens? The answer

is quite simple, and there are many reasons why a young queen should always reign in a hive. A few of the foremost are as follows: An old queen fails after the second year to lay sufficient eggs to keep up the strength of the hive. Old queens are always more prone to swarming than young ones, and to ensure a good honey crop swarming must be kept in check as much as possible. When a colony swarms the old queen goes with the swarm, and the old hive is left queenless for a few days until the young queen emerges from her cell. Seven or eight more days must elapse before she is mated and egg-laying commences; so it will be noted that a big loss of time in breeding is occasioned when a colony swarms and is, too frequently, divided into two and very often half a dozen portions through young queens emerging and going off with a fresh contingent of bees. If this is allowed the old hive will become so weak that no surplus honey will be produced, and even feeding may have to be resorted to to keep them through the winter. These young queens are often mismated, and if supplies of pure Italian stock are not kept on hand in nuclei to replace those mismated the apiary will gradually go back to a black strain.

How to tell a Poor Queen.

1. The uneven appearance of the brood illustrates that the queen does not lay regularly in every cell, but moves over the combs, laying indiscriminately.

2. Old queens are shiny-looking about the abdomen, and appear stiff and slow in their movements.

3. If the colony has available stores and only a small quantity of brood the queen may be held responsible.

4. When the bees are evident loafers it is often the fault of the queen.

Queens which are observed to be faulty in the above respects should be disposed of and a young queen installed in the place of each.

How to tell a Good Queen.

The essential qualities in a good queen are the reverse of the above. She will lay her eggs regularly in circles, commencing in the middle of a comb and working outward, so that as each comb of eggs develops it will present a regular appearance. She will fill each side of the comb with a solid mass of brood, leaving only the edges free for pollen-storing, and possibly the outer sides of the two outside combs. Any bits of drone-comb will be left until the season is well advanced before eggs are laid in them.

QUEEN-REARING.

A beekeeper's problem is not so much how to rear queens, but how to look after them from the time the cells are capped until they are mated and introduced to the hive. It is easy for those who are keeping only a few hives for pleasure, and who do not look to their bees as a source of revenue, for then time is not taken into consideration. The old queen may be killed and a capped cell introduced to the colony; but this entails much loss, and means the hive would be without a laying-mother for some considerable period. This method does not meet with the large beekeeper's approval, whose ambition is to economize in time as much as possible. Ways and means adopted by him must be on sound commercial lines, and proved to be efficient in every respect.

The Swarthmore System.

Assuming you have plenty of strong colonies in the apiary from which bees may be drawn, proceed in the following manner: Prepare a swarm-box with two frames of comb, one containing a quantity of fresh water that has previously been sprinkled into the cells, and one

with an abundance of new honey and fresh pollen. Place these combs a little distance apart, and carry the box to a strong stock which has a queen-excluder over the brood-chamber. With as little smoke as possible open this hive and proceed to shake four combs of bees into the box, placing the fifth comb in with bees attached. Now quickly put the lid on and carry to the honey-house or some cool spot. The operations should take place about 10 o'clock on a fine morning. Before closing the old hive place a cell-bar holding-frame in the centre of the super, and put over the frames a cloth split in halves to allow the said holding-frame being readily removed without disturbing the colony. Next place over the whole an empty honey super, and lay blankets or other warm material in same for the time being.

The usual work of the apiary may now be carried on for the space of six hours, after which time, about 4 o'clock, remove a comb of young brood from your breeding-hive. An empty comb placed in this hive four days before will be just right for the purpose. The young larvæ are now transferred from the comb to the artificial cell-cups in the swarming-box. When all the cups are grafted, wrap over the cell-cups and the sides with blankets to preserve the warmth, and at the same time darken the room as much as possible. Leave them in this condition overnight.

Early next morning go to the colony from which you borrowed the bees and lift all but the brood-chamber on to a new stand. Now shift the brood-chamber with the bottom-board to a distant part of the apiary, and place the super containing the queenless bees on to the old stand. Later in the morning the swarm-box may be brought out from the honey-house and placed in front of the old stand now occupied by the super, and proceedings may be taken to open the hive and roll back the quilts. It is advisable not to shake the bees in the swarming-box, but remove as quickly as possible the cell-bars, and place in the holding-frame in the hive. Put on the cover after replacing the quilts, and shake all the remaining bees from the swarming-box in front of the hive. These will soon run in and continue work on the cells, and field-bees from the brood-chamber will fly to the old stand filled with honey.

Under these conditions fine big cells are produced. After three or four days have elapsed the brood-chamber may be removed to its former position.

The Alley System.

A simple, efficient, and easy plan for raising numerous queen-cells may be found by using the alley plan. It must be understood, however, that when raising queen-cells they require to be large and well-shaped, and that any cells not up to size should be cut out. Procure a frame of young larvæ from your breeding-hive, and with a sharp knife proceed to cut every second row of cells down to the midrib of the foundation. Next kill two out of every three larvæ, and cut the comb into strips about 1 in. wide the full length of the frame. These strips are fastened with melted wax to cell-bars that hang about midway in a standard frame. The cells are pared down to about $\frac{3}{8}$ in. in height, which gives the bees room to construct a solid base for the queen-cell. The frame or frames containing these bars with the strips attached may now be put into the hive previously prepared for their reception.

Another way—the Dines method—is to cut every second row of cells down to the midrib, leaving the foundation whole and in the frame. By placing an empty frame flat above the combs of the prepared hive the comb of larvæ could be placed resting on top of this, with the cells intended for queens pointing downwards. Put plenty of warm packing over this, and then the cover; and if everything has been done properly a fine batch of queen-cells will surely result.

FIG. 30.—TRANSFERRING LARVÆ TO CELL-CUPS.

Photos, F. A. Jacobsen.]

FIG. 31.—PLACING BAR OF STARTED CELLS IN PREPARED HIVE.

FIG. 32.—REMOVING STARTED CELLS FROM SWARMING-BOX.

The Stewart Method.

First prepare a good strong colony in the following manner: Find the queen and put her above a queen-excluder with two frames of young brood and stores, the remainder being empty combs, and the rest of the brood-combs being left below in the original brood-chamber. We will call this "hive A" for the purpose of reference. In three days' time go to the colony with your best queen (hive B) and insert in the centre of the brood-nest an empty comb. This is for the purpose of securing young larvæ the right age for queen-rearing. Now wait for a further five days, and then go to A and remove the top body-box with the queen to a fresh location, after which thoroughly examine the lower portion and cut out all queen-cells that may be started there. Remove a comb from the centre, which will be replaced with the one inserted in hive B five days earlier, which is now removed from the colony and treated as follows: Cut a strip from the bottom of the comb through the eggs and larvæ, then vertical strips three parts of the way to the top bar. Do this as quickly as possible so as to avoid chilling the brood, and then insert in the space provided in hive B, which now contains an abundance of young bees for cell-building, and in addition is queenless. When the cells, which will be built round the edge of the prepared comb, come to maturity, in ten

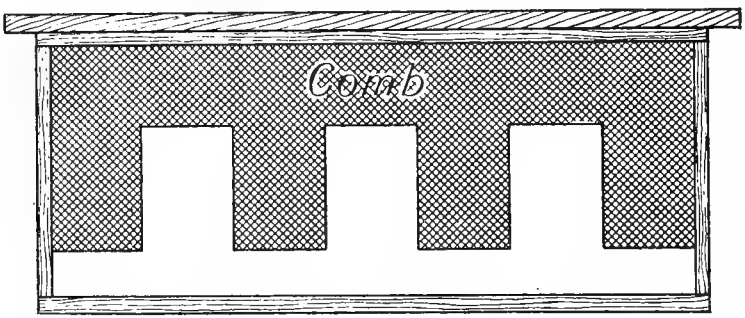

Fig. 33.—Illustrating Method of cutting Comb.

days' time, they can be disposed of in any manner the apiarist deems advisable. Do not on any consideration feed sugar-syrup to colonies building queen-cells, as too often these will hatch out inferior and of poor constitution; pure honey should always be used. During queen-rearing operations always curtail the flight of black drones as much as possible.

Queen-nurseries.

The advantages and perhaps disadvantages attaching to queen-nurseries may be discussed here in a few words. It is not certain that a queen-cell given to a colony will hatch out in a perfect condition. Her legs or other parts of her body may be imperfectly formed, or it is possible that her wings will be imperfectly developed. In this latter event she will always be unfertilized and worthless, and will waste the time of the colony in which she has been introduced. Sometimes it happens that the occupant of the cell is dead, and time is wasted in waiting for her to hatch out. This, of course, is avoided by having queens hatch in a nursery. A number of queen-cells may be on hand without any immediate use for them, and when put in a nursery they will hatch out and can be stored there for some time. Large batches of queens can be nursed under this system, and either introduced as virgins direct to colonies or to nuclei for mating.

The various styles of cages which are made to fit and combine into a nursery are all operated on the same principle. They may be made of wooden blocks or wholly constructed of wire, and of different sizes. They must fit smoothly yet tightly into a standard-size frame—say, twenty or thirty to a frame. The common style used in connection with cell-cups is to get a block of wood the size required, according to how many are intended to go to a frame, and bore a 1¾ in. or 2 in. hole right through the block. Then bore a ⅜ in. hole through the bottom side of the block, for the purpose of storing candy and connecting with the large one. Yet another one is bored at the top, of the same diameter as the cell-cup, and destined for receiving this latter, with queen-cell attached. Cover the two outsides with wire gauze, and you have a complete cage. Wire cages for cells cut direct from the comb, and for nursery-work, may be purchased from dealers in bee-requisites.

Beekeepers should delay as long as possible before putting cells in cages, and remove queens at the earliest convenience after hatching.

Mating-boxes.

The best mating-boxes are made the size of ordinary supers and divided into two compartments. The divisions are made in various ways. One way is as follows: One saw-cut is run from top to bottom, about ¼ in. deep, on the inside of each end, and a division of tin is slipped down in the grooves so made. Another way is to tack one set of cleats at each end, so that a thin partition of wood may be slipped between. One of these division boards divides a hive-body into two compartments; and the entrance to each is made by boring ¾ in. holes at the bottom of each compartment, one on each side, making two entrances to the hive.

When the hives are not in use for mating-purposes the divisions may be slipped out and the super used in the ordinary way. These mating-boxes have an advantage in the matter of heat-conservation. The partitions are so thin that the two lots of bees on their combs help to keep each other warm. Queens have been held over all the winter in these boxes, and each nucleus built up to a ten-framed hive in the spring. It is advisable to place strips of matting of suitable size over the compartments. The ordinary hive-cover is used over the whole.

Introducing Queens.

The first thing to do on receipt of a queen is to make a careful examination, without opening the cage, in order to ascertain if the queen is alive. Should she arrive dead, post back the cage intact to the sender, who will usually replace it free of charge. If the queen has arrived in good order, proceed to find the queen to be replaced. when she should be killed. At the same time all the combs should be carefully examined for queen-cells, and any found must be destroyed, otherwise there is little likelihood of the new queen being accepted.

Do not interfere with the cage containing the queen and attendant bees. One end of the cage should contain soft candy, and there should also be a small hole through the wood at the end; this will also be filled with candy. Over this hole will be placed a small piece of cardboard, which may be pricked so as to assist the bees to gnaw it through. The cage can now be placed on top of the frames, face down. The bees will at once proceed to remove the cardboard and tunnel their way through the candy, thus releasing the queen in about two days, by which time they will have become friendly and readily accept her. Do not open the hive again for a week, except by gently removing the mat on the second day to see that the bees have eaten through the

cardboard. If not, it may be removed and the mat and cover replaced. Many a queen has been lost through the hive being disturbed too soon after the introduction. It should be remembered that the queen is still somewhat strange to the hive, even after she has been released. The bees are apt to "ball" her if they are disturbed before they become used to her. Should a case of balling be noticed at any time, the best plan is to drop the ball of bees into a basin of water; this will cause the bees to quickly release her. The queen can now be recovered and smeared with honey, then dropped between the frames. In cleaning her the bees will become friendly, but the hive must not be disturbed again for a few days.

Finding Queens.

It is a very difficult matter to find a queen in a thickly populated colony by the usual method of looking over the frames. Much time and labour may be saved by adopting the sifting method. To do this tack a queen-excluder on the bottom of an empty half-super; then nail on the excluder a piece of board about 4 in. wide and the length of the hive, so that its edge is flush with the side of the half-super. Now remove from the bottom-board the hive containing the queen to be found, placing it to one side. Put an empty super in its place on the stand, then over it the sieve, or super with excluder. This should be placed so that the board on the bottom overlaps the hive below by about 4 in., which will leave a gap at the opposite side in which to replace the frames. Now place the hive over the sieve, lift out each frame with the adhering bees, starting from the side nearest you, and quickly give each frame a sharp shake over the sieve so as to dislodge the bees. As each frame is done place it in the hive below, sliding it along under the excluder; it will be gradually pushed along until it occupies its former position in the hive. When all have been done the remaining bees in the now empty hive may be dumped into the sieve. The bees will soon find their way down to the brood below, leaving the queen and the drones above the excluder, as they cannot get through the small holes. A little smoke will hasten the descent of the worker-bees. The queen can then be found trying to get through to the brood below.

Fig. 34.—Queen-rearing Apiary at Tauranga Horticultural Station.

SEASONAL OPERATIONS, ETC.

Early Spring Work.

August is one of the most critical months in the year, as the bees have awakened from their semi-dormant condition, and the incessant demand of the young brood for food will deplete the stores in a way to astonish even the seasoned beekeeper.

Advantage may be taken of the mild weather occasionally obtaining in August to give the hives their first inspection of the season. This is very necessary where sufficient stores have not been left to carry the bees through the first stages of brood-rearing, which in the milder parts of the Dominion will have commenced in earnest. It is not wise to delay this work till breeding is well advanced, as it may lead to losses through a shortage of stores. The examination is made for the purpose of determining the amount of food in each colony, to note the queenless hives, and to ensure that the bees are in a suitable condition to carry on brood-rearing until the appearance of the early spring flowers. In making the examination it is necessary to carry out the work expeditiously, choosing the warmest hours of the mildest days.

In cases where the supers have been left on the hives these should be removed, as advised previously. Have the smoker in readiness. After removing the mat take out one of the end frames. This will facilitate the examination of the centre combs. Under normal conditions the centre combs will contain varying-sized patches of brood, according to the strength of the colonies. This will at once denote whether the colony has a laying queen or not. However, it is not wise to conclude at once that the colony is queenless if brood is not visible, so much depending on the locality and the weather preceding the examination. If the colony is strong and contented it is as well to shelve the question of its queenlessness until a later date, when a further examination may be carried out.

If each hive is to be left for the next few weeks undisturbed it should contain at least 18 lb. to 20 lb. of honey; failing this amount, preparation should be made for feeding.

Preparations for the Season.

By the end of August the beekeeper should have his preparations for the season's work well in hand. Hive and frame making, also the overhaul of all defective supers, roofs, and bottom-boards, should be undertaken in earnest. It is not wise to postpone the mechanical part of the work in the apiary until the bees themselves require the major portion of the beekeeper's time. If increase is desirable, and more especially when the apiary is being enlarged, make ample provision for it. Nothing is more tantalizing than to leave a swarm hanging on a tree whilst a hive is being hastily put together.

Apiary Register.

