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*Issued by direction of*

*The Hon. W. G. Ashford, M.L.A., Minister of Agriculture.*

FARMERS' BULLETIN, No. 129.  
February, 1920.

# THE BEGINNER IN BEE CULTURE

W. A. GOODACRE,  
Senior Apiary Inspector.

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DEPARTMENT OF AGRICULTURE,  
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# DEPARTMENT OF AGRICULTURE, NEW SOUTH WALES.

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FARMERS' BULLETIN, No. 129.

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## THE BEGINNER IN BEE CULTURE.

### INTRODUCTION.

SINCE the introduction of the bar frame hive, many scientific as well as practical apiarists have made a close study of bee-keeping, contributing opinions which it behoves us to consider carefully. It is not suggested that, to be successful, the apiarist should necessarily be a scientist, but it is intended rather to stress the advantage to be derived from associating with practical experience a sound knowledge of the main principles of apiculture. As in other activities, the start is all-important. A start in the wrong direction leads to all sorts of troubles, and in no case is this better instanced than where the beginner purchases bees in any odd-sized hives, thus inaugurating an "any old way" system at the opposite pole to any which characterise profitable modern bee-keeping.

Five well-hived colonies containing a fair breed of bees will, with ordinary attention, equal thirty of the "kept any way" sort, so far as production is concerned. Surely then it is easier to attend to five hives than thirty? It is quality, not number, that counts; and the beginner's first aim should be to keep bees the right way. A very comfortable living can be made from apiculture, providing the apiarist will properly qualify himself to become a producer. The three main things are experience, locality, and energy. Small apiaries can be profitably worked as a side line with other industries, providing time can be found for ordinary attention during the season.

The manner in which a start is to be made will largely depend on the prospective bee-keeper's experience, capital, and available stocks. For instance, if one good season's experience with a practical apiarist has been gained and he has £150 to £200 and the opportunity of purchasing, say, a hundred colonies within reasonable distance of a selected locality, then a good start may be made—especially if the purchase is made in the spring with something like favourable prospects as to flora for the first season.

Many of our successful apiarists embarked in the industry in a very small way and with limited capital. With two or three colonies hived in factory-made hives they gained practical experience, and improved their knowledge by reading books on bee culture. Others, again, had the advantage of gaining some experience from practical apiarists in their locality, and were able to build up their stocks by small purchases or from "bee trees." Generally, however, the bees paid for the extension. In the majority of cases the apiarist was working in or near localities favourable for commercial bee-keeping, and gave attention to the bees in his spare time until he was able to make a clear start on his own.

Conditions are somewhat more difficult for city people, or for those residing in unfavourable localities, who have very limited capital. A good method in such cases is to purchase from a practical apiarist one or two healthy colonies in factory-made hives, and to gain all practical experience possible from these; it will be found that one or two colonies will be sufficient for this purpose practically anywhere in the State. After some knowledge has been gained in this way, a position should be obtained in the country in a locality favourable for commercial bee-keeping, and a start made in a small way. It is always advisable to have some tuition from a practical apiarist if it can possibly be obtained, and the interested and energetic beginner will usually find some way of getting in touch with the right person.

Many settlers on small areas that are in fair localities for bee-keeping could improve their income by working small apiaries as a side line. A start should be made as already described, good hives being purchased, and a modern method of management being adopted. An effort should be made, too, to Italianise the colonies.

Unless the beginner knows of colonies for sale locally, it is a good plan to advertise in a bee journal, or the local or daily papers; the most convenient and favourable replies can be considered and classed for personal inspection. It is not advisable to purchase more than two or three colonies for a start, and these should, if possible, be obtained from a practical apiarist of whom the buyer has some knowledge. Another plan for the beginner is to purchase one or two colonies from a queen-raising apiary.

### THE INTERNAL ECONOMY OF THE HIVE.

Probably in no form of insect life does the talent for domestic economy attain a more intelligent eminence than among the bees; the story of their activities is a fascinating fairy tale "come true." Quite distinct from the study's financial aspect—the point of view of the bee-keeper for profit—the history of the hive, the busy duties of its inmates, and the laws which guide them are well worth investigation.

A colony of bees consists of one queen, a large number of workers, and usually a fair number of drone bees. The queen is a developed female, the workers undeveloped females, and the drone is the male bee.

#### The Queen Bee.

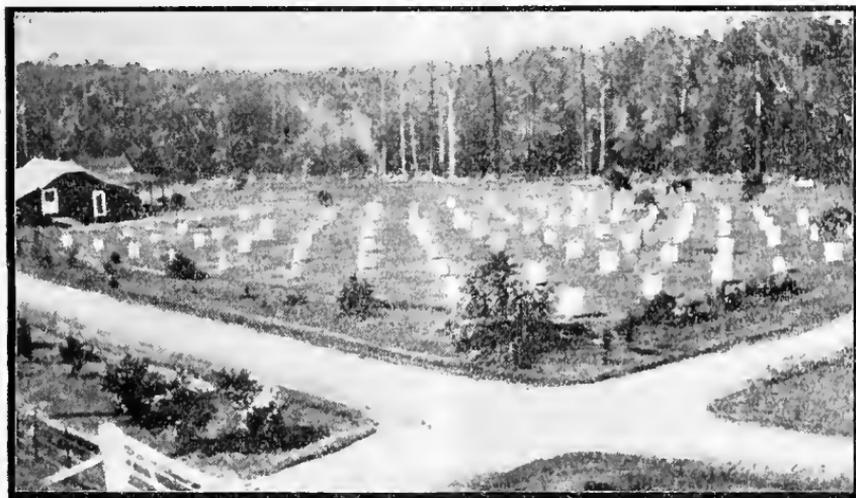
The work of the queen bee is to lay all the eggs, and she may therefore be described as the mother of the colony. She is raised from the same larvæ that would produce a worker.

