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A MODERN BEE FARM

S. SIMMINS.



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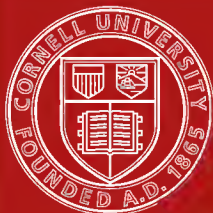


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A MODERN BEE-FARM



AND

Its Economic Management.

SHOWING HOW BEES MAY BE CULTIVATED AS A MEANS OF LIVELIHOOD ;
AS A HEALTH-GIVING PURSUIT ; AND AS A SOURCE OF
RECREATION TO THE BUSY MAN.

PROFITS MADE CERTAIN BY GROWING CROPS YIELDING THE MOST
HONEY, HAVING ALSO OTHER USES ; AND BY JUDGMENT IN
BREEDING A GOOD WORKING STRAIN OF BEES.

BY

S. SIMMINS,

Author of "Direct Introduction of Queens ;" "Simmins' Non-Swarming System ;"
"A Practical Experience with Foul Brood, and How Cured ;" &c., &c.

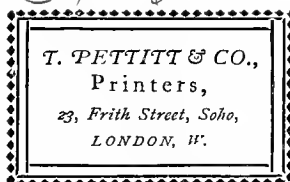
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PREFACE.

IN placing this work before the reader, it is the Author's intention to adhere strictly to the Science of Practical Bee-keeping, and to refer to the natural history of Bees only in so far that the one cannot be separated from the other to secure correct management. Those wishing to study the complete Anatomy and Physiology of these wonderful little insects, cannot do better than secure Cheshire's* most exhaustive work on the subject.

With few exceptions, the instructions contained herein will be confined to the Author's own experience, which has extended over twenty years of close observation. The reader will therefore have the benefit of a lengthened and varied experience, and by following one

* "Bees and Bee-keeping," Part I., Scientific. London: L. Upcott Gill, 170, Strand, W.C.

recognized system, there will be little possibility of one being confused by the usual multiplicity of ideas upon any one subject. The exceptions will be such matters as have a very important bearing upon the management of Bees. When the beginner has mastered the present system he will then be in a position to use his own judgment in selecting the good and leaving out the errors of others.

The Author does not hesitate to say that he has himself learned more by his failures than by success, in that where he has failed there has been a direct incentive to overcome such difficulty; and as the result, some of the most important methods of management have been brought about, while many time and labour-saving implements have been devised; all of which will be found invaluable to the Apiarist of the present day.

It has been the Author's utmost endeavour to place the management of Bees before the novice and those who wish to become Bee-keepers, in as clear and straightforward a manner as possible. He knows full well how difficult it is for one more advanced in the science to fully expose every detail of procedure, and how equally difficult it is for those just entering the ranks to grasp many of the details which go to make up the grand total of success; hence the reason why some apparently simple matters are gone into at length, that the learner may profit by the writer's own earlier experiences.

With regard to the foregoing it is to be hoped that those who are more advanced will not be wearied by that which is given for the benefit of others, who have not much knowledge of the subject, remembering that we all have been in need of just such teaching. At the same time, the Author trusts the expert will find some things not before known to the bee-world, and which he will be willing to admit go far towards the economic production of honey ; and, moreover, constitute the very "pith" of practical bee-keeping.

It will be asked : "What are the Profits of Bee-keeping ?" Many consider that there is a fortune in it, but this is not so. All may gain health and pleasure in following the study of this, the most remarkable creature in the insect world, but the number who make a profit out of this occupation will be limited to those only who have special qualifications, and are able to give the subject close study and application.

The man who finds himself adapted to the undertaking may safely invest his money, and be assured of obtaining, to say the least, better returns than very many other occupations offer at the present day.

The Author has not followed the usual orthodox historical manner of many of the bee-books published of late years, some of which are little more than a repetition of what has gone before. On the contrary, he talks to his readers, and endeavours to keep "touch" with them throughout, being certain that by so doing

he can insist with greater force upon the necessity of doing things at the right time, and bring more prominently before them those vital points which are the essence of true practice.





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INTRODUCTION.

THE Culture of Bees is one of the most healthful occupations that can be named, and at the present day it is being adopted as a business, while the number of people in all ranks of life who keep only a few hives as a pleasant pastime is very large, as may be judged from the fact that the members of the various associations in this country make up a total of something like 10,000. Consequently, more honey being on offer, it has become much cheaper than it was a few years since, when the supply was very limited.

While an increased production has lowered the value, there is at the same time, a larger and increasing demand for the bee-keeper's commodity; and as he now has the benefit of improved appliances there is no difficulty in competing with present rates. In fact, it appears likely that very soon it will not pay foreign countries to send their honey here, as continued improvements are reducing the cost of production at home.

After honey was superseded by sugar, bee-keeping seems to have fallen into the background, but light began to dawn, and it was some thirty years since, that by using hives wherein all the combs could be removed separately at will, a great stimulus was given to both practical and scientific bee-keeping; consequently, the ranks began to swell, as it became known that much larger harvests could be secured than by the old fixed-comb methods, and in every way the bees could be brought more under control. But more light was yet needed, and Bee Journals were established, but it was not until the year 1873 that this country could

boast of one, and that was founded by Mr. C. N. Abbott, of Southall, who ably conducted it for about ten years, when it passed into the hands of the Rev. H. R. Peel. Soon after this paper was established we find Mr. Abbott inaugurating the British Bee-keepers' Association, his object being the diffusion of the knowledge of bee-keeping, especially among the poorer classes, as a means of bettering their condition.