There is no gainsaying the advantages to be derived from making a complete record of the individual hives in the apiary. Records thus kept enable the beekeeper to work to a system and tend to improve

apiary-management. It is wellnigh impossible to conduct an apiary on commercial lines unless the beekeeper takes notes at each examination. Working in the dark with respect to the age of queens, surplus, &c., is poor policy. In the absence of books the hive-cover may be used for writing notes on. A book may be mislaid, but records made inside the cover are more in the nature of a permanent handy reference. If advisable, these rough notes may be copied in the beekeeper's spare time into a complete record-book.

Enlarging the Hive.

A little judgment is required as to the proper time to put on the supers. This may be done when the brood-chamber is getting full of bees, and during mild weather. As soon as there is a fair flow of nectar the operation should not be delayed, as the bees are liable to be cramped for room. In cases where the beekeeper has plenty of drawn-out combs no trouble will be experienced in getting the bees to go up into the supers. However, where sheets of foundation are used the bees will not readily take to these, and it may be necessary to encourage them. Do not place a queen-excluder between the brood-chamber and the super when the latter is fitted with foundation. Much time is lost and very little honey will be gathered, as the bees will rarely work foundation in the supers when excluders are used. Should the bees not start work in the supers they may be induced to go up by elevating one or two frames of honey from the brood-chambers, at the same time inserting in their place sheets of foundation from the super. On no account break up the brood by transferring it to the super. Until settled weather is experienced this practice cannot be too strongly condemned.

When the season has advanced and the bees require additional room for honey-storing purposes the beekeeper may add supers from time to time as they are required. Do not wait until the previous super added is completely full of honey, but when the bees have started to cap the middle frames this may be taken as an indication that an enlargement of the hive is necessary.

Removing Honey from the Hive.

The usual practice followed when the time for extracting is at hand is to remove the frames one by one. If excluders are used much time will be saved in picking over the combs. As the combs are taken from the hive shake the bees in front of the hive, brush off the remaining bees, and place the combs in a super for removal to the honey-house. The combs should be covered with a cloth which has been previously placed in water containing a small percentage of carbolic acid. When the season is at its height very little trouble will be experienced from robbers, but in case of a stoppage in the flow the above precaution is necessary. At all times the beekeeper should study his working-equipment, and this is highly important when removing the honey. It will be found convenient to provide a good barrow or truck for carrying at least two full supers. Much time and labour will be saved, and the tedious work of removing the honey will be facilitated.

Once the honey leaves the hives it should be handled as cleanly and expeditiously as possible. Two or three zinc or tin trays are a big help in disposing of drips, &c.; one placed on the barrow which conveys the supers to the honey-house, and another on the floor of the house to receive the supers prior to uncapping, will save much un-

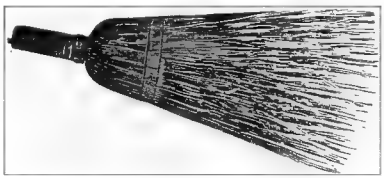

FIG. 35.—BEE-BRUSH.

pleasantness to clothes and feet. These trays should have small blocks or supports fastened in each corner to raise the supers a little, so that the drippings from burr-combs may be drained away from the bottom edge of the supers. They are easily washed at the end of the day and drained ready for the next using.

UNCAPPING.

One of the most important processes in the work of extracting is that of uncapping. There are several kinds of knives for the purpose on the market, but the stiff-bladed double-edged Bingham is usually first favourite. Two of these are necessary, and they must be stood in a pan of water which is kept boiling on a small lamp. Each knife as it becomes cold is returned to the boiling water, and the hot one takes its place. Any contrivance which is used for an uncapping-can should be provided with a cross-bar, through which to pass a screw or similar article, driven point upwards, to form a pivot on which to rest and

FIG. 36.—STEAM-HEATED UNCAPPING KNIFE.
Photo, F. A. Jacobsen.]

revolve the combs. The comb should be placed with one end resting on the pivot and tilted slightly forward, in order to allow the cappings to fall away from the comb. Uncapping should commence at the bottom of the comb and proceed with a sawing motion from side to side until the top of the comb is reached. The comb is then swung round on the pivot and the reverse side treated in the same manner. Only a thin sheet of wax should be removed, but it must be done thoroughly so that every cell is opened, and at the same time the top and bottom bars should be relieved of any burr-combs which may adhere to them. A contrivance much in favour with progressive beekeepers is the steam-heated knife. This is a Bingham knife with a soldered copper plate, so arranged that steam is forced through it from a rubber tube attached to the spout of a kettle. An escape-tube is fitted to the opposite side, and the knife is kept at a very high temperature all the time uncapping is proceeding, thereby obviating the work and trouble of continually plunging the knives into boiling water. For uncapping heavy fully capped frames it has no equal, as an ordinary uncapping-knife becomes cold, as a rule, before half one side of a full comb has been uncapped. The cappings should be left to drain for two or three days, after which time they should be gathered and melted, preferably in a solar wax-extractor. By this means the finest and purest wax of the season will be obtained.

The Honey-extractor.

Every beekeeper having five or more hives, and who is not working them for comb-honey, requires an extractor. They are made in various sizes, and the beekeeper selects the machine that he considers would serve his purpose according to the number of colonies he has. A two-framed extractor, preferably with the baskets reversible, would be large enough to use in connection with an apiary up to about fifty colonies, but when more than that number are kept it would in many cases be

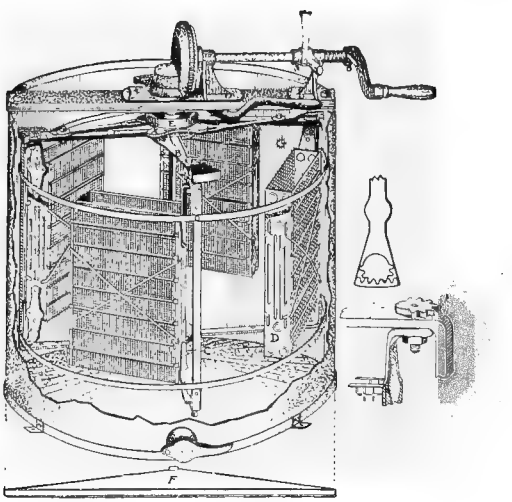

Fig. 37.—Four-framed Honey-extractor.

better to use the four-framed reversible type. Some of the very large beekeepers use the six- and eight-framed machines, and these are the largest sizes made for stock. The majority of large extractors are now motor-driven, the motors and fittings being supplied with the machine.

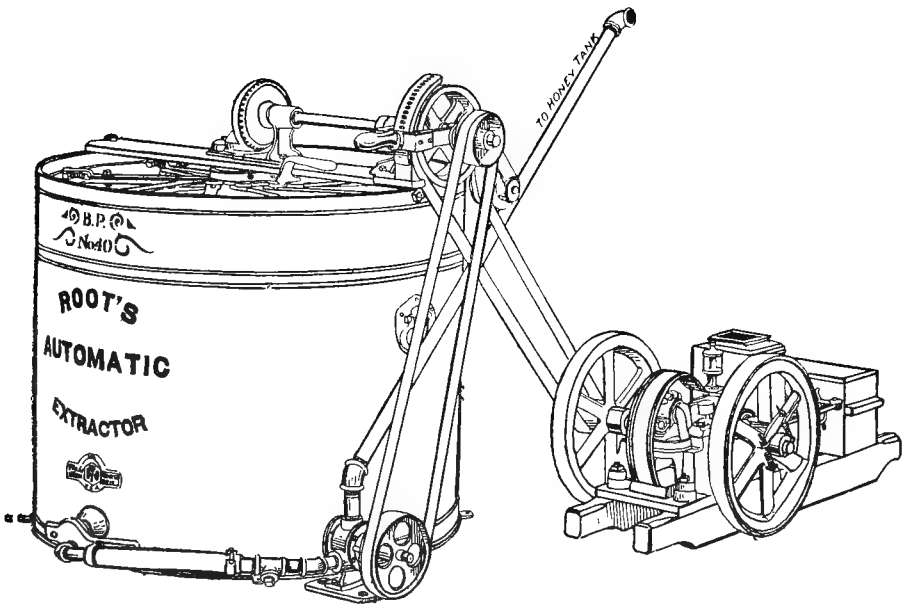

FIG. 38.—POWER HONEY-EXTRACTOR.

QUEEN-EXCLUDERS.

During the height of brood-rearing, and in order not to cramp the queen, she should be allowed the full use of the super, so that large numbers of worker-bees may be raised to work the main crop. It is not wise to bring the excluders into use too early, and never until such time as the bees are working freely in the super. By cramping the

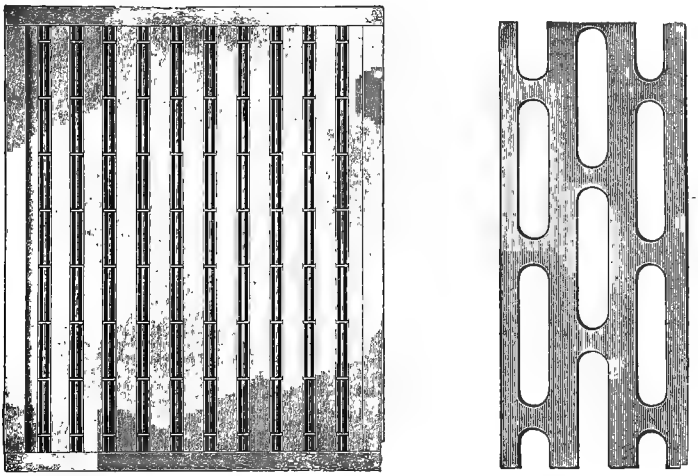

FIG. 39.—TWO KINDS OF QUEEN-EXCLUDERS.

queen fewer bees are produced, and small returns will be netted. Every encouragement must be given to the queen to lay to her utmost, and by so doing populous colonies will be produced. The best time to put the excluders on the hives is when the main flow sets in and the bees

are busy bringing in the nectar. Too many beekeepers make the mistake of putting on the excluders when the supers are first placed on the hives; and it is not an easy matter to get the bees to work in the supers even if combs of honey are raised from the brood-chamber, as excluders tend to make the passage between the lower story and the upper more difficult for the bees. Before placing on the excluders make a careful examination of the colony to note its condition and to take stock of the number of frames of brood in the hive. If the brood-chamber is full of brood the combs may be manipulated so as to provide the queen with ample room for laying during the period which follows. The best plan is to place the majority of frames of capped brood over the excluder, and to substitute empty combs, taking care to see that the queen is confined below. As the bees hatch out over the excluder they will become accustomed to passing through it, and as fast as the cells become vacant they will be filled with honey. If eggs are raised with the brood care must be taken to see that the bees do not raise queen-cells; for in the latter case the hive may swarm out, leaving one or more virgins in the top story, and these queens, being confined to the hive, cannot get out to be mated, and will eventually develop into drone-layers. Within one week after raising the brood examine the combs in the super to note if any queen-cells have been raised. If any are found they must be destroyed. The advantage of the use of queen-excluders is in saving labour at the time of extracting, by doing away with the work of picking over the combs. Much time is lost in this operation, and extracting is retarded when everything should be hurried. It is only by the use of excluders that bee-escapes can be employed, and in many seasons, depending largely on the weather, these have to be brought into use.

Bee-escapes.

For removing honey late in the season the beekeeper may find it necessary to bring into use bee-escapes. These escapes enable the honey to be removed without causing any disturbance. By the employment of the Porter bee-escape there is less likelihood of causing robbing, with its attendant evils. More especially will the escapes be found advantageous when removing section honey from the hive. There is far more risk in removing comb-honey from the hive than extracted honey. When the colony is disturbed the bees will at once start to fill their sacs, and often the cappings of the sections are punctured in order to secure a supply of honey. The damage to the cappings of sections is unsightly, and causes the honey to leak after removal from the hive. The escapes are fitted to a board the exact dimensions of the hive in use. In inserting the board gently prise up the super from the brood-chamber and insert the board. A puff of smoke will suffice to control the bees while the operation is being performed. If this is done late in the afternoon the bees will pass through the escape during the night to the brood-nest, and will be unable to return. In the morning the supers may be removed, when practically no bees will be left in the super.

The Hodson escape is fast finding favour with beekeepers. It is made in the form of a frame, 20 in. long,. 15 in. wide, by 3 in., which is covered with wire gauze and one or two bee-escapes fitted into it. The advantage of this escape is that it allows the warmth from the cluster to pass into the super during the night, thus keeping the honey warm, besides which the bees can clean up the drips of honey that fall from the burr-combs.

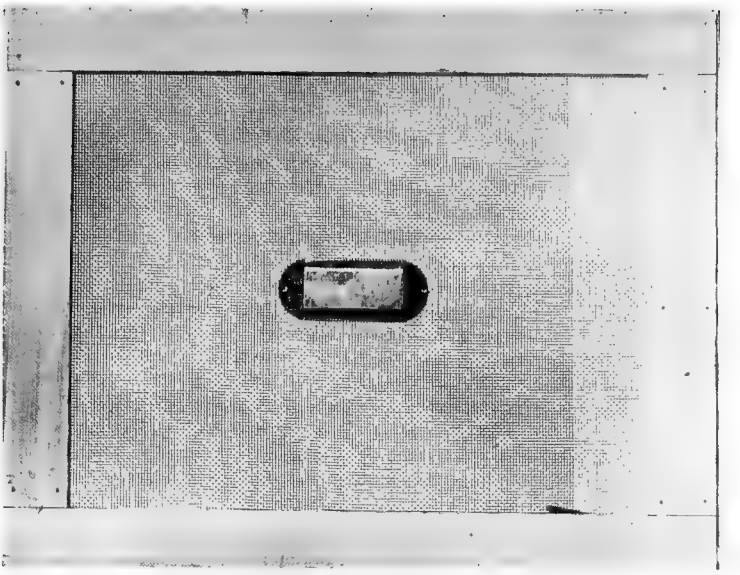

Fig. 40.—Hodson Bee-escape Device.

A word of caution to those who have not formerly used the escapes: Should there be brood in the super combs the bees will not leave, and the escapes will not prove effective in ridding the supers. Over and over again many beginners complain that they cannot get the bees to leave the supers when using escapes, but the reason lies in the fact that no examination had been made to ascertain beforehand whether the super contained honey only.

Size of Honey-tanks.

This is a matter most beekeepers will decide for themselves, but we must stress the point of maturing or settling the honey properly before tinning. Large tanks are necessary for this purpose, but the depth is governed by the kind of strainer used. In damp climates it is very unsatisfactory to expose a large surface of the honey to the atmosphere, as honey absorbs moisture readily, which will later cause it to ferment. Honey-tanks are essential in an apiary of any size, and the best material for their construction is tinned steel reinforced with boards 1½ in. thick. Suitable round tanks, however, are made from the best grade of galvanized iron. For an apiary of 100 colonies they should have a capacity of about 2 tons. It is very important that the honey-gates should be of large dimensions, and we recommend them about 3 in. in diameter.

Strainers.

It is not uncommon to find honey exposed for sale where proper care and attention has not been paid to straining at the time of extracting. Nothing deters the sale of extracted honey so much as a layer of wax-particles, dead bees, &c., and it is surprising how few beekeepers take the necessary trouble to see their product reaches the customer free from wax and other impurities. In no case should honey be run direct from the extractor into the containers, but should be

properly strained. It is the attention paid to this necessary detail that aids in the sale of the crop, and when honey is properly treated it readily commands a higher price. Fine wire-gauge strainers are usually adopted, but even these are not sufficient to remove the smaller wax-particles. In order to ensure perfect condition it should be passed through good fine cheese-cloth before being run into the tank. Cheese-cloth strainers are excellent, cheap, and are easily made, whilst at the same time they can be readily cleansed. They remove everything but the smallest particles of wax, which should be finally disposed of when the honey is skimmed. This latter process is an important one, and should always be carried out before the honey is put up in marketable form.