For instance, if a queen is removed from a normal colony when conditions for breeding are favourable, the bees would, within twenty-four hours, prepare to raise another, by feeding a number of very young worker larvæ on specially prepared food called "royal jelly." This food is given in abundance, and will cause extra development. To provide for this the bees build the cells out later to about  $\frac{3}{4}$  of an inch past the level of the ordinary brood and extend them in width. The queen thus raised from the larvæ usually issues from the cell on about the fourteenth day, though the condition of the weather may cause the period to vary slightly. When a queen emerges from the cell, she will very quickly destroy any remaining cells that are in an advanced stage, unless the colony desires to swarm, which seldom occurs in such an instance. Though the foregoing should not be

taken as a desirable method of replacing queens, in many cases a similar one is used where a better system is not available; that is, by placing a frame of selected brood with a queenless colony, or by introducing a queen from a populous colony for the purpose of raising cells to replace unsatisfactory queens in the apiary. In the case of a beginner the brood placed should contain some eggs, as his knowledge of the right age for larvæ would be limited.

### Virgin Queens.

A queen is termed a "virgin" from the time she issues from the cell until successfully mated with the drone. Strange to say, this virgin queen could lay eggs that would produce live drone bees, but in order that the queen may lay eggs that will produce worker bees it is necessary for her to be fertilised by the drone. The mating usually takes place in about five days after issue from the cell. Selecting a nice sunny day if possible, the



The Government Apiary, Wauchop:

young queen issues from the hive and mates with the drone whilst on the wing. The queen absorbs the organ of the drone, which has the effect of killing him immediately, and she then returns to the hive, where she will commence to lay in a few days. In most cases the queen will be laying within ten days from the time she issues from the cell, though the weather conditions sometimes cause the time to vary. A queen may even be mated late in the autumn and not lay until the spring.

A virgin queen is very difficult to find in the hive on account of her small size and shyness, but a change takes place shortly after successful mating, for the queen develops in a wonderful manner, due to the presence of eggs forming in the abdomen. When this takes place the queen is usually easily discovered.

The life of a queen bee is about three years, and only once during that period is she mated. Despite the average period of a queen bee's life, it is usually advisable to replace her after two seasons' work.

### Drone-laying Queens.

A drone-laying queen is one that has not been successfully mated, or (on some occasions) a queen that has lost the power to fertilise her eggs. The former state is usually brought about by some abnormal condition of the queen, or an unfavourable condition of the weather during mating time. For instance, a queen will at times issue from a cell with damaged wings, being thus prevented from taking the wedding flight. This queen would naturally be a drone-layer. At other times unfavourable weather may prevent mating, and after a fair period the queen will lay, but the issue will, in such case, be drones. A novice will often clip a virgin queen, causing her to become a drone-layer. Others sometimes leave an excluder on the entrance for an unlimited period, which has a similar effect if there is a young queen in the hive during the time.

A drone-laying queen can be detected by the appearance of the brood, the caps of the worker cells being abnormally bulged, and having practically the shape of a .22-rifle bullet. Her eggs are usually laid irregularly, and their condition and appearance are quite abnormal when compared with the brood of a good queen. Drone-laying queens should be destroyed, about two frames of her brood being then removed and replaced with about the same quantity of normal brood obtained from good Italian stock. This brood should contain at least some eggs and larvæ. After twenty-four hours a ripe queen cell should be placed with the colony, or a queen introduced that is not considered valuable. In case neither cells nor queen are obtainable, all the brood should be removed in the first instance, and the bees allowed to raise cells from the brood introduced until a cell or queen raised under better conditions is available to give them. A good method is to unite a nucleus containing a laying queen if one is on hand.

The brood of a drone-laying queen is similar in appearance to that of laying workers, and it will therefore be necessary to note the distinguishing features of each case. The apiarist usually has a knowledge that a queen was, or should be, in the hive, whereas in the case of laying workers the colony must have been queenless for a considerable time. This knowledge, combined with diligent search, will place the apiarist on the right track.

### Worker Bees.

The name "worker" is self-explanatory, and their wonderful organisation is clearly apparent when it is seen how smoothly a colony will progress in normal times with a population of probably 20,000 of them. Among a few of the duties performed by them daily during normal times are the gathering of nectar, pollen and water, the feeding and attending of the larvæ, and the cleaning of the hive. Besides these things, they circulate the air through the hive, guard the entrance from attack, and secrete wax and build comb.

Remarkable self-sacrifice is shown by the bee. When crippled, she will throw herself over the alighting board; and when swarming, the colony which worked so hard to build its comfortable home, sallies bravely forth to start all over again, leaving its hard-earned stores for the younger generation. It would be impossible to find greater energy, organisation, self-sacrifice or love of home than that which marks the worker bee.

Nectar, the liquid gathered from the flowers which undergoes a change in the honey stomach of the worker bees, is subsequently stored in the comb and becomes "honey." Pollen is the nutritious food which is gathered from the flowers and carried on the legs of the bee. It is stored in the cells and is principally used, after being mixed with honey and water, and partially digested in the chyle stomach of the worker bee, for feeding larvæ.

### Laying Workers.

The statement that the worker bee is an undeveloped female and a sister to a queen, and that a virgin queen can lay eggs that will hatch live drone bees, will clearly show why it is possible for a worker to lay eggs that will produce live drone bees. It is only in an exceptional case, however, that a few workers will try to take up the position of a queen and be accepted as such by the colony, and usually when a colony is without a queen for a considerable period. If, therefore, attention is given to the colonies either by introducing a queen or a frame of brood containing larvæ and eggs soon after they become queenless, the trouble will be averted.