In 1874 this body held its first great Exhibition of Bees, Hives, and Honey, at the Crystal Palace ; and since that time other Associations have sprung up, one after the other, each holding its own Annual Show. Is it any wonder then that thousands have entered into the pursuit, and that many thousands more have become acquainted with the value of the busy bees' product ?

The manufacture of hives and appliances alone has become quite an industry, giving employment to many ; while as a means of bringing the producer and consumer together, principally through the untiring energy of Mr. Peel, the British Honey Company has been established ; and others, as well as private individuals, are always prepared to buy at reasonable rates.

Honey in the comb will ever remain a luxury, but that in the liquid form is destined ere long to be found in general use in almost every family, besides being used in various manufactures ; and the apiarist should do his best to place the latter upon the market in as cheap a form as possible, at the same time being careful that such shall have a neat and attractive appearance.





CHAPTER I.

BEE-CULTURE AS A PROFESSION.

THERE is a peculiarity about bee-keeping—I may say a certain risk, though, perhaps, not more than there is with any other business, when one does not fully understand what he is about ; but nevertheless it is certain, that unless a man first makes himself thoroughly acquainted with the peculiarities of bees, he is doomed to disappointment should he attempt to give all his time and capital to this occupation.

There are two ways open to those who hope to take up bee-keeping as a sole means of gaining a living.

First, by keeping a few hives, and gradually increasing the number, over a term of several years, until the stock is large enough to claim undivided attention, and the experience gained warrants one in giving up what other occupation he may have been following. One may have to plod on for a number of years before this opportunity presents itself, and even then he will find himself launched into an undertaking quite different to what he had expected, and the greatest caution will be needed to see that all goes on as it should do, as keeping a large number of colonies requires very different management to what the few needed.

By far the safer plan would be to

Enter some well established Apiary

and serve there for a couple of years. By so doing, you save time and money ; your plans will be more definitely formed, and the experience so gained will be far more certain to put you on the right road to successful management, than half-a-dozen years

given to working up an apiary from a small beginning. You will start at once with all modern material, and buying in large quantities a considerable reduction will be gained; whereas, many of the appliances collected from time to time under the former condition of preparation, have become valueless by the time the apiarist enters into the business as a specialist, leaving out of the question that much of his material may consist of odd patterns, and cannot be worked to the best advantage.

The man who has served his time in a large apiary will next want to consider how he is

To obtain the necessary Materials.

In the first place, there is more risk in buying his bees than he is likely to incur at any future period of his management. Many buy bees of irresponsible advertisers, and though the latter may consider there is nothing wrong about them, the purchase often turns out simply worthless.

If it can be so arranged, the student should by all means buy his stock from the apiary where he has served his time. He knows something about the condition of the same, and may rely upon the proprietor treating him honourably. Failing this, the owner of the apiary will probably know where and how he can get good stock, and will proceed accordingly.

Before beginning his own work the apiarist will do well to visit in turn all the apiaries in the country to which he can gain access, thus glean any new ideas which may be thrown out, while at the same time consolidating his own knowledge.

I have said that under ordinary conditions there is a certain risk about bee-keeping. This is quite true; but the reader by referring to the chapters relating to Planting and Breeding will at once see how the whole thing can be rendered a certainty by those capable of following out the instructions there given. (Chapters VI. and VII.)

The Choice of Location

is another matter for serious consideration. It seems unnecessary to advise a bee-keeper not to enter a district where an advanced

apiarist is already situated ; but he should not settle down close to a town, nor near a public highway. Select some quiet spot in a valley, if possible, and the further from any manufactory, the better, but do not lose free communication with some large centre, or railway convenience.

When you know that you will presently be entering upon the business, have a good look around, and endeavour to secure a few acres in some favourable spot which may abound in clovers of the different kinds, the White or Dutch being the main-stay in most districts. This is sometimes grown as a crop, but more frequently the bee-keeper relies upon what is to be found in nearly all pasture lands. There is the Yellow Trefoil in May, and soon after the clover begins to wane the Lime, in some places, yields much nectar. The Sycamore must not be forgotten ; then there may be market gardens growing the various small fruits, as well as large orchards. It is seldom all these things are to be found in the neighbourhood of heather, though in Autumn it would pay well to remove bees to the same if within a reasonable distance, as the honey commands a high price.

On chalk soil, particularly among the South Downs, there is the Sanfoin in June, Wild Thyme in July, and numerous wild flowers of the thistle family during the Autumn, as well as a species of trefoil (*Lotus Corniculatus*) throughout the Summer. Red Clover is also grown in great quantity, upon the second crops of which the foreign varieties only can work ; and as the first cutting of this plant would otherwise be very light, Yellow Trefoil is mixed with it and this flowers freely for nearly a month before the first mowing.

Should the bee-keeper's lot fall upon any spot not so favourably situated he *must*

Grow suitable Crops

which will also do for hay, and even in a good district he would do well to have some large crops going throughout the whole season.

I have sometimes been asked

What Amount of Capital should be Invested

to ensure a certain income ; but considering that I know nothing about the personal qualifications of those who apply by letter, it would be idle to attempt a satisfactory answer ; but the annexed list of preliminary expenses may aid the enquirer in obtaining the necessary information.