Probably the most satisfactory method of dealing with both large and small quantities of honey is to have a bag of fine cheese-cloth made to reach to within 6 in. of the bottom of the tank, and fastened in position right round the top of the tank. This strainer never blocks, and may be used until the end of the season before cleansing.

Care of Extracting-combs.

If proper care is not to be exercised in storing the extracting-combs when removed to the honey-house it is far better that they should be stored in the hives. If the latter plan is adopted the mats must be placed on top of the brood-chamber, and the supers tiered above the mats. Unless the apiary is well sheltered, however, they must be weighted, as the winter gales will easily overset them when only empty combs are stored inside. It is far better to remove the combs if it can possibly be done, and thereby obviate the labour of lifting the supers if it becomes necessary to examine the brood-chamber. But in this case the combs must be properly housed to secure them from destruction by mice and wax-moths. It is not uncommon to find tiers of extracting-combs destroyed as the result of carelessness. Mice are especially destructive, and the damage they will do in a short period is such as to render the greatest trouble worth while in preventing them from gaining access to the combs. The abnormal price of foundation now ruling is making it far more costly to produce combs, and if large numbers have to be annually produced the renewals become a severe tax on the season's profits.

During extracting many combs may become damaged, but the damage can be repaired by the bees when the combs are returned to the hives. As a rule, however, mice destroy the combs beyond repair, and no effort on the part of the bees can restore them to their original form. It is during the working season that the beekeeper realizes the value of combs in securing a crop. A shortage of combs during the flow will often prevent the bees being kept in working-trim, and the production of honey will be greatly restricted. Mice destroy the combs to gain access to the pollen, and render them foul and offensive to the bees. In the absence of a mouse-proof room the combs can be stacked in supers tiered one above another. Be sure that there are no holes or cracks in the supers through which the mice can obtain an entrance. Place a queen-excluder at the bottom of the tier and another on the top. Queen-excluders, if used as described, are a complete success in preventing mice from destroying the combs during the off season. Should the wax-moth be detected the combs must be fumigated. Bisulphide of carbon is generally used for destroying insect-life, but it should be used with great caution, as it is highly inflammable. It is far better, when storing the combs at the end of the season, to place a few moth-balls among them. This will usually be sufficient to prevent the attack of the moths.

Care of Utensils.

As soon as the honey has been disposed of thoroughly clean all utensils used in handling the crop. Remove all traces of honey from the extractor, tanks, uncapping-knives, &c. Wash carefully with boiling water, and dry thoroughly to prevent rusting. The high cost of working-equipment should impel the beekeeper to take great care in storing his plant during the off season. It is advantageous to use loose washing-covers of close texture to cover the tanks and extractor. The covers will help to keep the utensils free from dust that is likely to accumulate during the winter. See that all metal parts likely to rust are given a good coating of oil. In season or out of season the watchword of the beekeeper in the extracting-house should be cleanliness.

Uniting Colonies.

A simple method of uniting may be practised by placing the weaker hive on top of a stronger one, and placing a sheet of newspaper between the two hive-bodies. In the course of a few days the bees of the weaker colony will gain their way through the paper, and unite peaceably with the bees in the stronger hive. The surplus combs may subsequently be removed and reserved for spring feeding if required. It is not advisable to attempt to winter weak colonies, as there is a danger of them being robbed of their stores by other colonies in the autumn or spring, and thus starting an epidemic of robbing throughout the apiary.

Robbing.

At the close of the honey-flow the beekeeper must persistently guard against robbing. Robbing is the result of carelessness, and once it has started is exceedingly hard to check. Do not expose honey, sugar, syrup, or anything that the bees can rob. In case wet combs have to be returned to the hives for the bees to clean up, postpone this operation until late in the day, when robbing is not likely to start. See that the honey-house is bee-proof and that all combs and vessels containing honey are removed to a place of safety. Contract all hive-entrances, and especially guard against leaving hives open in a way that they can be attacked by robbers. All operations must be carried out quickly. If robbing has started it is better to postpone all outside work until the apiary is quiet again than to risk extending the trouble by opening the hives. Should a colony be attacked, contract the entrance and pile wet grass in front of the hive. This will usually cure mild cases of robbing, but where a colony has been overpowered by the robbers it should be closed altogether or removed to another location in the apiary.

Care of Comb-honey.

There are factors in the proper treatment and care of comb-honey which the producer is apt to overlook when putting his honey on the market. Usually the practice followed is to despatch the crop to market, where it is sold, to be afterwards graded and cleaned by buyers who are alive to the demands of the local market. These buyers obtain a better price by grading and cleaning the comb-honey, whereas the producer can by employing proper methods demand an increased price. Comb-honey should be fully capped before taking from the hive, and it should not be left until its white appearance is destroyed by travel-stain, this being caused by the constant traffic in the hive. When the sections are removed they should be stored in a warm dry room, as low temperatures hasten granulation, and granulated comb-honey is not likely to meet with ready sale. Moreover, comb-honey

stored in a cold damp place is apt to "weep" (or absorb moisture from the atmosphere), forming beads on the surface of the comb, and in the course of time becomes sour, thus destroying its marketable value. As opportunity allows, the sections should be cleaned of all propolis and stain; and this is best done by scraping the sections with a knife, and the operation finally completed by sand-paper. Care must be exercised not to damage the cappings of the comb and thus destroy its attractiveness.

Before forwarding the honey to market it should be carefully graded and finally packed in cartons. By the use of cartons the sections are secured from dust and insects, and present an attractive appearance when offered for sale, besides being far less liable to breakage. In order to ensure safe transit, excellent shipping-cases can be purchased from the hive-dealers. These cases are fitted with corrugated-paper cushions, which materially reduce the breakage from rough handling. A feature of these section crates is a sliding cover which enables the honey to be readily examined. The crates are appreciated by the retailers, and at the same time help to increase the average price to the producer.

Marketing the Crop.

Before the honey is finally run out of the tank the beekeeper should have decided on which market he intends to place his product. If export is his aim the market is comparatively simple, as only large packages are required; but where the local trade is to be catered for it is wiser for him to put the honey up into small packages himself. Rehandling means remelting, and unmelted honey is the better article.

The value of attractive packages should weigh with the producer, whether the honey is put up in bulk for the merchant or in small packages direct for the retail trade. In order to appeal to the consumer the packages containing honey must be made as attractive as possible, and every care observed in its preparation as an article of food. An inspection of lines sent forward to market will serve to demonstrate the advantage of careful preparation. Consignments forwarded in good clean cases, carefully graded, and contained in new tins readily command attention; whereas lines which have been packed in rusty tins and present a rather unattractive appearance generally are hard to dispose of, and too often merchants are compelled to sell at a reduced rate, although the quality of the honey is quite on a par with that packed in new packages. In such cases the producer is apt to blame the merchant for a reduction in price, but as a rule the fault lies with himself.

Everything should be done to make the article as attractive as any other food product, and proportionately as much care given to the intricate result of beekeeping as to the bees themselves. The Sale of Food and Drugs Act requires the honey-producer to label his packages and to state thereon the contents and weight. Apart from this requirement being a necessity as representing a fair deal with the consumer, it has also done good work in disposing of old-time haphazard methods of marketing honey, and has helped to force on beekeepers the necessity of studying the commercial side of the industry.

Honey for Export.

The essentials of a good export honey are, firstly, that it must be well conditioned—*i.e.*, granulated, and free from the slightest trace of ferment; secondly, it must be entirely free of scum—*i.e.*, wax-

particles and dirt; and, thirdly, it must have received strict attention in packing. These factors are the basic provisions of export, and are provided for under the regulations in force. The object of Government grading is to create a good name for the New Zealand product on the oversea market, and establish our reputation as producers of a high-grade article. To this end the exporter can assist by forwarding shipments of uniform grade and quality, and by thorough attention to detail in packing.

A great deal of time and labour could be saved if the producer would learn to tentatively grade his own product. This may be done at extracting-time, when each separate extracting can be marked, and the information conveyed to the grader. There are seasons in the Dominion when each successive extracting will vary, and each lot of cases should be marked accordingly. It may happen that the

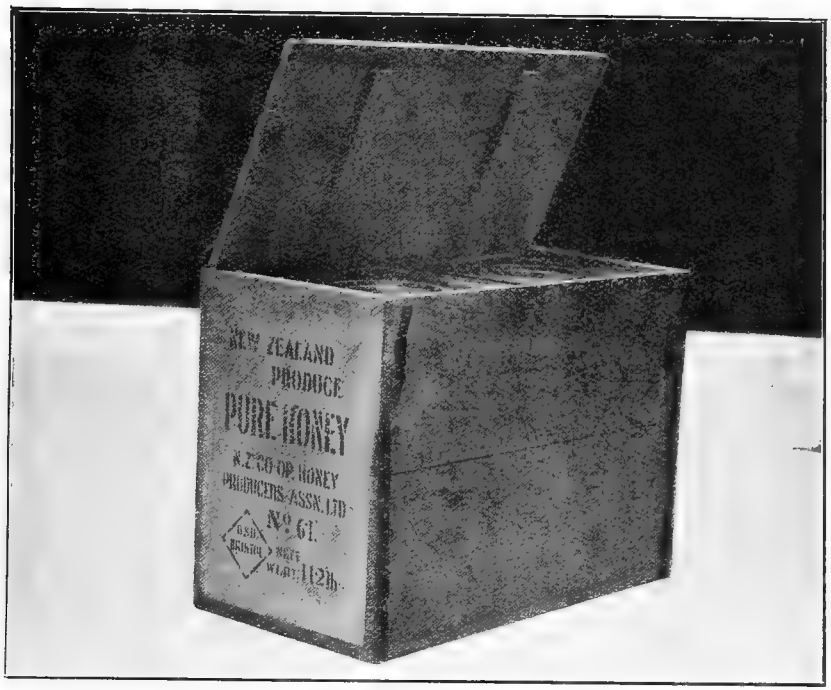

Fig. 41.—Export Honey-case (packed).

colour will vary, in which case, with a view to facilitate grading, a note despatched to the grader, intimating, for instance, that there are so-many cases of light amber and so-many cases of medium amber in the consignment, would be the means of preventing a great wastage of time at the grading-store. Honey that is not granulated should not on any account be submitted for export. The regulations provide against liquid honey leaving the country, and honey that is semi-granulated will be held up at the expense of the producer.

In order to ensure safe transit, only good strongly constructed tins should be used, and any showing signs of rust rejected. All tins must be carefully lacquered or oiled on the outside to prevent rusting, and this operation is best carried out when the tins come to hand from the tinsmith and prior to filling them with honey. Lacquer can

be procured from the dealers at a reasonable cost, but, if desired, boiled linseed-oil may be substituted, and its action is just as effective as that of the lacquer in obviating rust. Press the lids on tightly, but on no account use solder to secure the caps, as each tin has to be opened at the time of grading. In the past large numbers of tins have reached the grading-stores minus their lids, and this has been more noticeable where the caps have exceeded 3 in. in diameter. A uniform cap of 3 in. would ensure security and prevent to a large extent their becoming loose in transit. Under the regulations the graders have power to reject tins where the lids are ill-fitting. See that the cases are strongly constructed and neatly bound at each end with wire or metal strapping. Good cases are of paramount importance, and good well-seasoned timber should be used in their construction. False economy in this direction cannot be too strongly condemned. Brand the cases on one end only, and stamp the net weight of the contents of the tins on each case. In all cases where the weight of the contents does not coincide with the weight stamped on the package a grade certificate may be refused.

Transport of Bees.

During the winter months bees may be moved with perfect safety to a new location. If the work is left until spring, when the activities of the hive commence, the resultant loss of field-bees will be enormous, if the hives are to be moved short distances only. The colonies are numerically weaker, and there is usually little brood to become injured in transport. When hives are located for any length of time in one position the flying bees take full observation of every landmark, but as in the winter there are shorter periods of sunshine the flight of the bees is necessarily curtailed, and they usually return at a much shorter distance from the hive. In addition, there are often periods of several days together during which they take no flight at all, and in consequence they must renew their acquaintance with their surroundings when an opportunity for flight occurs. Therefore if the hives are moved during a spell of bad weather the bees will take more readily to their new location when a fine day comes.

To secure bees for transit over a short distance sufficient ventilation can be provided by tacking a piece of wire gauze over the hive-entrance. It is then only necessary to secure the bottom and roof, and after making sure that there are no holes through which the bees can escape the hive may be carried with perfect safety.

The successful moving of bees over long distances calls for considerable preparation. All heavy combs should be secured, and only sufficient honey left in the hives to prevent the bees from starving during their journey. The most important factor is ventilation, and it is the neglect of this matter which leads, as a rule, to heavy losses when bees are being moved. The constant vibration of any vehicle tends to disturb the cluster, and the excitement caused thereby is sufficient to raise the temperature of the hive considerably, so that the bees are in danger of being suffocated and the brood scalded. These troubles can be avoided by the employment of wire screens. First see that the frames are made as secure as possible by inserting two wedges between the side of the hive and the top of the end frames. This prevents the frames from rocking during transit. The bottom-board should then be secured to the hive-body by means of crate-staples, driving one end of the staple into the hive-body and the other into the bottom-board. Usually six staples are sufficient.

The screens can be made by using narrow laths nailed together to form a frame of the same dimensions as the hive-body, and covering this with wire cloth, such as is used for making queen-cages. The screens must be securely fastened to the top of the hive, and the entrance covered with wire cloth. By this means ample ventilation is provided to ensure the safe carriage of the bees during the winter months.

In these days of motor transport the work of moving bees over long distances is greatly minimized, and the beekeeper will be well advised to adopt this method if it can be obtained. In any case, the beekeeper who has occasion to move bees should not relax any effort to make the hives secure when moving to a new location.

When railing bees the frames should run parallel with the truck, but with road transport the reverse should be the case. Follow this practice to prevent the frames from rocking and thus killing the bees.

Do not move bees without first obtaining a clean certificate or permission from the Inspector of the district from which the bees are moved.

RIPENING AND MATURING OF HONEY.

All honey should be thoroughly ripened and matured before being placed upon the market; otherwise it will rapidly deteriorate, to the injury of the producer and the industry generally. All beekeepers are fully aware of and admit this; nevertheless, occasionally unripe honey has found its way to the markets, eventually to be condemned through fermentation.

Amount of Moisture in Honey.

Nectar or honey when first gathered contains a variable quantity of water, usually ranging from 18 to 23 per cent., according to the weather.

In Thorpe's "Dictionary of Applied Chemistry," page 286, the maximum, minimum, and average amount of moisture in twenty-five samples of honey examined are given as follows: Maximum, 23·26 per cent.; minimum, 12·43 per cent.; and the average of the twenty-five, 19·3 per cent.

Recently some important investigations have been made by the United States Department of Agriculture regarding the "Chemical Analysis and Composition of American Honey." Some hundred samples were procured, and placed in the hands of Dr. C. A. Young, a skilful sugar-chemist, and regarding the moisture in the honey he says in his report,—

"The average amount was 17·90 [per cent.], with a range of from 12·42 to 26·88. This shows that American honey is 3 per cent. drier than German honey, and German honey is drier than British. This is due to our drier climate. . . . Nevada honey is drier than that of Missouri; the former had only 14·61 per cent. of water, and the latter State 19·57 per cent. It is a truism to say the locality having the highest rainfall has the highest percentage of water in the honey produced."