The brood of laying workers is similar in appearance to that of a drone laying queen, but the eggs are laid in a very erratic manner, and it is not uncommon to see a dozen in one cell and perhaps thirty in a queen cell cup. The bees, noticing the abnormal condition, will often endeavour to supersede. The cells raised for this purpose are much longer than the ordinary queen cell, but the bees have no chance of raising a queen from drone larvæ, and therefore there is no issue from the cells raised. The knowledge or suspicion that the colony has been queenless for quite a long time, combined with a diligent search, will convince the apiarist that laying workers are present. It is practically impossible to detect the bees that are laying.

A colony containing laying workers is almost invariably in a weak condition, therefore it is best to remove all their brood and unite them with a populous colony. To do this, it is best to wait until the bees have finished work for the day. Carry the colony to the one it is to be united with, remove the cover of the populous colony, and place upon it a sound sheet of newspaper; then place the laying worker colony on top, leaving the bottom board on the ground. Regarding the brood combs that were removed from the colony, it is best to extract the honey and melt them up, for if this brood is placed with a good queen the bees will often supersede their queen, and the risk is not worth while.

### The Drone Bee.

The drone is the male bee and his term of life is generally regulated by the workers. For instance, if the colony is progressive they are raised and allowed to remain in numbers; but when times are not progressive the majority are driven from the hive, killed or starved. The sole purpose of the drone is to fertilise virgin queens; but in the breeding of bees he has just as important a part as the queen, and the effect of his peculiar breeding makes his part even more beneficial to the apiarist. For instance, a pure Italian queen, mated with a drone from black stock, would produce crossbred worker bees, but the drones in this case (not being affected by the mating) would be pure Italian. If, however, a queen is raised from this crossbred stock then the drones would be crossed. It will be seen, hence, that the drone has a grandfather, but no father.

This knowledge that the first cross from Italian stock will produce pure drones is of considerable assistance to those apiarists who are improving the standard of breeding in their bees. They can be sure that these drones will be equal to those raised from pure stock, so far as any effect they will have on future breeding is concerned.

### DIFFERENT TYPES OF HIVES.

To look through many of our books on bee culture, for the purpose of finding out the best class of hive to use, would puzzle the beginner, for of the many varieties he notices, all claim certain advantages. Personally I advise the use of the "Langstroth principle" hive, in using which the reader will be in company with the majority of successful apiarists. These hives are made in eight and ten-frame sizes, though at the present time the latter size is the more popular. It is unnecessary to go into the construction of the hive, save to say that it consists of a full depth body for brood, and that generally the half-depth supers are preferred for surplus honey. Fig. 1 will give an idea of the appearance and construction.

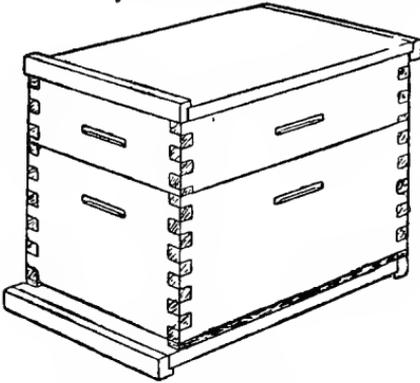


Fig. 1.—A Hive on the Langstroth Principle.

It is best to purchase the first hive complete, as a good idea is then obtained as to how they should be nailed and adjusted. After this knowledge has been gained the hives could be forwarded in the flat as is usual. Be sure and paint all hives before use.

### The Home-made Hive.

As many apiarists prepare home-made hives during the winter it is advisable to consider the manner in which they should be constructed, for it means much in easy manipulation later on. Good construction of the hive is practically the basis of successful management in the case of a beginner. The usual fault in construction is that the hives are not made to a standard or interchangeable size; this causes such inconvenience to the would-be progressive apiarist, that after a time he finds it necessary to transfer his bees to a more efficient and convenient hive. We find in other cases where the hives are interchangeable, that the spacing for the frames is at fault; too much space is left in the frames between the supers, or between the side bar and end board of the hive. This will induce the bees to build a considerable amount of burr comb, and cause difficulty in manipulation and damage to the frames; in addition, the temper of the bees is severely tested. Insufficient space allows protection for pests such as wax moths, for the bees cannot attack them; the manipulation will be as difficult as with overspacing, and often many bees will be crushed during manipulation of the supers or frames. The disadvantages mentioned do much towards destroying the interest of the beginner in the business.

It is always preferable to use factory-made hives; but if there is a reason for desiring the home-made article, the apiarist should obtain at least one of factory make as a guide. Then take all measurements correctly; purchase the frames, make use of comb foundation before the bees are placed in the hive, and have a sound cover and bottom board.

### The Bolton Hive.

This hive is lately being used to some extent in New South Wales, and there is no doubt that it is convenient in some ways; the chief of its advantages is that all parts are interchangeable. The end bars of the Bolton frames are the same size from the top bar to the bottom, and the frames can be made firm with the aid of a screw, and the body inverted when desired. My reason for not advocating this hive at the present time is that the method of manufacture allows double-spacing between the frames, the disadvantages of which have been mentioned in the paragraph on the home-made hive. In my opinion, to get the best from this design, there should only be half bee space at the top and bottom of each body, which would make correct spacing even if the bodies were inverted. If this hive were so constructed as to overcome the difficulty mentioned, it could be advocated for extensive use.