It should be almost unnecessary to point out that "everything must be done at the right time ;" there must be "a place for everything, and everything should be in its place." Thus by constant, and careful attention, and by keeping all things in order, the specialist will command success ; but the man who is not naturally of an orderly and temperate disposition, and moreover is not enthusiastic and a lover of nature (the natural qualifications of a bee-keeper) had better keep out of the business, or failure will surely be the result.

The Estimated Expenses for the First Two Years

will be found as under, the apiarist starting with not less than 100 colonies, and with quite £500 as his capital ; otherwise he will struggle on for years before his business can be satisfactorily established.

FIRST YEAR ; GENERAL EXPENSES.

			£	s.	d.
100 stocks in "Standard" hives	...	at 30/0	150	0	0
100 extra body boxes, with frames	...	at 3/6	17	10	0
200 dry feeding dummies	...	at 1/0	10	0	0
50 rapid frame feeders	...	at 3/0	7	10	0
One 2-cwt. cylinder for reducing sugar to syrup	...		1	0	0
Large glue-pot for melting wax to fix guides	...		0	1	6
Flat-blade scraper	...		0	1	6
Wax extractor...	...		0	17	6
Timber for work-shop and honey-room	...		20	0	0
Labour	...		10	0	0

	£	s.	d.
Timber for frame racks, store racks and sundries,			
labour, &c.	10	0	0
Rail carriage, cartage, &c.	10	0	0
Carpenter's bench and tools, nails, screws, paint, &c.	11	10	0
Rent (more or less)	15	0	0
Sugar	5	0	0
Total	£268	10	6

Add the following if Comb Honey is to be worked for:

	£	s.	d.	£	s.	d.
300 sets of super crates at 2/6	37	10	0			
6000 1 lb. sections, at 22/6	6	15	0			
100 1½ doz. crates, glass two sides, at 2/6	12	10	0			
100 lbs. super foundation, at 2/6...	12	10	0			
General expenses	268	10	6			
Total, first year	£337	15	6			

Add the following if Extracted Honey is desired:

	£	s.	d.	£	s.	d.
300 extracting supers, at 2/6	37	10	0			
Uncapping stand, knives, &c,	2	2	0			
Honey extractor	1	15	0			
6 Honey cylinders, 500 lbs. each						
at 15/-	4	10	0			
50 three dozen crates at 3/-	7	10	0			
25 one dozen crates, 2/-	2	10	0			
lbs. 100 lbs. brood foundation, at 2/-	10	0	0			
1728 12 gross 1 lb. glass jars, at 14/- ...	8	8	0			
12 „ corks, at 1/6	0	18	0			
1728 6 „ 2 lb. tins, at 18/-	5	8	0			
1296 3 „ 3 „ at 24/-	3	12	0			
864 1 „ 6 „ at 30/-	1	10	0			
5616 General expenses... ..	268	10	6			
Total, first year	£354	3	6			

GENERAL EXPENSES, SECOND YEAR:

	£	s.	d.	£	s.	d.
Rent (more or less)	15	0	0			
Sugar	10	0	0			
Sundry expenses, carriage, &c.	5	0	0			
				30	0	0

Working for Comb Honey:

Total 1st year	337	15	6			
100 extra super crates, at 2/6	12	10	0			
6000 1 lb. sections, at 22/6	6	15	0			
50 1½ doz. crates, at 2/6... ..	6	5	0			
100 lbs. super foundation, at 2/6	12	10	0			
General expenses, 2nd year	30	0	0			
				405	15	6

Working for Extracted Honey:

Total first year	354	3	6			
50 crates, to hold 3 doz. bottles, at 3/-	7	10	0			
lbs. 100 extracting supers, at 2/6	12	10	0			
2880 20 gross 1 lb. jars, at 14/-	14	0	0			
20 „ corks, at 1/6	1	10	0			
1728 6 „ 2 lb. tins, at 18/-	5	8	0			
1296 3 „ 3 lb tins, at 24/-	3	12	0			
864 1 „ 6 lb. tins, at 30/-	1	10	0			
6768 General expenses	30	0	0			
				430	3	6

ESTIMATED RETURNS, AT A LOW AVERAGE, TAKING A SERIES OF YEARS, GOOD AND BAD.

	£	s.	d.	£	s.	d.
Comb Honey: First year.						
100 stocks, at 30 lb. per hive						
= 3000 lbs. at 9d.	112	10	0			
				112	10	0

Second year.		£	s.	d.	£	s.	d.
Increased to	125 stocks at 30 lb. per hive						
	= 3750 lbs. at 9d.	...	140	12	6		
Increase to	150; sell 25 at 30/-	...	37	10	0		
					<u>178</u>	2	6

Extracted Honey: First year.

100 stocks at 50 lbs. per hive							
= 5000 lbs. at 6d.	...	125	0	0			
Wax...	...	2	0	0			
					<u>127</u>	0	0

Second year.							
Increased to	125 stocks at 50 lbs. per hive						
	= 6250 lbs. at 6d.	...	156	5	0		
Wax...	2	10	0		
Increase to	150 stocks; sell 25 at 30/-...	...	37	10	0		
					<u>196</u>	5	0

The greater part of the expenses go towards stock-in-trade; but after the second year, the outlay will be smaller, while the returns will be considerably higher, as the apiarist consolidates his working force. The sugar will amount to more or less, according to the season and the extent to which the bees are deprived of honey. The extracted honey at 6d. does not include the cost of the bottles or tins it may be sent in to the customers; that will be added accordingly.

Number of Colonies.