This latter assurance is just what one might expect, and worthy of consideration when choosing a location for bee-farming.

Honey containing an excess of moisture is unripe, and bound sooner or later to ferment; but when such moisture is reduced below a certain percentage the honey is said to be ripe, and it will in that condition keep good for any length of time. At what point the "excess" of moisture commences we have no definite knowledge. The different works available contain no guidance on the question.

Honey Analyses.

The following is a list of New Zealand honeys analysed for water content, and the districts from which the samples were procured. New Zealand honeys are dry in this respect.

Sample No.	District.	Percentage of Water.	Sample No.	District.	Percentage of Water.
1.	Papatoetoe ..	16·60	27.	Cust	14·58
2.	Te Awamutu ..	17·45	28.	Waihao Downs ..	15·78
3.	Repongaere ..	17·52	29.	Hinds	16·27
4.	Tryphena	17·67	30.	Tai Tapu	16·57
5.	Tauranga	17·73	31.	Peel Forest ..	16·20
6.	Runciman	16·95	32.	Little River ..	16·16
7.	Mangonui	18·10	33.	Glentunnel	16·42
8.	Cambridge ..	17·30	34.	Kaikoura	17·03
9.	Raurimu	15·62	35.	Rangiora	16·16
10.	Amodeo Bay ..	17·70	36.	Leeston	16·41
11.	Claudelands ..	15·97	37.	Havelock	15·25
12.	Hamilton	17·64	38.	Blenheim	17·83
13.	Palmerston North ..	16·07	39.	Bainham	17·53
14.	Upper Hutt ..	17·52	40.	Wyndham	15·95
15.	Wellington	15·92	41.	Menzies Ferry ..	17·41
16.	Wanganui	16·52	42.	Invercargill ..	16·17
17.	Patutahi	17·65	43.	Round Hill ..	16·87
18.	Manaia	16·17	44.	Balclutha	15·76
19.	Otaki	16·78	45.	Maungatua ..	16·20
20.	Manakau	15·40	16.	Outram	16·72
21.	Papawai	14·43	47.	Waikaia	15·75
22.	Masterton	16·32	48.	Crookston	15·05
23.	Carterton	16·11	49.	Cromwell	17·07
24.	Le Bon's Bay ..	15·20	50.	Palmerston ..	16·75
25.	Wainui	15·50	51.	Pukeuri	16·33
26.	Southbridge ..	15·40			

Testing Honey for Ripeness.

Before tinning off the honey make certain it is ripe. There should not be much difficulty about this where combs were well sealed over. The only certain way of ascertaining if the honey is ripe is to test it with a hydrometer. If on testing with a Twaddel's No. 4 hydrometer the instrument does not sink below 84 it indicates a well-ripened honey. This is equal to a specific gravity of 1·42, the test being made at a temperature of 60° F. As the temperature of honey in the summer rarely sinks so low, the test may be taken at 70° or 80° by adding 1 point to the hydrometer-reading for each 10° of heat over 60°. Thus, if the hydrometer sinks to 82 at a temperature of 80°, it would register 83 if taken at 70°, and 84 if taken at 60°. To arrive at the specific gravity multiply the hydrometer-reading by 5; thus $84 \times 5 = 420$; add 1 for the gravity of water and it will equal 1·420. This method is only reliable up to a temperature of 90°. Honey registering below 1·42 is not considered sufficiently ripe for export.

Testing Thick Honey.

Sometimes the honey is so dense that the hydrometer will not sink. When such is the case take equal parts by volume (not weight) of honey and water, mix thoroughly, test with a No. 2 Twaddel's hydrometer, and then multiply the result by 2. This will give the same result as if taken with a No. 4 instrument by the direct method. Thus, if the No. 2 instrument sinks into the honey and water to 42, this multiplied by $2 = 84$. Perhaps the quickest and simplest method to test thick honey is to have a deep glass or beaker on which is a mark to contain about 4 oz. of water. Fill up to the mark with water, then pour it into another vessel; now fill up to the mark with liquid honey, add the

water previously measured, and mix thoroughly; then place in it the No. 2 hydrometer, note the number to which it sinks, and multiply by 10; place the decimal point before the result, and add 1. Thus, if it registers 43, 43 × 10 = 430; place the decimal point before the 430 = ·430; to this add 1, which is the specific gravity of water, the result being 1·430.

The instrument is made with various scales, according to the density of the liquid to test which it is required. Each degree is equal to 5 degrees specific gravity; for example, 80 degrees Twaddel is equal to 1·400 sp. gr., as 80 × 5 = 400 + 1,000 = 1·400 sp. gr.

The cost of the appliances is a mere nothing compared with the importance of making tests, as every beekeeper should assist in arriving at a reliable standard for ripe honey. A Twaddel's hydrometer as

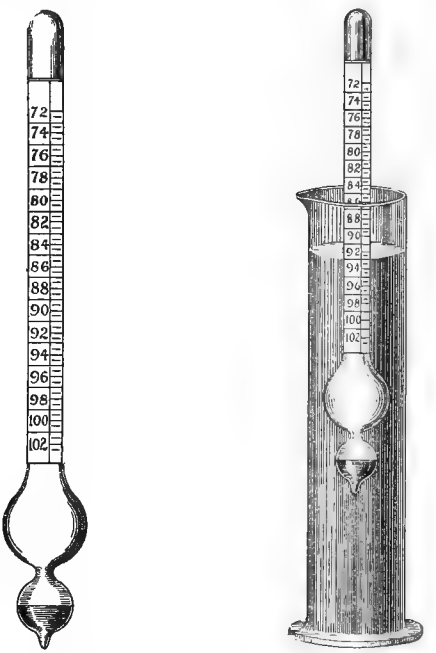

FIG. 42.—TWADDEL'S HYDROMETER: METHOD OF TESTING.

shown in the figure, or two instruments with a range from 1·350 to 1·400 in one and 1·400 to 1·450 in the other, with a suitable test-glass and thermometer, cost about 12s. or 14s.

RIPENING HONEY INSIDE AND OUTSIDE THE HIVE.

The practice of ripening honey outside the hive has been much discussed of late years, and apiarists who have carried out experiments report varied successes. Generally speaking, this method cannot be recommended. The beginner should be careful to extract none but well-sealed combs. By extracting unripe honey, fermentation will often result, much to the detriment of the producer. Too much care cannot be exercised over this important matter. A better flavoured and better keeping honey is produced by allowing it to age in the hive, extracting only perfectly sealed combs.

All that is needed is to leave the honey in the hive until all the cells are sealed or capped over before removing the comb for extracting. The capping of the honey-cells denotes that the contents are ripe. There are some beekeepers, however, who think this is not so in all cases, and that the honey is better when allowed to remain in the hive for some time after it is capped. The time elapsing between the storage and the capping of the honey depends in a great measure on the state of the weather and the condition of the honey when stored; it may be several days before the honey is capped, or in dry warm weather only a few hours after the cells are filled. When the honey is allowed to ripen within the hive it is necessary to have tanks to clarify it, for, no matter how small in the mesh the strainer may be or how carefully the honey is strained, it is impossible to prevent very fine particles of wax and pollen-grains running from the extractor into the tank with the honey.

It is by no means uncommon to find an unpleasant-looking film or layer, anywhere between $\frac{1}{8}$ in. and $\frac{1}{4}$ in. deep, on the top of honey in tins sent into the market. This is the result of tinning it before it has been matured and skimmed, probably in most cases through not having a suitable tank for the purpose. Honey, like other commodities, must be put upon the market in its most attractive form if we wish to encourage the demand for it.

Testing Strength of Liquid for making Honey-vinegar.

The washings of cappings (when there are any), the skimmings and washings of the tanks, honey-extractors, &c., broken honey-combs, and other odds and ends of honey need not be wasted; all can be utilized in the making of vinegar or mead, or both. A hydrometer comes in very useful here again to test the strength of the liquid. For vinegar there should not be more than $1\frac{1}{4}$ lb. of honey to each gallon of water, the specific gravity of which is 1·040, so that when the honey cannot be weighed the hydrometer will at once show whether the strength is right, instead of depending on guesswork.

Liquefying Granulated Honey.

Great care is necessary in liquefying granulated honey. Do not allow it to rise above 140° F. Overheated honey loses much of its fine flavour and aroma. The best method is to set the vessel containing the honey inside another holding hot water, and stand it on the stove. The bottom of one vessel must not come in contact with the other. On no account allow the water to boil. It may take considerable time to reliquefy the honey, but the process should not be hurried. Care should be taken to see that the vessel holding the honey is free from holes.

DEALING WITH THICK HONEY.

One of the few serious drawbacks beekeepers in certain districts have to contend with occasionally is thick honey—that is, honey that is too dense to extract from the combs in the ordinary way. Fortunately it is not met with every season, except, it may be, in apiaries situated near heavy bush, or where little else than flax or manuka abounds, in which case it would be folly to attempt to raise extracted honey. It is, however, becoming less each year as the land is cleared and sown down in grasses and clovers.

The storing of thick honey commences early in the season, but ceases as soon as the weather is favourable for gathering clover-honey. Should this latter condition not come about, the first continues and

gives trouble. Should there be a comparatively small quantity of thick honey stored, but more than is needed for immediate use as food, the combs when sealed are removed and stored away for the bees' future use. Every particle of extractable honey is taken from the hives to the end of the season, and the thick honey returned for winter stores. Should, however, there be more of the latter than can be utilized in this way, as there frequently is, it is put through the honey-press, or else through the honey-melter, this latter being made somewhat similar to the cappings-melter.

Pressed honey is not nearly so good as that extracted in the ordinary way. It is not of so high a grade in the first place, and the flavour is not improved by pressing. Honey to be pressed should be thoroughly ripe before removal from the hive—that is, all capped over—as it is so dense that there would be little chance of getting rid of any surplus moisture afterwards.

Honey-capping Presses.

Looking at the illustration of the Jacobsen press it will be noticed how everything has been built for strength. This is to prevent breakages when a large pressure is brought into bearing on the cappings. Every additional weight (see No. 1) adds an extra ton pressure. Mr. Jacobsen

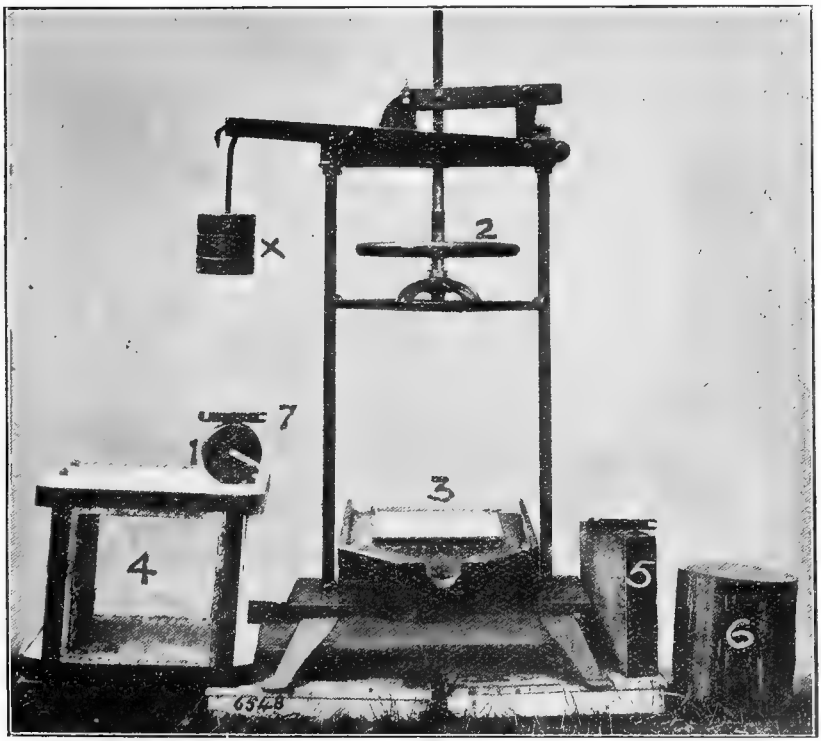

Fig. 43.—The Jacobsen Honey-capping Press.
Photo, F. A. Jacobsen.]

has five of these weights, and can therefore supply 5 tons pressure, exclusive of that brought to bear by the wheel (No. 2). This pressure may be left on until every particle of honey is squeezed out of the cappings, and they will not become less as they are squeezed down.

The weights on the drop sink lower as the shrinkage in the box takes place, thereby keeping up a continuous pressure. The wheel may be used independently of the weights. No. 3 comprises the bottom part of the press, and is made of 2 in. kauri. It is 2 ft. 6 in. from back to front, and 18 in. wide. Running all the way round, and nailed on the side, is a strip 3 in. by 1 in., projecting 1 in. above the top surface of the bottom-board, to receive the box portion of the press and prevent leakage. Strips 13 in. by $\frac{1}{2}$ in. by $\frac{1}{2}$ in. are nailed in the centre of the bottom. These are kept $\frac{1}{2}$ in. apart, and form a square to fit into the inside of the box, which is placed on the bottom. On the top surface of these strips is tacked perforated steel or two or three thicknesses of wire gauze, to allow the honey to squeeze through and so pass along the

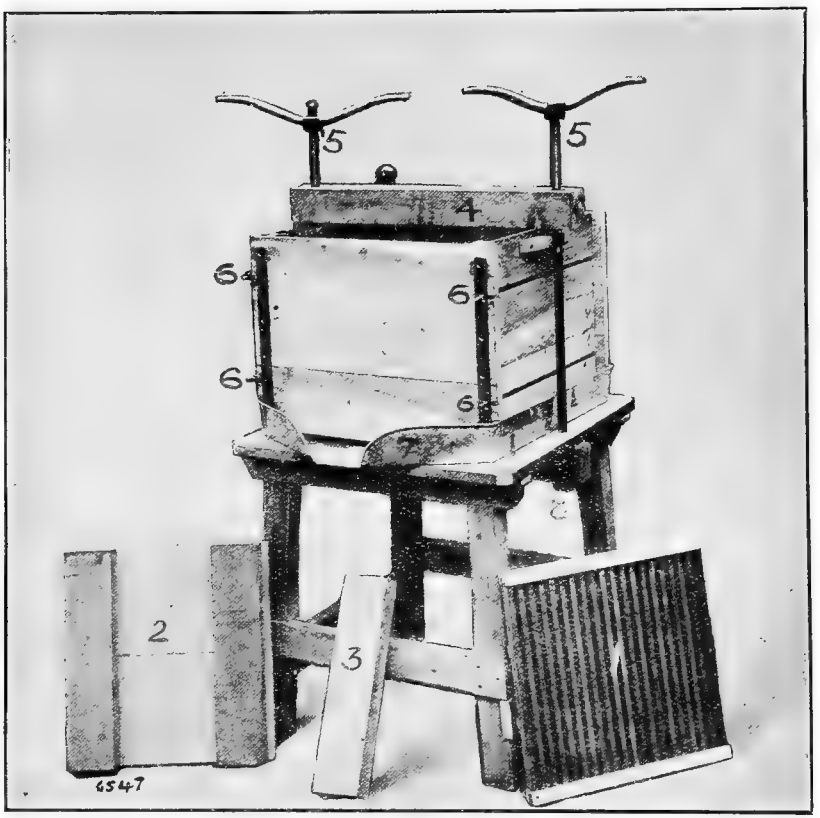

FIG. 44.—THE LENZ HONEY-CAPPING PRESS.
Photo, F. A. Jacobsen.]

length of the strips and out through the front. The box marked No. 4 is also made of 2 in. kauri, and is bolted together with two bolts on each side and extending from one side to the other. It is 16 in. deep and 18 in. wide, outside measurement, with projecting sides 22 in. long, for the purpose of allowing plenty of hold for the bolts. The inside is covered all round with $\frac{1}{2}$ in. by $\frac{1}{2}$ in. strips, tacked $\frac{1}{2}$ in. apart, running from top to bottom. On top of these is tacked the same material as the bottom has been covered with. The inside measurements are now 13 in. by 13 in. No. 5 is a stout top, to go directly on the cappings, and is fitted with strips the same as the box and bottom. This is made

out of 3 in. timber, to stand the strain, although it is perhaps not necessary to have it so thick. No. 6 is a large wooden block placed on the top of No. 5, when it no longer projects above the sides of the box. The wheel is then screwed down on this block, which takes the pressure, forcing down No. 5 on the cappings and squeezing out the honey. No. 7 is a little fixing for raising the box off the bottom, to enable the operator to push the block of wax right through the box. Two bolts with big heads are screwed into the top of the box on each side, so that when No. 2 is screwed down tightly on No. 4 these bolts are in position, one on each side of the lower portion of No. 2. The two No. 7 fixings are then placed over the base of No. 2 and under the bolt-heads, so that when the wheel is screwed up the box is lifted bodily off the bottom, when the wax may be pushed right through. Each succeeding day when the cappings have been pressed into solid blocks they are placed on one side ready for melting down, and the honey can be run in with the extracted honey, being just as pure in every particular.