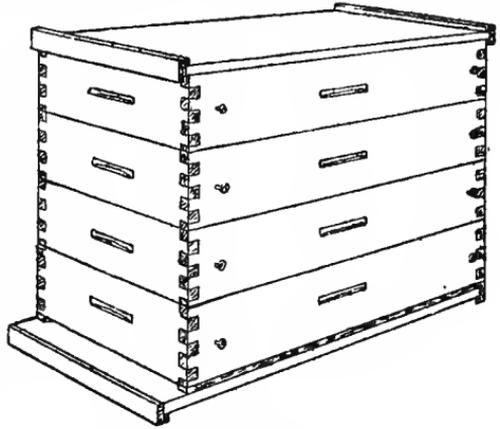


Fig. 2.—A Bolton Hive.

### Cover, Bottom Board and Frames.

A flat cover (redwood) or the Beuhne cover is recommended when purchasing from the factory, and for a bottom board a solid redwood board is preferable.

Root Hoffman self-spacing frames are manufactured in two classes—the “wedge and groove” and the “moulded comb guide.” The former have two grooves in the top bar, the centre or larger groove being for placing comb foundation upon, and the adjoining groove for a wedge. The moulded comb guide frame has a solid top bar with a convenient ledge on which to place the foundation. This frame is generally preferred for reasons of convenience in nailing and cleaning if the combs are cut out, and there is also less harbour for wax moth larvæ.

Shallow extracting frames are made with a plain top bar. The end-bars of the frames should be fitted as illustrated in Fig. 3, so that the V-edge will come in contact with the square, and manipulation will not alter the position. To adjust the frames correctly, first take the top-bar and hold it perpendicularly with the back toward you and one end on the bench; next place a side-bar V-edge to the left and nail. Now invert the frame (its back still toward you), place the other end-bar V-edge to the left again, and nail. Put the bottom bar on, and keep the frame as a guide. If you desire to nail others it will be found useful to place the two together and nail the bottom bar first.

### Wiring Frames.

Tinned wire can be obtained for this purpose, and is sold in  $\frac{1}{2}$ -lb. and 1-lb. reels. The reel should be placed in a small box, and a round stick or piece of wire passed through to act as an axle; a hole in the box opposite the reel to pass the wire through will complete the work, and will save many inconvenient kinks and tangles.

Place four wires in the full-depth frames and two in shallow supers, as illustrated. (Fig. 4.)

Small tacks, driven nearly home, are convenient for fastening the ends of the wire. Give the wire a few turns round the tack, then hammer almost home. Wires are used for bracing the foundation and to give support to the combs.

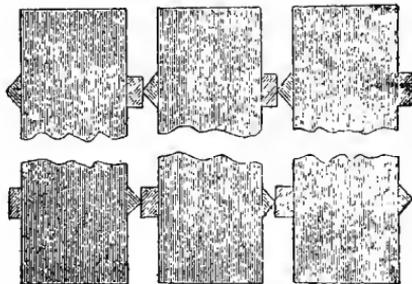


Fig. 3.—The Correct Arrangement of the end Bars.

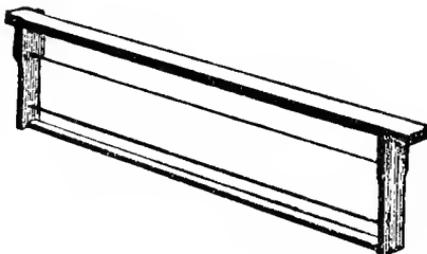


Fig. 4.

### Comb Foundation.

Comb foundation is so important to the apiarist that its use can be classed as absolutely necessary. It acts as a guide so that the bees will build the comb straight in the frames; and with its help, the bees get to work quickly, and the best breeding combs are produced. By using comb foundation it is also possible to regulate the number of drones in the hive.

Concerning the grade of comb foundation to use, I would advise "medium brood" for all purposes, apart from the production of comb honey, and "thin surplus" for use in section boxes. It pays to make a general practice of using full sheets of comb foundation, and by their use, if correctly adjusted, the apiarist will be sure of having good combs for breeding and storing purposes all through the hive—a necessity in these times, when the use of queen excluders is undesired when producing extracted honey.

Bees will build straight combs from strips of foundation, but the progress is usually slow and unsatisfactory, and, therefore, strips should only be used when the apiarist is not in a position to supply full sheets. The best effect I have obtained from the use of strips of foundation was in the hiving of a large natural swarm, though even in such a case it would pay to use full sheets.

Apiarists usually obtain their foundation by forwarding their wax to the factory to be made up.

### Fastening Foundation in Frames.

To prepare for the work of fastening foundation in the frames obtain (1) a board about  $\frac{3}{4}$ -inch in thickness, and cut to fit the frames easily; (2) a spur wire imbedder; and (3) a roller for pressing the foundation on the top bar. The latter are made in two classes—one for the moulded comb guide frames and one for the flat top bar.

The work of fastening the foundation is best done during warm weather when the wax is easy to work. The roller should be moved smartly with gradually increasing pressure, and dipped in water occasionally to prevent it sticking. When the foundation is securely fastened to the top bar, place the frame and foundation over the board, wire uppermost; then imbed the wires, by running the imbedder along the wires. If wedge and groove frames are used, the foundation is placed in the centre or larger groove, and wedged up with the wedge strips supplied for that purpose; the wire is then imbedded as stated above. To prevent the foundation from bulging, allow  $\frac{1}{4}$ -inch clearance from the bottom bar.