In reference to the foregoing estimates, it will be seen that it is proposed to keep the number of colonies but little over 100, increasing the first year to 125; the second season to 150. It is then understood that 25 stocks are to be sold; when the remaining 25 over and above the 100 will provide against all accidents, such as weak colonies, loss of queens, &c., during winter; thus ensuring that the number shall not fall below 100. This is as far as any one person should attempt to extend until he is very

certain he can manage more. With that number no assistance is required, but when greater extensions are decided upon, the apiarist should get some intelligent lad, and take the greatest care in teaching him to become an expert assistant. It is surprising how quickly a youngster takes to the various manipulations, and in this line he will more often than not, be of more service than a man at much higher wages.

Where the apiarist is capable of making-up most of his own appliances, his time will be fully occupied during the winter, and then timber will stand in place of many of the articles enumerated, making a considerable reduction in cost. The owner's labour in the apiary has, of course, not been estimated, as that can only be valued by the balance of profit shown at the end of the season.—The labourer is worthy of his hire—(profit).

The Average Yields per Hive

for both comb and extracted honey, taking a series of years, have been placed very low, but in a fairly good district the bee-keeper should have no trouble in far exceeding those figures, providing there are not more than 150 colonies kept at any one place. In a very favourable locality, or where the owner plants bee forage, the average will be still higher, while from 200 to 300 stocks may stand in one apiary without showing any diminution of the "out-put" per hive.

The editor of the *British Bee Journal* states that he obtained 1360 lbs. from seven hives. This was extracted honey, but his results in comb have often exceeded 100 lbs. per hive. These weights were obtained from a limited number of stocks; it will be seldom, however, that such returns will be gained where a large number are to be managed. I have myself had 50 lbs. from a single colony in seven days; and have had a queen whose bees in 1886, without attempting to swarm, gave upwards of 250 lbs. of honey, about 200 lbs. of which were in nicely finished sections. Such results show only what is possible if the apiarist will always breed from the best strains, as set forth in the chapter upon that subject.

What Kind of Honey to Produce.

It has often been stated that it pays best to run an apiary for extracted honey, but my own opinion is that to obtain the best results, the apiarist should work for both that and comb honey. Certainly a larger quantity of extracted honey can be obtained, but this would stand in the proportion of 50 to 30 lbs. of comb. Most practical apiarists will admit that this is correct, and upon this basis, I have made out the estimates. It will be noticed that there is little difference between the first cost of implements whether comb or extracted honey is worked for, but the season's produce of extracted honey costs more for packages than the other. After the combs are once established for extracting, with no further outlay in foundation, and a large quantity of new wax from the cappings, the balance is in favour of this class of honey; but again, against this we have to place more labour, and that none of the cleanest. Hence it will be seen that there is not much to choose between the two, and, with due respect to the opinion of others already given upon the subject, I consider nothing will do more to settle the question than the comparative tables already shown; in fact I have published these estimates that the bee-keeper may make his own comparisons and be more certain of what he is about; and I do not, by any means, wish or intend that the estimated returns are to be taken as implying a certainty.

Dear Reader, throughout these pages will be found my utmost desire to save you from the mistakes of others; and just now I must insist upon

One Point of the Greatest Importance.

When you have decided to make a start, purchase your bees, in one lot, if possible, about the middle of April, and have them removed to your own place at once. I do not contemplate that the transaction will take place at any other time, and shall certainly give no advice for obtaining them at another date. If you begin at any other season, the first great mistake is made, a mistake which will very likely cause ultimate failure.

Bees Moved in April

undergo just that excitement which induces a healthy activity at exactly the right time; the queens become equally energetic under the consequent stimulation; and better progress is made than if they had not been disturbed. If moved in February or March the same excitement causes the loss of thousands of the older bees, through flying for what they cannot obtain at that early date; the large patches of brood lose the warmth hitherto given by such workers, and the hive deteriorates to such an extent that the whole season is unprofitable. By purchasing in April there are plenty of young bees to fall back upon; you get only good stocks which have passed the ordeal of winter; there is no further risk, and the whole season is before you. If obtained at a later date, the first year is lost, and the excitement caused by late packing and travelling is not simply injurious, but absolutely ruinous. These statements are based upon hard facts and experience, and the reader will do well to be guided thereby.

So far we have considered one branch of bee-keeping only, but another thing is the

Sale of Bees and Queens.

This is more profitable, more certain, and the returns quicker than Honey production; but, at the same time, special qualifications are necessary to enable a man to conduct a queen-raising business, and unless he finds himself peculiarly adapted to the undertaking, he had better confine himself to honey, as continued application, constant care and thought are required in a much higher degree, to enable one to carry on this branch. It should also be understood that where bees and queens are raised for sale, the apiarist will have to be satisfied with but a limited quantity of honey; in fact if his demand is large, in some seasons instead of a surplus, a considerable amount of sugar will have to be given to the bees as their winter stores.

Do not expect that your demand will be great, as soon as you begin to advertise; on the contrary, you will have to keep on

pounding at the public through the medium of the journals, bee shows, &c., for years before your reputation is established. Supply a good article, and give value for your customer's money; moreover, do not keep them waiting longer than you can possibly help, and surely you will have your reward. Go slow with your expenses until you find where you stand, and do not attempt to do much in this way until you have a substantial stock of at least one hundred colonies to draw upon, or you will never get forward.