The Lenz press (Fig. 44) is a press much lighter in construction than the Jacobsen, but is better for out-apiary work, being more easily shifted about. It is made of 1 in. timber, and the sides of the box, the bottom and top, are fitted with strips and perforated steel, the same as in the Jacobsen press. When the block of wax is to be removed the box is taken apart by loosening the thumb-screws marked No. 6 in the figure. The box then comes readily apart. No. 1 is the top, No. 2 goes on top of No. 1, and several pieces marked No. 3, or as many as required, go on top of No. 2 to make up the packing required as the cappings are squeezed down. No. 4, of course, takes the pressure from the two main screws numbered 5. No. 7 is a tray to catch the honey, and is shaped to a point in front. The whole is fixed on a stand 2 ft. 3 in. high, and, although very simple, it does the work well. We highly recommend this press for both large and small apiaries.

Capping-melters and Thick-honey Reducers.

There are a number of capping-melters on the market, and they do away with the necessity for an uncapping-can. These melters require to be placed over lamps or a small stove; the combs are uncapped directly over the melter, and the honey and wax is immediately segregated. They are particularly valuable in apiaries where thick honey is gathered by the bees and cannot be extracted, as a good melter will rapidly demolish whole combs cut from the frames. There are several different makes of melters in use in the Dominion—namely, the Severin, the Beuhne, the Benton, and the Miller.

SPRING FEEDING OF BEES.

Lessons can always be learnt each successive season by the observant man, and thus may be avoided those little mistakes which are a drain upon profits, while an efficient system of bee-management will be thereby evolved. Not the least important lesson to be taken from previous experience is the necessity of providing stores in view of a possible unfavourable season. Next in magnitude to the losses of bees which result from inattention to disease are those which occur in the spring months through starvation. Few but experienced beekeepers and those who suffer financially from losses realize how readily the food-supply may become exhausted after breeding is in full swing in spring. All beekeepers worthy of the name will take care that their bees never run short of food, be it spring, summer, autumn, or winter.

The Cause of Starvation.

Given a fair supply of stores in late autumn, when fixing the bees up for winter, a colony will use comparatively little during the winter months; but as soon as breeding begins in the latter part of July or early August the stores are largely drawn upon for feeding the brood, and unless nectar can be gathered to help them out, the stores will rapidly diminish. As a rule, willows and other spring forage afford a good supply in fine weather, but the weather is frequently far from fine at the time—generally unsettled and against the bees securing nectar. Take a case, for example, where the bees have come out of winter quarters with a fair supply of food in the hive, the weather fine, and some nectar is being brought in from the fields. Under these conditions, where there is a good queen, breeding will go ahead very rapidly, and in a short time there will be a big lot of brood to feed, and a large quantity of food needed. If at this time bad weather should set in and last for several days, preventing the bees gathering nectar, probably within a week pretty nearly all the reserve stores within the hive will be used up, and if the bees are not seen to before they arrive at this stage they will probably die of starvation.

In addition to the above, it is advisable to make a hurried examination of all colonies in the apiary, taking care to select a fine warm day. Expose the brood as little as possible and note any that are getting short of stores, and feed accordingly.

Feeding.

Many beekeepers have been convinced that it is a wise and assuredly a safe policy to make ample provision against possible starvation. Losses have been suffered in this way not once but many times, thus condemning the weak system of leaving but a minimum amount of stores

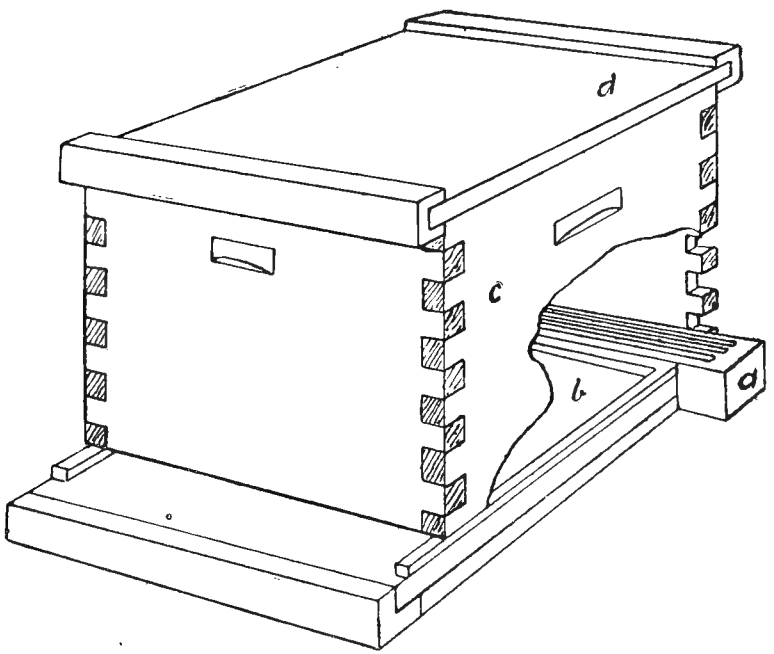

Fig. 45.—The Alexander Feeder in Position.
a, feeder; *b*, bottom-board; *c*, super; *d*, cover.

in the hives instead of the maximum. Half-starved colonies will never winter well, but will exhibit weakness in the spring, and will then demand special feeding to stimulate brood-rearing. On the other hand, by leaving a few extra pounds of honey in a hive the strength of a colony is assured at the critical period, providing, of course, it went into winter quarters with a good population of bees. Weak stocks for honey-producing are practically useless. From 30 lb. to 40 lb. of stores is necessary to be left in the hive for the winter consumption by the bees, and certainly not less than the former amount.

When and how to feed.

Experienced beekeepers can judge in a moment by the weight of the hive, without opening it, whether the supply of food is running short or not, and every beekeeper should learn to do this. By putting one foot on the back of the bottom-board to keep it steady, and with one hand raising the back of the hive, one can get the weight at once, and after a little practice can judge to within 1 lb. the amount of honey inside. In this way a large number of hives can be examined in ten or fifteen minutes, and those needing food should be marked.

The safest and best food to give, unless frames of honey from known clean hives are available, is sugar-syrup. Never purchase honey or accept it as a gift to feed your bees with—it is too risky, and to sterilize it would require two or three hours' boiling, which would be more trouble than the honey would be worth.

The Advantages and Disadvantages of Stimulative Feeding.

The practice of feeding sugar-syrup in the spring to stimulate brood-rearing is not done nearly so much as formerly, but preference is given to the system of leaving in the autumn enough bulk stores to last the colony right through to the honey-flow. The reason of spring stimulative feeding was to make the colony rear early a large force of young bees to gather the harvest, but just when the harvest was to be expected was a difficult matter of determination. Sometimes, when this was done too early, more harm than good resulted from overstimulation: more eggs were laid than the bees could look after and keep warm, while robbing was encouraged. One of the main drawbacks is that swarming may be brought on prematurely. The system of leaving enough stores in the autumn to last right through, or of feeding in the spring, depends somewhat on the beekeeper and his locality. Many can doubtless practise spring feeding to advantage, especially when dividing is intended for increases, but, as a rule, the best plan is to leave enough sealed stores to last the bees until they can gather more supplies for themselves. This method is especially recommended to beginners.

What to feed.

It is, then, sometimes necessary to provide bees with artificial food —for instance, to induce brood-rearing in the early spring, supplying stores for them to winter on, and at other times when the beekeeper thinks it necessary. This food is supplied by the mixture of sugar and water. For stimulating brood-rearing about one-third sugar to two-thirds water should be used, but for wintering purposes as much sugar as warm water will dissolve—two parts of sugar to one of water —is preferable. Honey from an unknown source should never be used, as it may contain spores of foul-brood. At all times white cane-sugar is preferable. Cheap grades of sugar or molasses should never be considered for winter stores, as they would be liable to start dysentery. Tartaric acid, or vinegar in a small quantity, may be mixed with the

syrup for the purpose of converting the cane-sugar into invert sugar, and so retard granulation. It is best to feed in the evening to guard against robbing.

Feeders.

Different feeders are on the market for different purposes, and are as follow :—

The Miller Feeder.

For those who are desirous of supplying a sufficiently large quantity of provisions to last the bees right through the winter the Miller feeder would be the best. It enables about 25 lb. of stores to be fed at one time, which is a distinct advantage when a large quantity of colonies have an insufficient supply. It is made to fit completely over the

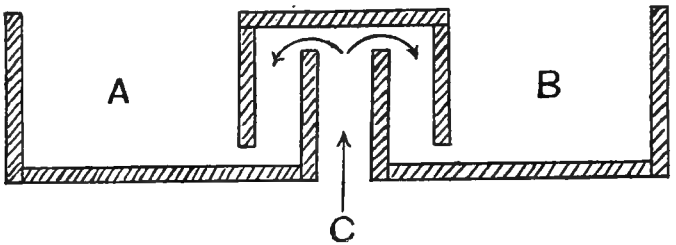

Fig. 46.—The Miller Feeder: A and B are Feed-reservoirs; C is the Bee-entrance.

brood-chamber, and comes out flush with the super on all four sides, and the cover fits over this. Some are made to slide easily inside a super, and these are in many cases preferable, as they have a double wall to help preserve the heat in the warm syrup. They are made on the liquid-level principle, as the cross-section clearly shows.

The Doolittle Division-board Feeder.

This feeder is neither more nor less than a large brood-frame boarded up on each side nearly to the top. Down through the centre runs a partition nearly to the bottom. A hole is bored through the top bar, through which the feed is poured. This method of working is very convenient. The feeder may be placed right alongside the bee-cluster without disturbing the bees. When a refill is required all that is necessary is to push the cover a little to one side and quietly pour in the syrup.

The Alexander Feeder.

The Alexander is a feeder that is very convenient, and is popular for outdoor working. It may be left under the hive the whole season, and so could be used at any time for stimulative or other feeding. It

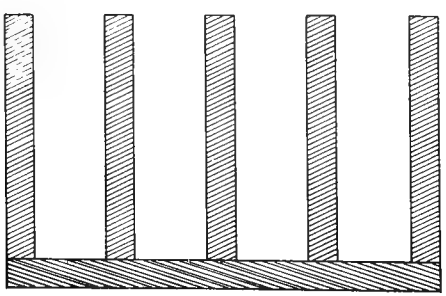

Fig. 47.—The Alexander Feeder: Sectional View.

is in the form of a trough, and when the brood-chamber is pulled back over the end of the bottom-board it is blocked up underneath, with the end protruding past the side of the brood-chamber. Over this end is placed a wooden block, which is only removed for the purpose of refilling. All work with this kind is exceedingly simple and speedy.

The Simplicity.

This feeder is most extensively used, and is simple and cheap in price. When not in use numbers of them may be packed into a very small space. They are good for stimulating brood-rearing, and occupy

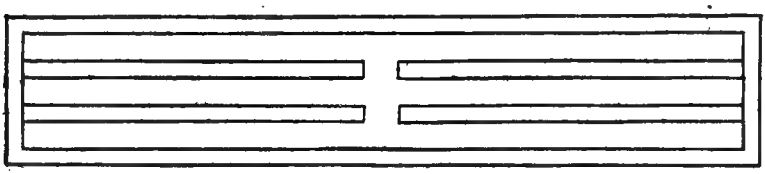

FIG. 48.—TOP VIEW OF THE SIMPLICITY FEEDER. MADE ON THE SAME PRINCIPLE AS THE ALEXANDER, BUT SMALLER.

very little room on top of the frames. When flat covers are used in the apiary, however, this style of feeder cannot be adopted without the addition of a half-super.

Pepper-box Feeder.

This is simply a can with a finely perforated top. When filled it is inverted and set directly over the top of the brood-frames. The syrup slowly drains through the perforations, and is immediately sucked up by the bees.

The Boardman Style.

This is an entrance feeder, and makes use of the common Mason jar, which fits on to a box arrangement. The sides of the box are made to project some distance into the hive, thus guarding against robbers.

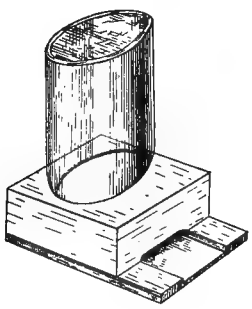

FIG. 49.—THE BOARDMAN FEEDER, AS USED WHEN ENTRANCE FEEDING.

A special cap is necessary for the jar, and is sold by the bee-supply manufacturers, who also supply the box which completes the feeder. The advantage with these is that one can see at a glance how quickly the bees are taking the syrup and when the jars need refilling.

An Excellent Method for the Large Beekeeper.

Perhaps the best method of feeding a large number of stocks is as follows: It is simple, and has the advantage that when once the food is supplied no more attention need be given, as in other cases, concerning the refilling of feeders or their removal. The syrup is mixed and is poured into a small tank, which is placed at a considerable elevation. From the bottom of this tank a pipe, rubber for preference, is fixed, and a rose is fitted with a cut-off tap attached. This arrangement is for the purpose of squirting the syrup into the empty combs; but considerable pressure must be employed to force the air from the cells, hence the height of the tank. In this way several pounds of syrup can be supplied in each comb, which does away with the expense of feeders. A great amount of work can be got through under this system in a very short time, which is particularly advantageous to large apiarists.

Sugar-candy.

During the winter months bees lie dormant, and it is not until the approach of warmer weather that they become very active. Frequently, however, the amount of stores left the previous autumn is consumed before the spring, and then to save the colony it is essential to feed. When bees are in this semi-torpor in cold weather they are unable to move very far from the cluster, hence they would be unable to go after the syrup. To supply their needs at this critical period the best thing to do is to place a cake of candy on the frames immediately above the cluster. This they readily eat, and is most accessible.

How to make Candy.