### EXAMINATION OF THE HIVE.

To prepare to examine a colony it is necessary to have an efficient smoker and a hive tool, or a lever the shape of a screw-driver. It is advisable, too, to have a veil in readiness to afford protection for the face. There are apiarists that do not use a veil; but I would advise the beginner to have it carefully adjusted, for even the most practical apiarists like to wear a veil or have it on the hat so that protection can be had when required. However, if the manipulation is carried out in the right way there will be very little trouble as regards stinging. A colony should not be examined unless the day is fine enough to allow the bees to work freely, and it seldom happens that a colony should be examined during winter months.

Before attempting to remove the cover, it is advisable to give the guards at the entrance a couple of puffs of smoke, then raise the cover about 2 inches and give two or three puffs of smoke right over the frames. The cover can then be removed. Note should be taken whether the bees are tending to become excited at any time during manipulation, in which case a little more smoke may be given, but there is no need to overdo the smoking, for unnecessary punishment of this kind demoralises the bees.

To remove a frame, lever the adjoining ones so as to give sufficient clearance to prevent crushing the bees; if there is any burr comb it is best to cut it as near as possible to the adjoining frame. When examining combs always hold the frame so that the comb will be upright, otherwise the new honey will drip about the hive, while the comb, having no support from the frame, is likely to be damaged.

### The Brood Nest.

The portion of the hive taken up for the purpose of raising brood is termed the "brood nest." In the early spring the brood nest is at times found in the supers; but later the bees will require this portion of the hive for storing purposes, and the queen will be forced to take up her correct position in the lower body, and will also lay in the supers when space is available. It is by examination of the brood nest that a general idea as to the state of the colony is arrived at; and it is therefore essential that the apiarist shall have an idea as to what the different conditions of the brood or brood nest will denote.

Practically any adverse conditions—such as drought, excessive rain, or a dearth of pollen or nectar—will have some effect on the quantity of brood being raised, and these conditions must therefore be considered. Brood will be found in the hive from September to about the end of March unless some very abnormal condition prevails.

### The Normal Brood Nest.

When making an examination of the brood from a normal brood nest at the time favourable to brood raising, the apiarist should be able to detect sealed brood, larvæ, and eggs. Three days after the queen lays the egg it hatches into a small grub or larva, the latter growing very rapidly. On the ninth day the worker bees cap the cells, and on about the twenty-first day the young bee will nip her way out of the cell.

To detect eggs in the cells it is advisable to turn the comb to a position where light will show down the cells, when a tiny white egg will be discerned adhering to the bottom of the cell. The very young larva is not easy to detect unless the light is good. Just after hatching they appear as a very small white grub, usually surrounded by a milky fluid, which is really the chyle food supplied by the nurse bees.

The cappings on the sealed brood should appear as just a slight oval from the level of the cells containing larvæ or normal cells in a straight brood comb. Sometimes during warm weather the bees do not completely cap the brood, and the head of the immature bees can be seen through the openings. This condition is perfectly healthy.

### Some Abnormal Conditions.

The significance attached to the following conditions of the brood nests may be regarded as applicable to those periods when the other colonies are raising broods normally.

The apiarist will sometimes find eggs in the cells, but no larvæ or sealed brood. He has the knowledge that when last examined the colony had normal brood, so that it would be evident in this case that the queen has died—probably killed by some accident during manipulation—and that the eggs in the cells have been laid by a young queen that has been raised by the bees after the loss of their mother. If it were a case of supersedure or swarming, sealed brood would be usually found.

Sealed brood and queen cells, without larvæ or eggs, denotes that the colony has lost its queen and is preparing to raise another. In this case the apiarist could destroy the cells and introduce a ripe selected queen cell or a queen. In case neither cell nor queen is on hand, destroy any cells that have a small appearance, just leaving two or three selected ones.

When eggs, larvæ, sealed brood and queen cells are all present, the apiarist will have to consider the conditions and number of queen cells being raised. For instance, if there are eight or nine cells and the colony is in a populous condition, then the state denotes preparation for swarming. If only about two cells are noticed, the colony is about to supersede its queen. In the latter case examination may discover that the queen is unsatisfactory or too old to do satisfactory work. In the case of supersedure, if the breeding is unsatisfactory the cells may be destroyed and replaced with a selected cell, but apart from this it is best to allow the supersedure to go on. Do not introduce a queen to a colony that is endeavouring to supersede.

Absence of brood in a hive denotes that it has either no queen or a young queen that has not started to lay. There is no need to make a search for the queen in this case. Place a frame of brood containing some eggs and larvæ and inspect in about five days time; then, if a young queen is in the hive, the bees will have no queen cells started. If, on the other hand, there is no queen the cells will be noticed. If a queen or an advanced cell raised under better conditions is on hand, it could be introduced. In such case it would be advisable to first destroy the cells that have been started.

### The Brood of a Good Queen.

During normal times a good queen will always be prepared to make the best use of vacant cells in the brood nest and also for expansion of the brood when desired by the colony. The eggs are laid in a very methodical manner (this being specially noticeable when the queen lays in a fresh comb) and the sealed brood will be nicely packed. The beginner is advised to take note of the brood of a progressive colony, a good knowledge being thus gained as to what may be expected from the average queen.

There are times when a queen should be "given a chance." For instance, a young queen lately arrived by post may at first lay two or three eggs in some of the cells; but she will usually lay in a regular manner after a week or so. Other queens will sometimes lay slightly irregularly for a time. Should the practice become a habit—two or three eggs being laid in a cell and often some adhering to the side of it—then the queen should be destroyed. Always examine the queen in the first instance and note if she is injured in any way, as this will be likely to cause permanent trouble.