Remember always that "excessive populations are produced at the expense of surplus honey," while "a large surplus of stores is gained at the expense of bee life." At the end of the season the average colony is reduced to small proportions; and so also is that stock much smaller which had an excessive number of bees, and an over-production of brood throughout the summer; therefore while the former has something to show for its decreased condition, both in stores retained, and a surplus given to the owner; if the surplus bees of the other are not made use of either for increase or sale when in its prime, the cost of their production has gone for nothing and is lost for ever. As a last word of caution, it should be hardly necessary to state that while your bee and queen trade is developing it will be necessary to work most of your colonies for the production of honey; therefore make preparations accordingly, as all your stock will not be wanted for increase as soon as your first advertisement appears. Should the time come when you may have one apiary entirely for increase to supply others, and other apiaries for honey only, you will have done well in studying both subjects thoroughly.

Still another department is connected with apiculture;

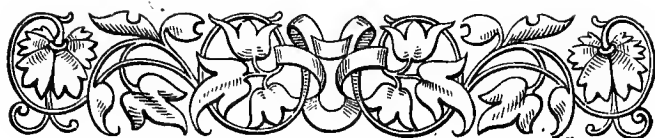
The Manufacture of Appliances

has attained great proportions, and there are many reliable men in that business. Again there are others innumerable, who gaining a first insight into bee-keeping, think it a great chance to make money by advertising hives for sale, either of patterns already in hand, or some idea of their own. Nothing does the

appliance business so much harm, nor the whole industry for that matter; and I would that I could persuade these small dabblers to leave such work alone. I do not mean to imply that none of our best manufacturers have begun in that way, but I do know that, as a rule, after spending more money in advertising than they can ever get returned as profit on the small number of hives sold, they are then forced to give up, in many cases having placed in the hands of novices, hives and other appliances so badly made as to be practically useless, besides bringing discredit upon the established houses, as well as the loss of their legitimate trade. It would be better for all parties if the buyer would go straight to a well-known maker, and get what he wants at a cheaper rate, better made, and correct in measurement. I must here advise a beginner who hopes to start hive making for sale, to consider no idea of his own to be new, nor to expect others to consider it worthy of general adoption, until he has had several years experience; has studied the history of bee-keeping for at least ten years back, and moreover has gained some reputation and standing as a man of practical experience. Reader, take the hint therefore and do not waste your money upon advertising "a new idea" until you know where you stand, or as surely as these lines are before your eyes you will never get value in return. By watching the journals closely for the past twelve years, I have noticed a great many of such advertisements, ending only in "smoke," and if my words of advice tend to restrain beginners from making these attempts, and thus keep good money in their pockets, I shall feel rewarded, and I am quite certain the trade will be all the better for it.

In conclusion, I would say, if you have another business on hand, do not expect to make a success of bee-keeping. If you wish to be successful at honey production and queen raising, do not touch the supply trade until your apiary is well established.

The exceptions are rare where all branches are carried out successfully under one proprietor, and even then, each department is under a thoroughly reliable manager, who seldom has need to question his principal.



CHAPTER II.

BEE-KEEPING FOR RECREATION.

WHILE the greater number of amateurs endeavour to get all the profit they can out of their bees, there are many who keep them solely for the pleasure afforded, by studying their nature and habits ; though, of course, the delight experienced in being able to place pure honey upon one's own table and that of friends is by no means a secondary consideration. Nothing can be more appreciated than a present of beautifully chaste honey-comb in sections or bell-glasses, and what can exceed the pride and pleasure in thus being able to present what is your own production—a thing of beauty which has gradually been “growing” under your own fostering care.

The busy man who occasionally spends a few minutes among his bees, finds healthful and soothing recreation both for body and mind ; and lucky are those whose leisure gives them almost unlimited time to carry out the study of these remarkable insects. They are a never-failing source of interest, there being always something new to discover, either as to their habits or management.

Modern bee-keepers are enthusiasts, and among all who study the subject, there is a general understanding and mutual sympathy. The novice, or would-be bee-keeper, may therefore go to his nearest neighbour who cultivates bees, and be sure of a hearty welcome, and a free gift of all the knowledge about them which

he may have acquired by many years practice ; but all the same, just here, I advise the novice not to "ride a willing horse to death." You will have difficulties, but do not fly to your well-informed neighbour every time ; consider well what he has told you, and what you may read ; strive to put it into practice and "help yourself."

It does not much matter at what time of the year you may begin ; you are only a learner, and have first to gain confidence in handling bees before you can make much profit out of them. Get some friend or other bee-keeper of some experience, if possible, to examine the stock you wish to purchase and be guided by him as to its value. Be careful that you obtain a good lot, and in the absence of any friendly advice, you cannot do better than buy a first swarm of some cottage bee-keeper. Obtain your hives of a well-known advertiser and so get them correct to measurement ; otherwise your expected pleasure will be somewhat marred, and your manipulations will become sadly complicated.

While the number who may be capable of making bee-keeping their sole occupation will be limited, almost everyone can

' Keep a few Colonies at great advantage to Health,

and at the same time make the bees pay their own way. Even the scientist need not go to any great expense over his investigations, as with ordinary care his bees can be made to return all the money he may want to lay out for such purposes.

Many who have hitherto disliked to keep bees from fear of being stung, may now obtain the Carniolan variety, which are so gentle that almost any rough treatment will fail to make them sting. Hive after hive can be examined without resorting to intimidation of any kind ; and while their introduction will enable the operations of the large apiary to be carried out with greater comfort and rapidity than hitherto, these bees will be the cause of very many keeping a few stocks who otherwise would never have done so.