In candy-making "practice makes perfect." The proportion of sugar and water cannot be definitely stated, as much depends on the state of the fire which regulates the evaporation. About 1 pint of water to 4 lb. or 5 lb. of sugar is as near the amount as possible. Place the required amount in a saucepan, the best cane or lump sugar to be used, and pour sufficient boiling water over the sugar; stir carefully, and boil for a few minutes. To test if it is tough enough, cool a few drops on a piece of paper, and in a few seconds it should draw out into threads. When thoroughly set it should be brittle. If your judgment calculates it sufficiently boiled, lift the saucepan into a pan of cold water, stirring continuously all the while until cooled enough to be in a pasty state, when it should be poured into moulds—saucers, &c. Grease the moulds inside or place thin paper in them to prevent the candy sticking, and enable the blocks to be turned out readily. On no account feed burnt candy, as this would probably kill some of the bees.

Cautions.

(1.) Do not feed bees with liquid food during excessive cold weather. Candy is preferable.

(2.) Contract all entrances if bees are inclined to rob, and do not spill syrup on the ground.

(3.) It is advisable to place small sticks under the mats during winter to enable the bees to move readily from comb to comb.

(4.) Care should be taken to avoid feeding syrup showing the slightest sign of fermentation.

(5.) Wooden feeders before using should be well waxed inside with a mixture of resin and paraffin.

WAX-EXTRACTORS.

The conversion of old and broken combs into commercial beeswax is a problem that presents itself to those engaged in practical apiculture. Working under old methods the process was disagreeable and unsatisfactory, but the improvements which have lately been made in wax-presses have obviated a great deal of the unpleasant work, and the difficulty of reducing old combs into wax is no longer a serious trouble. Many good presses can be obtained for the purpose. The following are favoured by the majority of beekeepers:—

The Solar Wax-extractor.

The Solar wax-extractor is a useful appliance in the apiary, but requires a good deal of sunshine to work it properly. It is very handy for throwing in odd scraps of wax and pieces of broken comb, but it can hardly be recommended to put in brood-combs or those that have any trace of disease.

The dimensions outside are—Length, 5 ft. 3 in.; width, 2 ft. 8 in.; depth of main part of body, 4½ in.; wax-receptacle at lower end of body, 9 in. wide by 8 in. deep. The sash is furnished with two sheets of glass with an air-space of 1 in. between them. The wheel on which the extractor is mounted is 4 ft. 6 in. diameter, and works on an axle about 2 ft. long, driven into a block of wood in the ground. The body of the wax-extractor is lined with black sheet iron turned up at the sides, and fitting loosely in the extractor. A long tin divided into three compartments fits in the lower part for catching the wax as it runs from the combs. The tin and the divisions should run smaller at bottom than at the top, to facilitate turning out the cakes of wax, and the tops of the two divisions should be ¾ in. below the top of the tin. The middle compartment will then retain any dirt or foreign matter running in with the wax, while the clean wax will flow over into the outside compartments.

With the exception of perhaps the sash and the metal parts, there is nothing difficult about the making of such an extractor to a man handy with tools. The woodwork must be substantial and thoroughly well seasoned to stand the great heat, and must also be well put together, otherwise it would soon fall to pieces. Screws are better than nails in the woodwork. It is advisable to bind the edge of the sashes with 1½ in. angle-iron. The depth inside from the lower sheet of glass to the iron lining should not exceed from 2½ in. to 3 in. The wheel, of course, is handy for turning the extractor to the sun, but is not absolutely necessary if one cares to lift it round when required.

If in a warm corner of the apiary and well sheltered, the extractor would work at almost all times when the sun is shining. Such an appliance will soon pay for itself in a fair-sized apiary, for every particle of comb can be put in at once and converted into good commercial beeswax instead of being wasted.

The Hatch Press.

This press is known as the hot-water type, and the method of working is to melt the combs in a separate vessel; and when all is in a liquid state, dipper it off into the cheese-cloth forming the lining of the press, fold over, and apply pressure by means of the screw.

The Root Wax-press.

In apiaries of twenty colonies or more this press will be invaluable to the beekeeper in converting combs into commercial wax. The wax-press shown is a very popular one, and is worked by hot water and pressure. The work saved would soon defray the cost and show a profit. The press is also very useful as an uncapping-can and honey-press, and is largely used for the purpose.

Method of rendering Wax.

Choose a cold day for the operation, since nothing excites the bees during the off season like the smell of hot wax. Commencing opera-

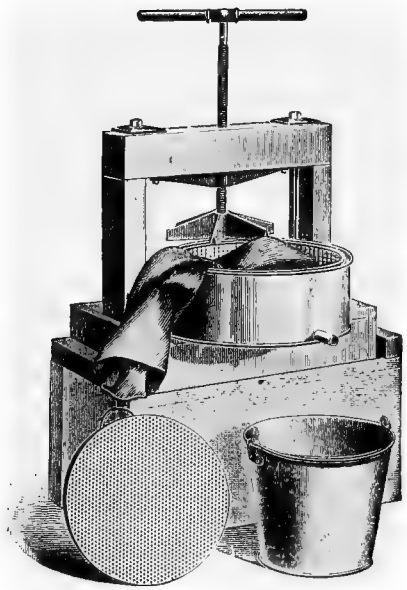

Fig. 50.—The Hatch Wax-press.

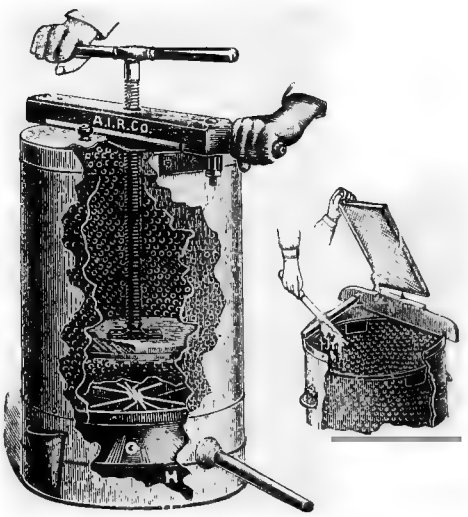

Fig. 51.—The Root Wax-press.

tions, fill the copper half-full of water, and when this is heated place the combs—which must have been removed from the frames—in the hot water. Have a strong stand ready to support the wax-press, and inside this place a kerosene-heater, so arranging it that the flame comes in direct contact with the bottom of the press. Fill the water-compartment of the press with boiling water, which the heater will now keep boiling, and in the perforated basket of the press place a coarse scrim bag large enough to reach to the bottom of the basket. The combs in the copper should be stirred with a stick until the wax is all melted, and the contents of the copper—water and wax—should then be ladled into the scrim bag in the press. The top of the bag should now be folded, so as to allow of one or more of the wooden "followers" belonging to the press to be placed on top of it, and the screw placed in position, when a stream of water and wax will

immediately commence to flow from the outlet provided in the press. A kerosene-tin or similar vessel should be placed in position under the outlet.

Two precautions are necessary in using a wax-press. Pressure should at all times be applied with caution. Until the flow from the press slackens, the screw should not be turned, and when it becomes necessary to apply pressure this should be done without appreciable effort. The screw should always turn easily. It will be found that if this advice is taken the maximum of wax will be obtained with very little risk to the machine. Another point to be borne in mind is that only a comparatively small quantity of water and wax must be put into the bag at each ladling. It is difficult to exactly estimate how much to treat at once, so much depends on the proportions of wax and water, but on no account attempt to fill the scrim bag at one operation. When the wax and water cease to run from the outlet the bag should be removed, and the slumgum emptied out before the press is required to deal with any more wax.

As the copper will, of course, contain a great deal of water, it is an excellent plan to keep a kerosene-pump in the vessel placed to receive the contents of the press. If this is sunk to the bottom of the vessel it will draw off a great deal of the water, leaving the wax, which will, of course, be on top, untouched. This will result in the wax being gathered in far larger cakes than if several vessels are used. The wax should be set aside to cool as gradually as possible, this being best achieved by covering the tin containing it with cornsacks or similar material. The gradual cooling helps to clarify the wax. When it is quite cold the cake should be taken out of the tin and carefully scraped.

The tin should now be washed out and partly filled with clean hot water, the cake of wax replaced, and the whole gradually heated until the wax is once more melted. After this second process the whole should be slowly cooled as before, and when the wax is once more removed and scraped it will have reached its commercial form. The wax-press and copper should be cleansed while still hot. The water should be emptied out of its compartment in the press at once, and the press placed to drain in order to prevent rust. The slumgum must be gathered up and burnt, and the bag washed and dried for future use.

DISEASES OF BEES AND THEIR TREATMENT.

The hive-bee (*Apis mellifica*), like all other animals, especially those under domestication, is subject to several diseases, some fortunately of minor importance. The most injurious are those which attack and destroy the brood, thus preventing the normal development of young bees, and the inevitable result of which, when allowed to run their course, is the rapid decline and ultimate extermination of the colonies affected.

FOUL-BROOD.*

The most pernicious of bee-diseases is what we know as "foul-brood," a germ disease of a very infectious nature, and only too familiar to the majority of beekeepers. It is, without doubt, the greatest drawback to successful bee-culture known at the present time, and seems to be prevalent in all countries where bee-culture is followed.

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* This subject is also dealt with in the Department's Bulletin No. 1 (New Series), "Foul-brood in Bees and its Treatment."

The economic value of the bee-farming industry is now recognized in all progressive countries, and is receiving encouragement in some form in most of them. The knowledge of losses sustained in the past through disease, which to a large extent is preventable and curable

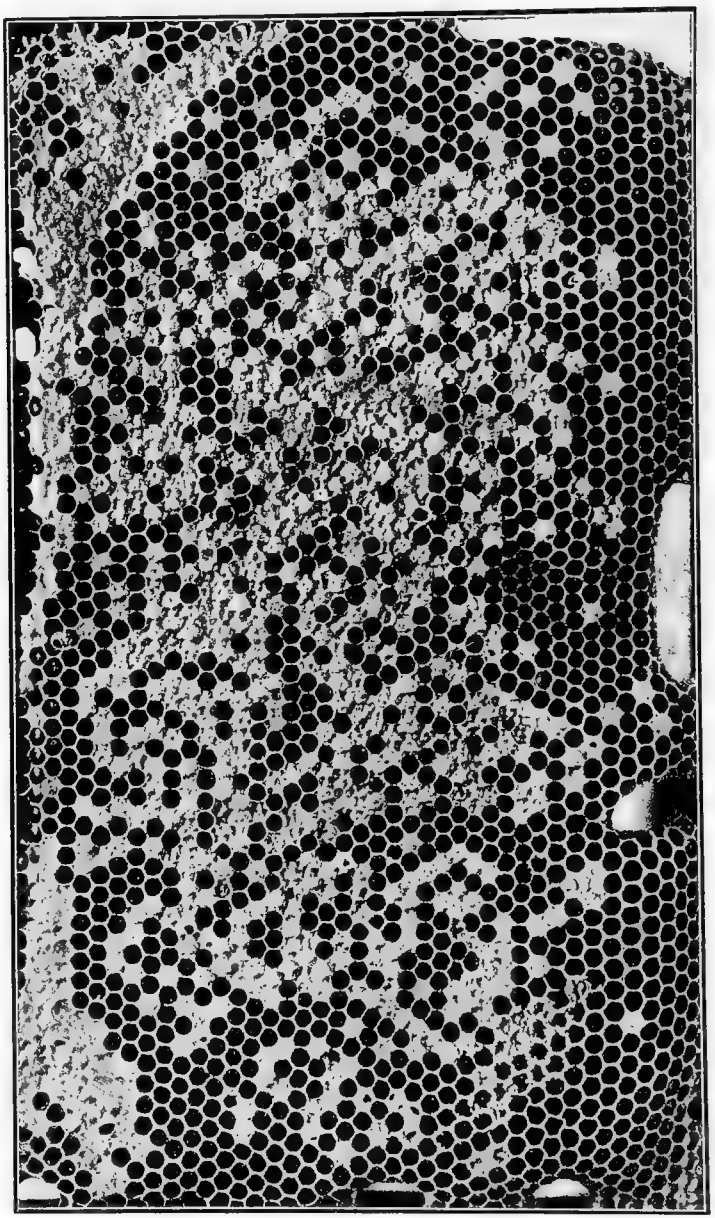

FIG. 52.—COMB INFECTED WITH FOUL-BROOD (BACILLUS LARVÆ) IN AN ADVANCED STAGE.

in its early stages, has caused an energetic movement, based on legislation, for stamping it out, or, at all events, for bringing it under control.

Symptoms of Foul-brood.

We need not at present concern ourselves about the distinction of germs causing disease, so long as we know and can detect the

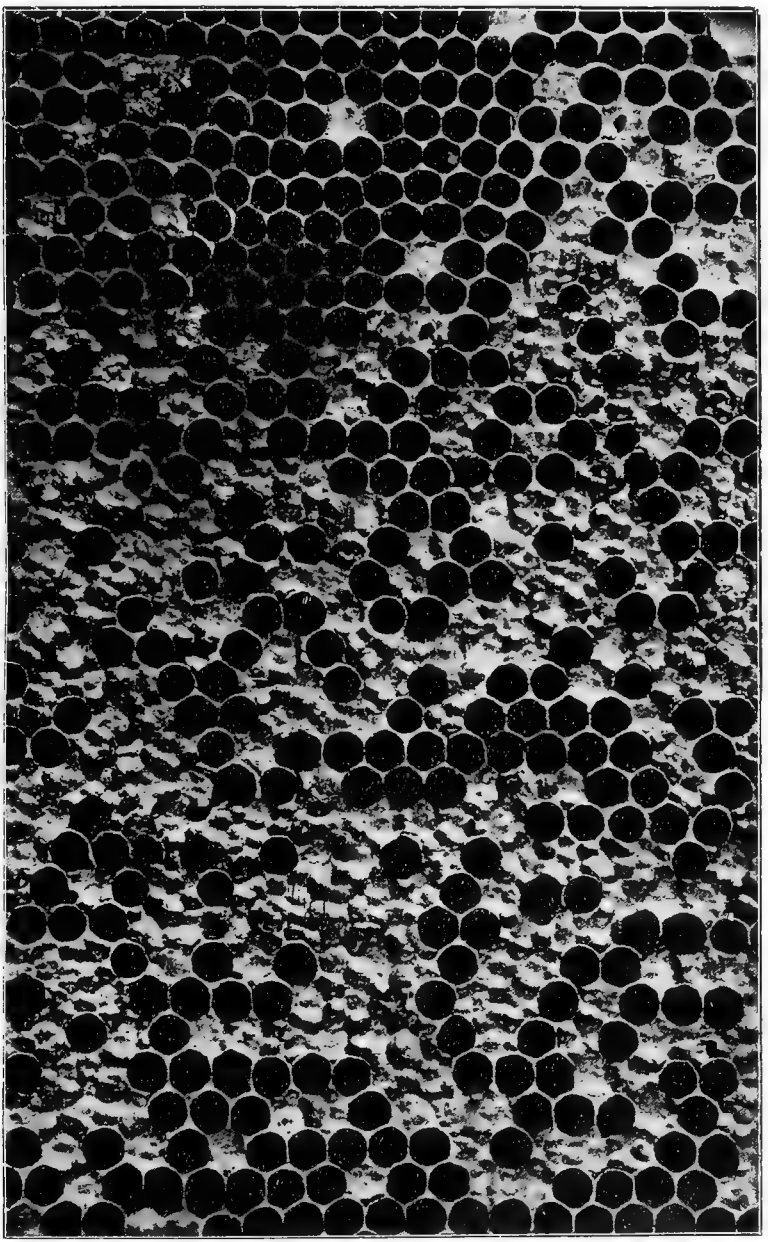

FIG. 53.—FOUL-BROOD: PORTION OF DISEASED COMB (NATURAL SIZE).

symptoms of the form of foul-brood we are troubled with. Healthy brood in the larva stage—that is, before it is sealed or capped—presents a clear pearly whiteness, but when attacked, which is usually about

the time of capping, changes to a light buff, then to brown. It is, however, when the brood has been capped that the novice is better able to detect the presence of disease.