### Space for Brood Combs.

It is always advisable to have correct bee space in the frames in the brood nest. There may be times when some advantage is gained by allowing extra space in the frames in the supers used for storing honey to be extracted, but in all cases the brood frames should be neatly fitted to the measure the self-spacing frames will allow. The depth of the brood is practically always the same, and it is therefore a waste of room to have extra space; beside this, the correct space allows more convenience for the bees in their work of attending to the larvæ and keeping up the necessary temperature in the brood nest.

### Putting in Extra Frames.

When a frame containing brood is removed from a populous colony, a frame containing foundation (full sheet preferred) can be put in the place from which the brood was removed. When putting in extra frames to provide for increase in population, &c., the foundation should be put at the side of the brood nest.

If the combs from the side of the brood nest are extracted during a honey flow, care should be taken to have them correctly replaced, for these combs usually contain a fair portion of the important and convenient pollen supply of the colony.

## POINTS IN OPERATING.

### How to raise good Queen Cells.

The conditions best suited for the raising of good cells are those obtaining during warm weather when sufficient nectar and pollen is being gathered to favour brood raising and to make the colonies progressive. With these conditions the young "nurse bees" will be stimulated to supply ample food (royal jelly) to the royal larvæ. For honey production, easy manipulation, and immunity from certain diseases, the Italian bees are in favour; and when preparation is being made to raise cells, the larvæ or eggs should always be selected from the most progressive Italian stock.

Whether a colony is in a condition favourable for starting a number of queen cells may usually be determined by logical reasoning. For instance, a colony made queenless and with all its combs containing eggs and unsealed larvæ removed, would after a few hours readily accept a batch of grafted

cells or even a strip of comb containing eggs (as referred to later). Again, a colony endeavouring to supersede its queen would accept and complete grafted cells, providing the superseded cells were removed before issue. Sealed brood and young bees separated from the brood nest of a populous colony by means of a queen excluder only, will usually give satisfaction in accepting and completing cells. The chief essentials in this case are that the colony must be populous, and have plenty of young bees on the brood above the excluder. Once this colony makes a start, very satisfactory work will be carried out. Some colonies give more satisfaction in this work than others, just as some hens are better mothers for their chickens. It lies to some extent with the owner to find the best parent.

In each case mentioned the colony should be prepared and a space left in the centre of the brood nest for the frame containing the grafts at least twelve hours before they are put in. The apiarist should have on hand a quantity of royal jelly; this can be obtained from queen cells and kept for a fair time if necessary.

### Cell Cups.

Having selected and prepared a colony to accept cells it will be necessary to make a number of cell cups, these to have a similar inside appearance to that of an embryo queen cell, often noticed on combs in populous colonies during the swarming period; in fact, the embryo cells can be carefully removed and used for the purpose in cases where only a few cells are required.

Another simple method is to get a piece of soft wax and roll it into a solid ball about  $\frac{3}{4}$  inch in diameter. To form the cup in this ball use a round stick about the same diameter as an ordinary lead pencil, one end neatly rounded. Although in the first instance the bees may accept a few more cells made with a thin edge (such as Doolittle cell cups) this simple method will be both convenient and effective, and the cells can be used many times by simply cutting them down to form cups. Natural queen cells can be saved and cut down to form cups, and then fastened to a ball of wax for extra strength and convenience. Embryo cells can be fastened in the same manner.

Having prepared about twelve cell cups—quite sufficient for one colony to attend to at one time—they can be fastened on a frame. If a full depth body is prepared to receive them, the cell cups can be pressed on the bottom bar of a shallow super comb, the opening of the cell cups pointing downward. Another method is to cut out a portion of the comb and fit a middle bar in a frame; the cell cups can then be fastened to this bar. When fastened, the cell cups are put in the hive and left there for about one hour before the larvæ is transferred, for the purpose of having them primed.

### Transferring Larvæ.

This operation is best performed during the warmest part of the day. Remove the frame containing the cell cups, and supply each one with a small drop of royal jelly—previously kept in a warm place. Carry the frame to your best Italian colony, and select a frame of brood containing the minute larvæ noticed surrounded by chyle food. The wall of the cell containing the selected larvæ can be broken down and the transferring needle immersed in the chyle food and raised so as to carefully lift the tiny grub. It is then transferred to the prepared cell cup and floated on the royal jelly at the bottom of the cell. When sufficient larvæ have been transferred the frames can be returned to their respective colonies. Larvæ should not be kept too long out of a hive.

Ten days from transferring, the cells will be ripe enough for removal. A colony given regular stimulating food will raise good cells in a season when the supply of nectar is limited, providing a supply of pollen is available, and brood is raised freely under the stimulus. In all cases, of course, a number of drones must be flying.

Another method of transferring larvæ, and one in favour with many apiarists, is to transfer from the best Italian colony a frame of brood from the brood nest, and to put in its place a frame containing a full sheet of comb foundation. When this foundation is drawn out and eggs are laid in the cells, the operator finds and cages the queen of another colony, and after shaking the bees from the brood combs and supers leaves the colony with only two frames, these containing honey or honey and pollen, and sufficient space being left between the two for a third frame. The brood removed can be put over the brood nest of a fairly populous colony.

The colony manipulated is now left queenless and broodless until next day. The apiarist will then remove from his Italian colony the comb containing eggs, cut a strip containing only one row of cells and shave to the midrib the cells on one side. This strip should be fastened to the under side of the bottom bar of a shallow super frame, or the middle bar of a frame as previously mentioned. To allow ample room for the cells to be built out conveniently, leave only one egg out of every four along the row. Eggs can be destroyed with a piece of stick or a match. The frame is then put into the space between the two combs in the queenless hive, and left until the cells have been started. If desired, the cells after being started can be removed and completed by a populous colony above an excluder, as previously mentioned. After the cells have been removed, the brood combs and supers can be returned and the queen liberated.