The cry of "over-production" is but a false alarm. No genuine article of food will long want for a customer, if only it is presented in an attractive manner at a reasonable rate. There are many ways in which honey may be utilised, not only as food and medicine, but also for manufacturing purposes; and while the fact that many others will continue to follow the occupation, may cause reduced prices, the value of honey will become more generally known, to the advantage of all concerned.





CHAPTER III.

HOW TO HANDLE BEES.

AMONG the uninitiated the general impression is that bees will be certain to sting if molested, but if let alone they will not touch one. This is to a certain extent true, and while the novice would hardly be able to open a hive to take out the combs and bees, without being attacked, the expert could do all with neither veil nor gloves, and receive no stings. Of course, the difference is that the former has not yet gained that caution and confidence necessary in all manipulations, and this will only come by practice ; no one can give him the desired skill to start with.

As to leaving them undisturbed, no modern bee-keeper believes in the "let-'em-alone" policy, though there are those frequently found among beginners who are continually opening their hives without cause. Bees so disturbed cannot prosper, and it must be borne in mind that no hive should be touched unless there is a definite object in view, which shall be of benefit to the colony or its owner. No hives should be opened, and the contents exposed during cold weather, especially if it be in Spring, when bees are breeding up in preparation for the coming harvest.

Why Clustering Swarms do not Sting.

Nearly everyone has noticed how readily a new swarm may be handled ; the bees showing no inclination to sting. The reason

is not so much that they are full of honey as that they are homeless, and have only recently been under great excitement. By the aid of some intimidant, the bees of an established colony may also be excited and made to fill themselves with honey, when the combs may be removed at will. It does not happen, however, that all the bees rush to the cells, as I have always noticed that many do not attempt to do so. These may be already loaded, but the state of excitement is so soon communicated to all that none, as a rule, attempt to retaliate when the hive is examined.

When necessary to look into a fixed-comb hive (commonly called a "skep") first drive a few puffs of smoke in at the entrance from a bellows smoker, as illustrated, which is of the "Bingham" pattern; give the sides of the hive several sharp raps, then turn it up in a line parallel with the combs, so that none may fall to one side. If it be desired



To Drive the Bees,

first invert the hive, and let its crown rest upon the ground, place an empty box or skep above, fitting exactly mouth to mouth, and then continue to rap upon the sides of the lower hive with a stout stick, or the hands; but on no account jar in such a rough manner that the combs are broken from their attachments. Soon the bees will be heard roaring on their march upwards, being in fear of the trembling combs falling about them. In the first instance a cloth may be secured round the junction of the two hives, thus ensuring that no bees rush out; after a few minutes this can be removed, and the upper skep tilted from front to back, having first been secured to the other with a skewer, or anything that will keep them together without shifting. The operator will soon prefer to do without the cloth and keep the skeps parted from the first, when the queen may be captured as she ascends, if desired. It should be so arranged that the back where the bees are to run up shall be

the highest point, and that at the ends of the line of combs, or the bees will not go up readily. Then transfer the combs to the frame hive, and return the bees, as explained in the chapter on Modern Hives, &c. One is often told to procure a pail or table whereon to place the skeps while driving, but if the operator will only bend his back he will want no such thing and will find the earth a far better "stand" than any other.

Bumping.

After first intimidating the bees, another way to get them out, is to invert the hive and give it one or two sharp "bumps" on the ground, at the edge of the crown on the side parallel to the combs. If carefully done the combs break away from the sides and top of the hive much cleaner than they can be taken out by any other way. Brush the bees off into an empty skep, and transfer the combs as desired. This plan was first introduced by Mr. F. Lyon, and has met with great success.

Throwing.

This is quite an old plan, and where the combs are fixed, either by cross sticks through them in skeps, or in shallow-frame hives, nothing can exceed its simplicity and rapidity. Place an empty hive on a sheet upon the ground, mouth upwards; stand over the same with the stocked hive held by the hands at the rim between the legs of the operator; raise the hive and lower it quickly, then stop the motion with a sudden jerk just as the empty hive is neared; repeat as often as necessary and the bees will be all thrown out. Wait a few minutes after smoking them, lift the hive and proceed, when the bees having discontinued feeding at the cells, will come out more readily. In the case of frame hives they will be shaken down on the top, or at the entrance, of the lower hive.

Manipulating Bees in Frame Hives.

The foregoing operations are seldom necessary with moveable-comb hives, as each frame may be removed at will, and this meets all requirements. When any operation has to be carried out, first lift the material covering the frames, and drive a few puffs of smoke among the bees, replace the "quilt," and after a few seconds peel the same off with care, and make the necessary examinations. Remove and replace each comb carefully, taking care not to crush any bees while so doing, and see that your smoker is on hand in good order, in case the bees may get troublesome. If the combs are to be cleared, shake them from the same back into the hive, or at the entrance by a motion similar to that of throwing, beginning however with a gentle shake, and then more vigorously, as the bees become frightened. Nothing tends to subdue them so thoroughly, and on no account should a brush or feather be used until the bees have first been so shaken; as by brushing them from the combs they are much irritated.

Carniolan and Cyprian Bees do not require to be intimidated. The former can be handled almost anyhow, while with the others gentle treatment is necessary; and what is remarkable with both these varieties, and also some stocks of Syrian bees, it matters not how long the hive may remain uncovered, they remain perfectly peaceful. With these begin by peeling off the quilt gently, and then proceed to remove the combs in the same manner, and hardly a bee will take wing. Get them from the combs by shaking as above, when necessary, and no stings will be given as a rule.