In the early stages of an attack a capped cell here and there appears somewhat different from the surrounding healthy brood. Instead of the cappings or seals being bright, full, and of convex form, characteristic of healthy brood, they are of a dull blackish-brown colour, and flat or sunken (see Fig. 53), an indication that the cells contain dead pupæ. The disease rapidly spreads to surrounding cells and combs if allowed to take its course, till finally no brood can hatch, and the colony succumbs. On opening some of the cells a thin glue-like coffee-coloured mass will be noticed, which on the insertion of a splinter of wood adheres to the point, and can be drawn rope-like for some little distance out of the cells. Later on this glue-like substance dries up into the before-mentioned black scale-like body.

Other symptoms are "pin-poles" and ragged perforations in the cappings of the cells and a very disagreeable smell resembling that of heated glue or tainted meat, which may be sometimes, though rarely, detected at some yards away from a badly infected hive in close weather. The characteristic odour cannot easily be detected in the earliest stages, even when an infected comb is placed close to the nose, but some slight difference can be noticed between that and healthy comb at all times.

Symptoms of European Foul-brood.

It will be well to make known here the symptoms of this form of foul-brood, as described in Circular No. 79 of the United States Bureau of Entomology.

"Adult bees in infected colonies are not very active, but do succeed in cleaning out some of the dried scales. This disease attacks larvæ earlier than does American foul-brood (*Bacillus larvae*), and a comparatively small percentage of the diseased brood is ever capped; the diseased larvæ which are capped over have sunken and perforated cappings. The larvæ when first attacked show a small yellow spot on the body near the head, and move uneasily in the cell; when death occurs they turn yellow, then brown, and finally almost black. Decaying larvæ which have died of this disease do not usually stretch out in a long thread when a small stick is inserted and slowly removed; but occasionally there is a very slight "ropiness," but this is never very marked. The thoroughly dried larvæ form irregular scales, which are not strongly adherent to the lower side wall of the cell. There is very little odour from decaying larvæ which have died from this disease, and when an odour is noticeable it is not the "glue-pot" odour of American foul-brood, but more nearly resembles that of soured dead brood. This disease attacks drone and queen larvæ very soon after the colony is infected. It is, as a rule, much more infectious than American foul-brood, and spreads more rapidly. On the other hand, it sometimes occurs that the disease will disappear of its own accord, a thing which the author never knew to occur in a genuine case of American foul-brood. European foul-brood is most destructive during the spring and early summer, often almost disappearing in late summer and autumn."

Caution to those importing Bees and Queens.

It is now generally understood that disease ("foul-brood" and "black-brood") may readily be conveyed from one country to another through the food supplied to the queens and bees, be it honey in combs or the usual "candy" with which the queen-cages are furnished. The

latter is made with sugar and some honey; and as it is through germ-infected honey that disease is generally conveyed, it is absolutely necessary that every precaution should be taken against risk, lest we inadvertently import the dreaded " black-brood."

The measures to be taken to avoid risk are simple. With queens everything except the queens themselves, including the bees accompanying them, should be burned after the queen has been put into a clean introducing-cage. In the case of colonies, the comb and frames should be burned, and the bees be treated at once on the McEvoy plan.

Treatment of Foul-brood.

As far back as 1771 Schirach in his writings recommends the removal of the combs from the bees for the purpose of curing foul-brood. It is on this principle that the present treatment is based. It was not until recent years, however, that this method was generally recognized as giving the most reliable satisfaction. Formerly drugs were brought largely into use, but it has been proved beyond doubt that they are absolutely of no consequence and their use a waste of time. The present system, commonly called the " McEvoy " treatment, when properly carried out, gives an effective cure which has been repeatedly tried with absolute success in many thousands of cases in New Zealand.

Where the disease is so far advanced as to have left few bees in the colony, then it will be safest to destroy by fire everything that has been in contact with it. " Tinkering " with such a colony would be both useless and dangerous.

Treatment may be undertaken at any time of the year, providing the weather is not too cold to prevent the bees building comb. In the southern parts of New Zealand, if treating in the cold season, the bees should be put on to drawn-out combs and fed as below with warm syrup, or the bees put on to frames of clean honey, if procurable, and left until the spring.

All operations in this connection should be carried out in the evening, when the bees are quiet.

Prepare a clean hive and bottom-board with narrow starters of comb-foundation in the frames. Remove the infected hive and stand to one side, and put the prepared one in its place, prop up the front about an inch, lay a sack near the entrance, and shake and brush the bees as quietly as possible close to the entrance, and when finished remove every vestige of the infected hive away where bees cannot get at it. The combs, if not too badly infected, may be melted into wax, or, if insufficient in quantity for that purpose, they, with their frames, had better be burned right away and the ashes buried. The hive, bottom-board, and cover, if sound and worth saving, should be cleaned and thoroughly disinfected with a strong solution of carbolic acid or izal, or singed inside by fire.

On the evening of the fourth day following, the necessary number of frames for the hive should be furnished with full sheets of comb-foundation, to be exchanged with those the bees have been working on. This can be done by removing the frames one at a time, shaking the bees back into the hive, and inserting the others. The comb built on the starters during the four days may be cut out and melted up, and the frames disinfected.

The result of this treatment is that during their four days' comb-building the bees use up all the infected honey contained in their honey-sacs when taken from their old hive, so that when shifted again at the end of the four days they start clean.

Feeding and disinfecting.

In all cases when treatment is going on and honey is not being stored freely, feed sugar-syrup liberally after shifting the bees on the fourth day. Mix half a pint of water with each pound of sugar used, stir well, and bring it to the boil; when cool it is ready. Always feed within the hive and in the evening.

Be sure to remove out of the way of the bees, and disinfect or burn, everything used during the operations of treatment; and a solution of izal should be kept for disinfecting the hands, knives, &c., after handling an infected colony. Directions are given on the bottles, and the solution will not harm the skin. Also dig the ground over around the diseased-hive stand.

After-inspection.

In from three to four weeks, when the new brood begins to emerge, keep a look-out for any suspicious-looking brood-cells, and if any are seen cut them out at once, together with the adjoining cells. If suspicious cells recur treat again fully. "Eternal vigilance" should be the watchword of every beekeeper who hopes to keep down disease.

To prevent Swarming out.

On rare occasions colonies swarm out during treatment, but this is not likely to occur when honey is gathered freely. It can be guarded against by caging the queen for a few days, or by giving a wide entrance and placing queen-excluding zinc across.

Saving Healthy Brood.

When several colonies are to be treated and there is a large quantity of healthy brood in the combs, put a queen-excluding zinc honey-board over the frames of one of the least-affected hives, and put all the healthy brood above this to emerge. When this has been accomplished remove everything and treat the colony in the manner advised. The zinc prevents the queen making use of the affected combs while the brood is emerging.

Autumn Treatment.

When it is desired to treat colonies in the autumn, *after brood-rearing has ceased*, just put the bees into clean hives provided with ample winter stores in the shape of frames of honey from *clean* colonies. The disease is not likely to reappear.

Young Queens.

There can be little doubt that bees from young vigorous queens can better cope with disease than those bred from aged and weak mothers. It is therefore advisable to change the queens at the time of or shortly after treatment if those in the affected hives are not up to the mark; in any case it is profitable to do so if young queens can be obtained.

OTHER DISEASES.

The following description of symptoms of other diseases than foul-brood, and which so far have given but very little trouble in New Zealand, is taken partly from "The Bacteria of the Apiary," published in 1906 by the United States Department of Agriculture:—

"Pickle-brood.

"There is a diseased condition of the brood called by beekeepers 'pickle-brood,' but practically nothing is known of its cause. It is cha-

racterized by a swollen watery appearance of the larvæ, usually accompanied by black colour of the head. The larvæ usually lie on their backs in the cell, and the head points upward. The colour gradually changes from light yellow to brown after the larva dies. There is no ropiness, and the only odour is that of sour decaying matter, not at all like that of American foul-brood. In case the larvæ are capped over, the cappings do not become dark, as in the case of the contagious diseases, but they may be punctured. So far no cause can be given for this disease, and whether or not it is contagious is a disputed point. Usually no treatment is necessary beyond feeding during a dearth of honey, but in very rare cases when the majority of larvæ in a comb are dead from this cause the frame should be removed and a clean comb put in its place, to make it unnecessary for the bees to clean out so much dead brood.

"Chilled, Overheated, and Starved Brood.

"Many different external factors may cause brood to die. Such dead brood is frequently mistaken, by persons unfamiliar with the brood-diseases, for one or the other of them. Careful examination will soon determine whether dead brood is the result of disease or merely some outside change. If brood dies from chilling or some other such cause, it is usually soon carried out by the workers, and the trouble disappears. No treatment is necessary. Brood which dies from external causes often produces a strong odour in the colony, but wholly unlike that of American foul-brood—merely that of decaying matter. The colour of such brood varies, but the characteristic colours of the infectious diseases are usually absent, the ordinary colour of dead brood being more nearly grey."

Isle of Wight Disease.

This disease, as its name indicates, first made its appearance in the Isle of Wight, and from there it rapidly spread through England to the borders of Scotland, wiping out apiary after apiary. It has occupied the earnest attention of the English Board of Agriculture for some years, and it is now generally attributed to a small parasite organism known as *Nosema apis*. The symptoms seem to vary a great deal, but the most important seem to be the death of a large number of adult bees, mostly outside the hives. The bees crawl out and attempt to fly, but find they cannot, and fall off the alighting-board on to the ground, and there perish. In some, but not in all cases, the abdomens are distended and dysentery is present. The bees seem to be disinclined to work, and so crawl aimlessly about.

In no case has it been reported that the brood has been affected. The disease is impossible to diagnose with certainty without the microscope. It is most infectious, and the only way so far discovered to combat the disease is for the beekeeper to watch for unsatisfactory colonies, and relentlessly destroy all those that appear at all suspicious.

Some experiments have recently been made with what is called Ayle's cure, which is mostly creosote, and has a very decided odour. It has been found of practically no use, however, as the guards cannot tell their own bees on account of the smell, and robbing goes on extensively.

New Zealand, so far, has been fortunate in escaping this epidemic.

THE BEE OR WAX-MOTH.

We have in New Zealand only two varieties of wax-moth, the larger one being the *Galleria mellonella* and the small one *Achræa grissella*.

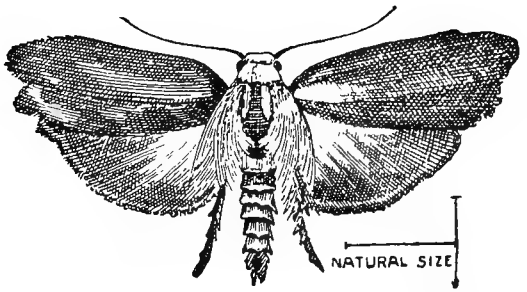

FIG. 54.—LARGER WAX-MOTH (GALLERIA MELLONELLA).

FIG. 55.—COMB ATTACKED AND NEARLY DESTROYED BY WAX MOTH (GALLERIA MELLONELLA).

A favourite haunt of the grubs is on the top of the frames under the mat, or where there are two mats they will get in between them. . In the daytime they apparently hide from the bees, and at night attack the combs ; but when the colony becomes very weak the grubs show no such fear, and attack the combs at all times.

It is the larvæ or grubs of the moth which prove so destructive to the combs, burrowing through them under the protection of strong silken galleries which they spin round themselves, secure from the bees as they advance in their work of destruction. Eventually the combs are completely destroyed and fall a mass of web and cocoons to the bottom of the hive (see Fig. 55).

The moth itself, which is usually to be seen during warm summer evenings flitting about the hives, watching for an opportunity to lay its eggs within or near the entrances, can readily discover weak colonies, when it does not hesitate to enter the hives, and thus the grubs eventually get a footing from which they are seldom or never dislodged by the bees.

The average length of the grub is about 1 in., and " when first hatched it is pale yellow, with a slightly darker head, and of a greyish flesh-colour when full-grown, with a dark reddish-brown head." The length of the moth is about ¾ in., " has reddish brown-grey forewings, which are distinctly lighter in colour towards the outer or hinder margins."

That wax-moths, large and small, are only enemies of careless bee-keepers and those who have not advanced beyond the common box-hive stage is a well-known fact. Careful up-to-date beekeepers have nothing to fear from these or any other insect enemies. Follow the golden rule of beekeeping—viz., " Keep all colonies strong "—and insect enemies will never trouble.

Fumigating Combs.

Not only the combs within the hives, but also any which may happen to be unprotected, are liable to be attacked by the moth. No combs or pieces of combs should be allowed to lie about. When they are of no further service they should be melted into wax at once. Spare combs should always be stored in a place of safety from the moth, and inspected frequently. On the first sign of moths or grubs they should be fumigated, and a few days afterwards they should undergo a second fumigation. When there are not many to do they may be suspended in empty hives about 1 in. apart, and the latter piled one on the other, taking care that the junctions of the boxes are made smoke-tight by pasting a strip of paper round them. The top box of the pile should contain no frames. Into this place an old iron saucepan containing live wood-embers, and on to these throw a couple of handfuls of sulphur, close the cover securely, and keep closed for a couple of days. In a large apiary it is best to have a small room fitted up for the purpose. Two or three pounds of sulphur will be sufficient for a large room.

PART III.—ACTS AND REGULATIONS.

THE APIARIES ACT, 1908.

1. (1.) THE Short Title of this Act is the Apiaries Act, 1908.

(2.) This Act is a consolidation of the enactments mentioned in the Schedule hereto [the Apiaries Act, 1907], and with respect to those enactments the following provisions shall apply:—

(*a.*) All Orders in Council, appointments, notices, directions, and generally all acts of authority which originated under the said enactments, and are subsisting or in force on the coming into operation of this Act, shall enure for the purposes of this Act as fully and effectually as if they had originated under the corresponding provisions of this Act, and accordingly shall, where necessary, be deemed to have so originated.

(*b.*) All matters and proceedings commenced under the said enactments, and pending or in progress on the coming into operation of this Act, may be continued, completed, and enforced under this Act.

2. In this Act, if not inconsistent with the context,—

"Apiary" means any place where bees are kept:

"Beekeeper" means any person who keeps bees or allows the same to be kept upon any land occupied by him:

"Disease" means foul-brood (*Bacillus alvei* and *Bacillus larvae*), bee-moths (*Galleria mellonella* and *Achroea grizzella*), and any other diseases or pests from time to time declared by the Governor in Council to be diseases within the meaning of this Act:

"Frame hive" means a hive containing movable frames in which the combs are built, and which may be readily removed from the hive for examination:

"Inspector" means any person appointed by the Governor as an Inspector under this Act.

3. Every beekeeper in whose apiary any disease appears shall, within seven days after first becoming aware of its presence, send written notice thereof to the Secretary for Agriculture at Wellington, or to any Inspector of Stock.

4. The Governor may from time to time appoint Inspectors and other officers to carry out the provisions of this Act.

5. Any Inspector may enter upon any premises or buildings for the purpose of examining any bees, hives, or bee appliances, and if the same are found to be infected with disease he shall direct the beekeeper to forthwith take such measures as may be necessary to cure the disease; or, if in the opinion of the Inspector the disease is too fully developed to be cured, he may direct the beekeeper within a specified time to destroy by fire the bees, hives, and appliances so infected, or such portions thereof as the Inspector deems necessary.