Good cells can often be obtained when a colony is preparing to swarm by removing their larvæ from the embryo cells and transferring the very young larvæ from a selected colony.

### Clipping Queens.

There are two important reasons why the apiarist should clip the wings of all laying queens: the first, so that a sure record can be kept and the apiarist know the age of the queen; the second, for convenience during the swarming period and in hiving swarms. To the practical apiarist clipping is a simple matter, but the beginner with little knowledge and a pair of scissors is likely to do some damage. Before attempting to clip a queen the beginner should understand that to clip a virgin queen will destroy her usefulness by causing her to become a drone layer. Also, that in the case of a supersedure colony there may be a beautiful virgin in the hive with the old queen. Be careful if there is evidence of a hatched queen cell.

A small, sharp pair of scissors are the most convenient for clipping. Catch the queen by the wings with the thumb and first finger of the right hand, and carefully transfer her to the thumb and first finger of the left hand; the soft portion of the top of the thumb to be on top of the thorax, and the top of the first finger directly underneath. Hold the queen carefully and clip the wings on one side only. The queen has two wings on each side. The beginner had better have some practice on drones for a while. If a queen should get a cramp while being clipped, the abdomen should be gently straightened and the queen kept out of the hive until she is all right, for the bees would ball a queen affected with cramp, which, however, is not a usual occurrence.

## SWARMING AND HIVING SWARMS.

Bees in their natural state depend solely on swarming as a means of ensuring the survival of their species. Some apiarists rely on this natural method as a means of increase; but the more practical men aim at minimising the number of natural swarms, and prefer to depend on artificial methods of increase.

The conditions which induce a colony to make preparation to swarm are—(1) the colony becoming over-populous for the size of the hive, and (2) insufficient ventilation on warm days, causing the bees to cluster outside. Although these conditions are generally observed to be the chief reasons, bees will on rare occasions, without any apparent reason, swarm in spite of all efforts to the contrary on the part of the apiarist. It is advisable therefore that apiarists should always be prepared for such an emergency, and should have on hand prepared hives and frames containing full sheets of comb foundation. Hybrid and black bees are more inclined toward swarming than pure Italian.

### Preparing to Swarm.

A colony becoming populous, drones being raised and the bees building embryo queen cells are the first signs that a colony is likely to have a desire to swarm. The next, and a sure indication, is that a good number of eggs are laid in the embryo cells, and the larvæ which are hatched therefrom are fed lavishly with royal jelly. It is wonderful how the bees arrange this preparation among themselves, and it is a recognised fact that scout bees will go out, select a new home, and even prepare it for the colony.

The swarm will usually issue about four days before the young queens are due to hatch from the cells, although conditions may cause the time to vary. Selecting a bright day if possible, the colony suddenly becomes in an excited state, and the bees issue pell-mell from the hive. Practically all the bees that can fly will leave, accompanied by the queen. Under natural conditions they will usually select a place and cluster, a shaded spot about a low bush or shrub being preferred.

### Hiving Natural Swarms.

It is usual for the swarm to cluster near the apiary, and therefore the most convenient method is to carry the prepared hive to the clustered swarm. A frame of brood containing some eggs and larvæ should be put in the prepared hive, the remainder of the frames for the brood chamber to be made up of full sheets of comb foundation. It is not always convenient to shake a swarm into the hive, and a tin dish or bucket to scoop them in with will be found convenient. Tip the first lot into the hive, and dump the remainder near the entrance, care being taken to enlarge the entrance for the time. When the bees have entered the hive, which should give ample accommodation, it can be put on a new stand.

When the swarm has been attended to, the parent colony should be inspected and queen cells removed, leaving one selected for size and appearance. When increase is not desired, the apiarist will place the parent colony, which has been cut down to the brood chamber, alongside the new swarm, with the entrances facing the same way. All queen cells are then removed and the colonies allowed to remain for eight days. Then examine the parent colony, destroy any cells, and place the brood and bees on top of the swarm colony.

If a swarm should cluster on a high limb and no swarm catching device is on hand, a simple and effective method is to strap an open ended kerosene tin to a long thin sapling, and work the edge across the swarm so as to cut most of the bees into the tin ; then lower and tip the bees into the prepared hive. Repeat the operation, and tip the next lot at the entrance.

### Swarming with Clipped Queens.

It must be considered in the case of a clipped queen, that the swarm will not cluster for the reason that the queen cannot accompany them for more than a yard or two from the entrance. Therefore when the swarm issues the apiarist will find the queen and cage her. The flying swarm will then be somewhat under control. The caged queen should be placed in a shaded spot—the pocket for convenience.

The apiarist should get quickly to work and select a frame of brood containing some eggs and larvæ. This is then put in the prepared hive, in the centre of the frames containing full sheets of comb foundation. If desired, this brood can be taken from the parent colony, providing there are no queen cells on the brood. Next remove the parent colony and place the now prepared hive on the stand that was occupied by the parent colony, with the caged queen at the entrance. The flying swarm will soon discover that their queen is not among them, and will return to what is now the prepared hive. The supers from the parent colony can be placed on the new hive, but they must be above an excluder and contain no brood. Be sure and give ample accommodation and so save discontent. The queen can be liberated when the bees settle down, which will be about one hour later.

The parent colony is put on a new stand, and if the queen cells on the brood are from a good Italian strain that has been forced to swarm through lack of sufficient accommodation, then the cells when ripe can be made use of, leaving with the colony one cell selected for size and appearance. Only one cell is left in this case to minimise the risk of after swarms. If increase is not desired, remove the parent colony and place the swarm on the stand, treating as previously mentioned.