Uniting.

Where bees are in fixed combs, drive both (or all), then remove all queens but the one wanted; stand the combed hive to receive them in an inverted position near to where they are to remain and throw all into the one. As soon as the bees are a little settled turn the skep right way up on two 1-inch

sticks laid on the floor board ; remove such sticks in the evening and see that the entrance is not less than 3-in. by $\frac{3}{8}$ -in.

Bees in frame hives can be joined by alternating the combs of one with those of the other. Smoke each hive and then part the combs so that no bees hang from one to the other, and then proceed to unite the two. Leave only one queen, cover up carefully and do not disturb them again. If two standing near together are to be united, move the hive to be occupied half-way between the two, and take the other hive right away. A board placed against the entrance, slanting to the ground, will aid the bees in collecting at that spot, while the original inhabitants of the hive will also feel in a strange position. In general, when preparing for winter I nearly always wait until October and then a stock can be carried any distance in the same apiary and joined to another, with no loss of flying bees, as none get far from home at this date, and not flying frequently they always make a note of their position.

Many use thin syrup scented with peppermint wherewith the bees are sprayed, thinking that a common scent will make them unite peaceably, but there is no need of anything of the kind, if but one queen is allowed, and my directions are followed with regard to separating the combs and fully exposing the whole of the bees to the light for a few minutes before the union is accomplished.

In the case of Cyprians and Syrians some caution is needed, but I have found that if both lots are *first made queenless* these bees can be united to any, while in that condition ; the queen to be retained, being returned in the evening. Except it be in the middle of the day during a good flow of honey *nothing else* will induce these bees to amalgamate with strangers.

Agents used in Quieting Bees.

Mr. Cheshire mentions that methyl salicylate, using a few drops rubbed over the hands, will effectually prevent bees attacking the same.* The same author also recommends a small

* "Bees and Bee-keeping," vol. II.

amount of crude creosote placed upon the fuel in the smoker for subduing any colonies not amenable to milder treatment. The Rev. Geo. Raynor has long used carbolic acid for quieting bees; his plan being to dip a feather in a weak solution of the acid and then pass it over the frames, when the bees rapidly retreat. Fume chambers added to bellows have also been introduced, and while I have no wish to disparage those who have invented these methods of applying carbolic acid, I am compelled to say that for general purposes I have found nothing to equal the smoker, and in extreme cases the creosote or other pungent article added to the fuel, which may be either rotten wood or brown paper of a coarse soft kind.

Gloves.

While I can but regard gloves as a great hindrance to manipulation, it is necessary that the novice should commence with something of the kind, just to give him confidence. Thick woollen gloves dipped in vinegar and water, wrung out, will answer better than anything, but as soon as possible these should be discarded.

Veils.

These should be made of fine black netting to protect the face, while any white material will do for the back, and will protect the wearer from the heat of the sun. Elastic should be run round the top so that it will fit tightly about the hat; and the length should be such as will enable the lower end to be tucked under the coat collar.





CHAPTER IV.

THE ECONOMY OF THE HIVE.

DESIRING to place a few important matters before the uninitiated reader in as simple a manner as possible, I will begin with the establishment of a new swarm, and explain the various phases of its existence until that in its turn is prepared to send forth its own increase.

Presuming that our swarm has been duly hived in movable frames, each of which has a wax guide down the centre of the top bar, we shall find that the bees begin to extend themselves in festoons from the highest point should the hive not stand on the level; if perfectly flat, then the cluster is formed near to one side, and forthwith waxen cells are added to the guide placed to ensure straight building. If the weather is favourable, the delicate white comb will be found to increase rapidly in a semicircular form, until the centre reaches to within $\frac{1}{4}$ -inch of the lower rail of the frame, when the side spaces are soon filled in. Sometimes combs will be started in different places along the guide, and as the circular edge of each nears its neighbour, these are joined, and the several united continued as one comb.

By using a sheet of glass next above the frames, or better still my glass rail sections, kept warm with woollen material, the interesting operation of comb-building may be watched. Many bees will be seen with strips of wax just removed from the "wax

pockets" on the under-side of the abdomen, and this they are moulding into shape as added to the thick rim on the outer edge of the cells. This rim is always present, not only as a reserve of wax for lengthening the cells, but more especially for giving strength to the structure, and the better to withstand the tramp of many feet; the actual cell walls being as fine as tissue paper. With a few exceptions, as when joining two combs, or where drone cells meet the worker size, each cell is hexagonal in shape, with a base composed of three irregular squares, so that the centre point of contact is deeper than the sides; thus, the centre of the base of one cell comes opposite the junction of three walls on the other side of the "septum."

The natural distance from the centre of one comb to that of the next is $1\frac{1}{2}$ -inch. It is not, however, absolutely necessary that this gauge should be retained, and it will be found by making the distance $1\frac{3}{8}$ -inch or $1\frac{1}{4}$ -inch when starting new combs that the bees will build them almost entirely of worker cells—five to the inch. When the natural distance is allowed, many larger cells are constructed; these are for storage or for the production of drones or males, their measure being four to the inch.