6. In any case in which it is found by an Inspector that the bee-combs in any hive cannot, without cutting, be separately and readily removed from the hive for examination, he may direct the beekeeper to transfer the bees to a new frame hive within a specified time.

7. (1.) Every direction by an Inspector shall be in writing under his hand, and shall be either delivered to the beekeeper personally or sent to him by registered letter addressed to him at his last known place of abode.

(2.) Every such direction shall be faithfully complied with by the beekeeper to whom it is addressed, and, in default of compliance within the time specified, the Inspector may within one month destroy or cause to be destroyed by fire, at the expense of the beekeeper, any bees, hives, and appliances found to be infected with disease.

8. No beekeeper shall—

(*a.*) Keep or allow to be kept upon any land occupied by him any bees, bee-combs, hives, or appliances known by him to be infected by disease, without immediately taking the proper steps to cure the disease; or

(*b.*) Sell, barter, or give away any bees or appliances from an apiary known by him to be infected by disease.

9. No beekeeper shall keep or knowingly allow to be kept on any land occupied by him any bees except in a properly constructed frame hive.

10. Every person is liable to a fine not exceeding five pounds who—

(*a.*) Obstructs an Inspector in the exercise of his duties under this Act, or refuses to destroy or to permit the destruction of infected bees and appliances:

(*b.*) Fails to comply with any direction given under the provisions of this Act by any Inspector:

(*c.*) Commits any other breach of this Act.

11. No person shall be entitled to compensation for anything lawfully done under this Act.

12. The Governor may from time to time, by Order in Council gazetted, declare any disease or pest affecting bees or apiaries (other than those mentioned in section two hereof) to be a disease within the meaning of this Act.

THE APIARIES AMENDMENT ACT, 1913.

1. This Act may be cited as the Apiaries Amendment Act, 1913, and shall form part of and be read together with the Apiaries Act, 1908 (hereinafter referred to as the principal Act).

2. (1.) Section two of the principal Act is hereby amended by adding to the definition of "beekeeper" the following words: "or who has in his possession or allows to be kept on any land occupied by him any appliances that have been used in connection with apiculture."

(2.) Section two of the principal Act is hereby further amended by omitting the words "*Bacillus alvei*," and substituting the words "*Bacillus pluton*"; and by inserting, before the words "and any other diseases," the words "Isle of Wight disease (*Nosema apis*)."

3. Section three of the principal Act is hereby amended by omitting the words "the Secretary for Agriculture at Wellington, or to any Inspector of Stock," and substituting the words "any Inspector appointed under this Act."

4. (1.) Section five of the principal Act is hereby amended by omitting the words "forthwith take," and substituting the words "take within a specified time"; and by omitting the words "within a specified time to destroy by fire," and substituting the words "to destroy by fire within a specified time."

(2.) The powers of entry conferred on an Inspector by the said section five may be exercised by any person authorized in writing in that behalf by the Inspector, and any person so authorized shall forthwith report to the Inspector the results of the examination made by him.

5. Section six of the principal Act is hereby amended by omitting the words "a new," and substituting the words "an approved."

6. Section seven of the principal Act is hereby amended—

(*a.*) By inserting, after the word "Inspector" in subsection two, the words "or any person authorized by him in writing in that behalf"; and

(*b.*) By inserting, before the words "any bees" in the same subsection, the words "any hives other than properly constructed frame hives, or."

7. Section ten of the principal Act is hereby amended by inserting, after the word "Inspector" in paragraph (*a*), the words "or any person acting under the written authority of an Inspector."

8. (1.) The Governor may from time to time, by Order in Council gazetted, prohibit absolutely, or except in accordance with regulations under this Act,—

(*a.*) The introduction into New Zealand, either generally or from any specified place, of any bees, honey, comb-foundation, appliances, or other thing which is diseased or infected with disease, or which in his opinion is likely to introduce any disease into New Zealand; or

(*b.*) The removal from any specified portion of New Zealand to any other portion or specified portion of New Zealand of any bees, honey, comb-foundation, appliances, or other thing which is diseased or infected with disease, or which in his opinion is likely to spread any disease.

(2.) For the purposes of this section the Governor may, by Order in Council gazetted, appoint any specified ports to be the only ports of entry for bees, honey, comb-foundation, or appliances, or for any specified bees, honey, comb-foundation, or appliances.

9. (1.) The Governor may from time to time, by Order in Council gazetted, make regulations—

(*a.*) Prescribing the manner in which diseased bees, honey, comb-foundation, appliances, and infected packages shall be treated, cleansed, destroyed, or otherwise disposed of;

(*b.*) Prescribing the manner in which any bees, honey, comb-foundation, appliances, or other things introduced into New Zealand in contravention of this Act or of any regulations thereunder, shall be treated, cleansed, destroyed, or otherwise disposed of;

(*c.*) Providing for the free registration of apiaries, and the terms and conditions of such registration;

(*d.*) For the inspection, grading, packing, marking, stamping, branding, and labelling of honey;

(*e.*) Prohibiting the exportation of honey from New Zealand otherwise than in accordance with such conditions as may be prescribed; and

(*f.*) Generally for any other purpose for which regulations are contemplated by the principal Act or this Act, or which are deemed necessary or expedient in order to give full effect thereto.

(2.) All regulations under this section shall within fourteen days after their publication in the *Gazette* be laid before Parliament if sitting, or if not, then within fourteen days after the commencement of the next ensuing session.

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HONEY-EXPORT REGULATIONS.

The following regulations under the Apiaries Amendment Act, 1913, came into force on the 1st December, 1915:—

1. For the purposes of these regulations—

"Director" means the Director of the Horticulture Division of the Department of Agriculture, Industries, and Commerce:

"Dominion" means the Dominion of New Zealand, exclusive of the Cook Islands:

"Owner" means any owner, shipper, or consignor of honey, and includes the agent of any such owner, shipper, or consignor; and also includes, in the case of a company, the managing director, manager, secretary, or other principal officer of the company in New Zealand.

2. No honey shall be exported from the Dominion until it has been graded as hereinafter provided, and until the other provisions of these regulations have been complied with.

3. Honey shall not be exported from the Dominion excepting at the ports of Auckland, Waitara, Wellington, Lyttelton, Timaru, and Dunedin.

4. The following stores are hereby appointed to be the grading-stores for honey at the places indicated opposite each:—

Place.	Store.
Auckland ..	New Zealand Express Company's Store.
Wellington ..	New Zealand Express Company's Store.
Lyttelton ..	Lyttelton Harbour Board's Store.
Timaru ..	Timaru Cold Stores and Ice Company's Store.
Dunedin ..	South Island Dairy Association of New Zealand's Store.
Bluff	Harbour Board's Store.

5. (1.) The owner of honey intended for export shall forward it to one of the appointed grading-stores not less than seven days before shipment.

(2.) He shall at the same time give to the Grader at the grading-store to which the honey has been sent an advice-note in the form set out in the First Schedule hereto or to the effect thereof.

(3.) Where there is any noticeable difference in the class or standard of honey forwarded to an appointed grading-store in one lot and under one brand, the owner shall submit such honey in separate parcels, each parcel containing honey of a uniform class and standard, with a distinguishing-mark on each case of honey in each such parcel, and the advice-note to the Grader shall show the distinguishing-mark of each such parcel.

(4.) Every person who wilfully supplies false information on any advice-note as aforesaid commits a breach of these regulations.

(5.) Every owner of honey sending the same to any of the appointed grading-stores must make his own arrangements for the transit of the honey to and from the store, and also for its receipt, storage, opening-up for grading, repacking, delivery, shipment, and any other service, including insurance and protection from damage and loss of any kind.

6. All honey submitted for grading must be granulated, and no honey will be graded or allowed to be exported unless it is granulated.

7. (1.) Honey intended for export shall be packed in clean strongly constructed tins, which shall be lacquered or oiled on the outside to prevent rusting.

(2.) To enable the grading to be carried out each tin shall be provided with a leak-proof lid which is capable of being easily removed and replaced.

(3.) The tins shall be packed in cases, which shall be clean and new, and constructed of well-seasoned timber planed on the outside, and strapped with metal strapping or wire.

(4.) The weight of the honey in any case shall not exceed 120 lb. net.

8. (1.) The owner of honey for export shall, before sending it to an appointed grading-store, cause the cases to be clearly and indelibly branded with an export brand to be approved and registered by the Director as hereinafter provided.

(2.) The brand shall contain the words "New Zealand Produce.—Pure Honey," and the name of the owner; provided that either in lieu of or in combination with the name of the owner there may be used such other words or such designs as the Director may approve for the purpose.

(3.) The net weight of the honey shall also be branded on the cases.

(4.) A shipper's brand or mark may also be branded upon the cases.

(5.) One end of each case shall be kept clear for the grade-mark to be placed thereon by the Grader.

9. (1.) Every person intending to ship honey for export shall make application to the Director in the form set out in the Second Schedule hereto, or to the effect thereof, for the registration of the export brand prescribed in clause 8 of these regulations.

(2.) The Director may, if in his opinion the use of the brand to which the application relates is not likely to lead to mistakes or confusion, approve and register the brand, and shall forthwith notify the applicant of the result of his application.

(3.) No person shall use any export brand unless and until he has been notified by the Director that it has been registered.

(4.) The Director may at any time, after giving one month's notice in writing to the owner thereof, cancel the registration of any export brand if satisfied that it has not been used during the preceding two years in connection with the export of honey.

10. For the purposes of grading, honey will be divided into four classes according to colour—viz., white, light amber, medium amber, and dark.

11. For the purposes of the grading of honey the maximum number of points that may be allotted in respect of the several qualities is as follows: Flavour, 40; colour, 10; condition, 15; grain, 12; aroma, 8; freedom from scum and froth, 10; packing and finish, 5: total, 100 points.

12. (1.) The following will be the standards upon which the grades of honey will be determined: A or Special Grade, 94 to 100 points, both inclusive; B or Prime Grade, 88 to 93½ points, both inclusive; C or Good Grade, 80 to 87½ points, both inclusive; D or Manufacturing Grade, 65 to 79½ points, both inclusive.

(2.) No charge will be made for grading.

13. As soon as possible after grading any honey the Grader shall stamp on the cases containing the honey a mark (herein called the "grade-mark") indicating the grade of such honey determined in accordance with these regulations; and shall also sign and deliver to the owner a certificate of the grade (herein called the "grade-certificate"), in the form set out in the Third Schedule hereto; provided, however, that no grade-certificate shall be issued in respect of honey scoring less than 65 points in the grading, and no grade-mark shall be placed on any case containing any such honey, but in any such case a notification of the result of the grading shall be sent by the Grader to the owner of the honey.

14. No person shall remove from any appointed grading-store, except for the purpose of immediately shipping it for export beyond New Zealand, any honey for which a grade-certificate has been issued unless the grade-certificate is surrendered to the Grader and the grade-mark upon the case has been erased.

15. If any honey, after being graded and prior to its export from the Dominion, is damaged or, in the opinion of any Grader, deteriorates, the owner of such honey shall, if and when directed by the Grader to do so, submit such honey for re-examination, and shall surrender to the Grader the grade-certificate issued in respect thereof.

16. No honey in respect of which the grade-certificate has been or ought to have been surrendered in accordance with the two last preceding regulations shall be exported until it has been resubmitted for grading and a new certificate has been issued in respect thereof.

17. No honey shall be exported from the Dominion which scores less than 65 points in the grading.

18. No honey shall be exported from the Dominion if the tins containing it show any signs of leakage.

19. The decision of any Grader as to the quality, condition, or grade of any honey shall be conclusive, and no action or other proceeding shall lie against any Grader or against any other officer of the Crown, or against the Crown, in respect of any erroneous decision of a Grader as to such quality, condition, or grade.

20. Except as otherwise provided in these regulations, no person shall alter or obliterate wholly or partially, or cause to be altered or obliterated, any grade-mark; nor shall any person counterfeit or improperly impress any such grade-mark on any case containing honey or intended to contain honey.

21. Any person committing or concerned in committing a breach of these regulations is liable to a penalty not exceeding £5.

SCHEDULES.

First Schedule.

ADVICE-NOTE SUBMITTING HONEY FOR GRADING.

The Honey-grader, Department of Agriculture, Industries, and Commerce.

In compliance with the regulations under the Apiaries Amendment Act, 1913, I hereby submit for grading the undermentioned honey, which I have forwarded this day per to the grading-store belonging to at the port of .

Please send the certificate to .

Number of cases : .

Net weight :

Brand and mark :

[*Address and date.*] [*Signature of owner.*]

Second Schedule.

APPLICATION FOR REGISTRATION OF EXPORT BRAND FOR HONEY.

The Director of the Horticulture Division, Department of Agriculture, Industries, and Commerce, Wellington.

I, We], , of , a shipper of honey for export, do hereby request you to register the brand of which a copy is attached for use by me us in branding cases containing honey intended for export, as required by the regulations in force under the Apiaries Amendment Act, 1913, relating to the export of honey.

[*Address and date.*] [*Signature.*]

Third Schedule.

GRADE-CERTIFICATE FOR EXPORT HONEY.

I hereby certify that I have this day classed and graded packages of the undernoted honey as follows, and at the same time have stamped the packages according to class and grade :—

..... packages A or Special Grade [*Insert class*] honey.
..... packages B or Prime Grade [*Insert class*] honey.
..... packages C or Good Grade [*Insert class*] honey.
..... packages D or Manufacturing Grade [*Insert class*] honey.
..... Total number of packages.

	Maximum Points obtainable.	A or Special Grade: 91 to 100 Points inclusive.	B or Prime Grade: 88 to 93½ Points inclusive.	C or Good Grade: 80 to 87½ Points inclusive.	D or Manufacturing Grade: 65 to 79½ Points inclusive.	Description of Packages.
Flavour	40					[*Brand.—Shipper's mark.*]
Colour	10					
Condition	15					
Grain	12					
Aroma	8					
Freedom from scum and froth..	10					
Packing and finish	5					
	100					
Total average points allotted						

[*Remarks.*]

Port: .

Date . .

.....

Grader

REGULATIONS UNDER THE SALE OF FOOD AND DRUGS ACT, 1908, AFFECTING HONEY.

CONTAINERS.

Containers used for keeping or holding jams, syrups, honey, condensed milk, soups, meat-extracts, meats, undried fruits and vegetables or other moist food substances, and wrappers in contact with such food substances, shall not contain in the surfaces which come into contact with the food any lead, antimony, zinc, arsenic, or copper, or any compounds thereof, or any poisonous or injurious substance. If the container is made of tinplate it shall be outside-soldered, and the said surfaces shall be free from pin-holes, blisters, cracks, or other defects. If the tinplate is lacquered the lacquer shall completely cover the tinned surface without the container. The container shall yield to its contents no lead, antimony, arsenic, zinc, or copper, or any compounds thereof, or any other poisonous or injurious substance.

HONEY

Honey shall be the nectar and saccharine exudations of plants, gathered, modified, and stored by the honey-bee; it shall contain not more than twenty parts per centum of water, not less than sixty parts per centum of reducing-sugars, and it shall not yield more than three-fourths of one part per centum of ash. It shall not contain any added sugar or glucose, artificial sweetening-substance, added colouring-matter, or other foreign substance.

By Authority: MARCUS F. MARKS, Government Printer, Wellington.

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