### After Swarms.

“After swarms” are a second issue from a colony, and are accompanied by one or more virgin queens which have issued from cells raised during the preparation for the first swarm. It is advisable to return the bees to their home, and this is done by driving them through an excluder to find the queen or queens, which must be removed. The parent colony should be inspected, and all queen cells destroyed, and then the best-looking virgin should be allowed to run into the hive.

### Absconding Swarms.

It is not unusual for an apiarist to have one or two colonies become dissatisfied and desert their homes ; this is more likely to happen during spring. The bees issue and cluster in a similar manner to a natural swarm. Their home should be made as comfortable as possible, with ample stores, and the swarm then returned. In the case of a clipped queen, the work can be carried out while the swarm is flying. Do not experiment with killing the queen and shaking the bees with a weak colony, for they will often cause the queen to be destroyed.

## THE ARTIFICIAL INCREASE OF THE COLONY.

To be able to increase the number of colonies by artificial methods is of considerable assistance to the competent apiarist, but beginners are often anxious to carry out the work without giving sufficient consideration to the particular conditions under which this method of increase is made practicable and beneficial. The beginner is advised first to attend to the colonies on hand, using every endeavour to make them as populous as possible; then, after making a close study of the conditions essential to the system, artificial increase may be tried in a small way.

These conditions may be set out as follows:—(1) The colonies should be populous, and in a progressive state in relation to brood-raising; (2) the weather should be fine and warm; (3) the increase should be made early in the season—preferably during the late spring; and (4) there should be indication of a fair provision in the way of flora for the prospective young colonies. It must be remembered, too, that the highest production is gained with moderate increase. When moderate increase is desired, the principle of dividing the colonies is usually preferred; moderate or extensive increase can be made, however, by forming “nuclei.”

### Forming Nuclei for Increase.

The foregoing conditions having been fulfilled it is next necessary to prepare a number of hives or nuclei, to contain four or five frames, the latter to contain full sheets of comb foundation. In the case of a beginner it is advisable to purchase the required number of untested Italian queen bees. The procedure is then as follows:—

First fit a piece of wire cloth across the entrance, pressing the cloth well into it before fastening in order that the bees shall not be jammed in their efforts to get out. Take three or four of the prepared hives to the colony to be manipulated, find and cage the queen, remove one frame from against the wall of the body containing the brood nest, and space the remaining frames, thus allowing extra room for the bees to cluster on the frames to be removed later; put the cover on the portion of the hive containing the brood nest and shake the majority of the bees from any supers as near to the entrance as possible, only a little smoke being necessary to hurry most of them into the hive. Give each nucleus two frames of brood and bees, one frame of honey, and one empty comb or full sheet of foundation. The foundation or empty comb should be against the wall of the hive; then the brood, and the frame of honey to act as a follower. If the queen bees are at hand, they can now be put in according to the directions on the label of the package containing them. If the cage will fit on the top of the frames screen downward all the better; if not, it should be between the frames, and the latter pressed up, care being taken to allow some communication through the screen. The cover can be put on immediately after each nucleus has been given to the bees, brood, &c. For extra ventilation put underneath the cover a thin wedge.

Should a hive contain nine frames of brood, then four nuclei may be made, and one frame left with the parent colony; the queen could then be liberated on this frame, and the full complement of frames, containing full sheets of foundation or good breeding combs, put in the hive. The supers should be placed above an excluder. The nuclei can be placed on stands in the

yard, providing they are sheltered from the hot sun, though some apiarists prefer to put them in a room during the time the bees are shut in. They are kept closed for three days to allow the bees to become accustomed to their new home; if they are removed to an out-apiary the entrance screen may be removed in about three-quarters of an hour after being put on the stands providing that a few puffs of smoke are delivered at the entrance to prevent a rush on its removal. In this case, when bees are to be removed it is advisable to introduce the queen after the bees settle down—generally a matter of a few hours.

If it is not desired to purchase the queens, it will be necessary to have ripe queen cells on hand to put in after the third day. If making moderate increase by forming nuclei, the apiarist should take one nucleus from each selected colony. In this case it is unnecessary to put an excluder over the brood nest.

### Another Method of Increase; Dividing.

Another method, similar to that known as the Alexander plan of increase, is as follows:—

Prepare one hive body for each nucleus colony to be divided, each containing frames with full sheets of comb foundation, which are interchangeable with the frames, &c., contained in the brood nest. A queen excluder is necessary for each colony.

The first work in dividing is to find and cage the queen. Next, exchange a frame of brood and bees for a frame of comb foundation from the new hive body, making sure there are no queen cells on this frame of brood. Remove the old hive from its bottom board, and put on the prepared hive body, now containing the frame of brood and bees; the queen can then be liberated on this frame. The excluder may now be put on, and the remainder of the colony put over it; should there be any queen cells above the excluder they should be removed. In five days the colony should be examined again and if any queen cells are started above the excluder the old colony should be removed later in the day and the entrance blocked with grass. Do not disturb the colony for two or three days, after which the cells can be destroyed, and the colony will accept a laying queen or ripe selected cell.

If no cells are started above the excluder the colony may remain for another five days; this will give the queen a chance to have a fair start below and the brood above the excluder will all be sealed. The old colony can then be removed to a new stand, and after twenty-four hours will accept a ripe selected cell or laying queen. It is advisable to introduce a laying queen to prevent delay in brood raising.

Nuclei can be formed from the old colony above the excluder if extensive increase is desired, but it would be advisable to crowd the bees into the two bodies containing brood above and below the excluder. This is done by shaking the bees from any surplus supers apart from the brood chambers and allowing them to settle down before forming the nuclei.



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