As soon as the combs are sufficiently advanced, the queen deposits an egg in each available cell; this remains for two days, when the workers add a milky fluid; on the third day the egg hatches, and the tiny embryo floats in the liquid, to which the bees continually add, until the seventh day, when the larva surrounds itself with a silken web, its cell being then capped over with a porous mixture of wax and pollen. According to Cheshire many more important changes then take place than hitherto have been supposed, and the student of nature will find much pleasure in perusing his work.* When fully developed, the insect bites its own way through the cap on the twentieth day after the egg was laid, and is readily distinguished by its light downy appearance. It immediately proceeds to the open cells of honey, and helps itself liberally. The youngster is

* "Bees and Bee-keeping," Vol. I., Scientific.

generally assisted by an older bee in removing the filmy skin from its body, and after two or three days it goes out for a cleansing flight at the warmest part of the day, at the time many others are having an airing and taking stock of their surroundings.

Our little friend gets stronger daily, and, soon after the seventh day we find her coming home with a lump of pollen on each back leg, in what are called the pollen-baskets, being hollow parts in the legs, with strong hair so overhanging that the load cannot fall. She enters the hive, travels up the comb to near the margin of the brood nest, and after finding a convenient cell, in which quite likely pollen has already been deposited, she pushes off her load with the middle legs, which Cheshire has shown have a peculiar instrument adapted to the purpose, and which is passed down the hollow behind the pollen, and thus it is forced off into the cell. The bee will then turn round and entering the cell, presses the pellets down into a thin layer, where probably many such are already placed, varying in colour according to the nature of the plant they may have been gathered from. It is well-known that the bee nearly always confines itself to one kind of flower when out foraging, hence its load of honey is of one kind only and the pollen is of one colour; the bee-keeper may therefore frequently tell what his bees are working upon by carefully noting the colour being brought in. Thus mustard gives yellow pollen; white clover, brown; red clover, dark brown; sanfoin, brown; willow, yellow; furze, dark orange; dandelion, bright orange; apple blossom, light yellow; poppy, black; blackberry, greenish white; while the various garden flowers give every conceivable shade.

It is but seldom that a bee gathers a large load of both pollen and honey on one and the same journey. A pollen gatherer will have little honey, while those carrying the most honey, will seldom stay for a particle of pollen, more than what may be brushed into the honey as collected. The pellets are brought in most freely up till 11 a.m. while everything is moist from the dew of night; or at any time, immediately after a shower, if warm. The honey sources of the day are about dried

up by three p.m., and the bees do not, as a rule, work actively after that time. As in the early morning, they then carry in much water to help in preparing the food for the young, a mixture of pollen and honey, first digested by the nurse bees, or those not yet old enough for outside work, and given to the unsealed larvæ as a milky fluid. During the warm part of the day, not a bee will be found at the water fountain if there happen to be a heavy flow of honey; but should there be a scarcity, many will be carrying water the whole day. It is, of course, understood that bees must have honey (or syrup), but, Reader, do not at any time lose sight of the fact that in building up in Spring, it is absolutely necessary that they have both pollen and water as well.

Substitute for Pollen ; Water Supply, &c.

If there is any sign of scarcity, nitrogenous food can be given in the shape of a thick paste, formed by mixing pea-flour with good honey (syrup will not do). With a thin broad stick press this into the cells of a tough comb to the extent of the half of one side and place the same next the cluster. Water can be given in large milk pans, either with sawdust at the bottom; moss; or wood to float as a resting place; taking care that the vessel shall stand in a warm, sheltered spot.

Young Bees take their Share of Work.

The honey gatherer will generally give up its load to the younger bees, returning at once to the fields, and it will be found that during the day the supers are filled almost exclusively with young bees* not yet able to work outside, and as these do most of the comb-building as well as store the honey, have we not here the reason why pollen is so seldom found in new stored combs? Of course, we know that pollen is required near the brood nest, but much of it is purposely stored and covered with

* Observation by Doolittle, America.

honey in view of future requirements, and if the load could be transferred, as the honey is to the younger bees, we should not be able to reckon upon the almost total absence of that article from our comb honey.

That the young bees do take so large a share of the work, as explained above, shows remarkable economy of labour, and disproves the theory that there is no benefit to be derived from brood hatched out less than three weeks previous to the probable close of the honey harvest. During a heavy flow I have seen hives with none but newly-hatched bees at home, proving also that upon an emergency young bees begin to carry much earlier than is often supposed. The fact is, from the time surplus receptacles are put on, the production of brood should be limited to the capacity of nine "Standard" frames. That number of combs crowded with brood, except for the usual quantity of pollen stored, will represent the population needed to

Make up for the continued Wear and Tear

of bee-life, and to keep the stock in good heart after the hard work is past ; as few of those which have gathered the stores are to be found within three weeks after the close of the season. Examine the hive, and you will find every field worker has its wings more or less worn ; look again, after the interval named, and they are gone.

How the Honey is Stored.

Watch the bee relieving itself of the nectar brought in. Should she select an empty cell, she first assures herself that it is quite clean, and then beginning at the base, with her tongue she commences to "paint" the same with the honey slowly leaving her tongue, until the first load completely covers the three squares. Another load is brought, and the next bee continues the operation of "painting" the sides of the cell, but only so far as it is necessary to accommodate her own load which

she is slowly disgorging. In like manner each following bee continues the process. until the cell is nearly full, and the mouth of the same is gradually sealed over with pure wax. It will be readily understood that were it not for this process of moistening the sides of the cell, the honey would not always adhere to the dry surface, and hence much waste space would be the result. Much of the honey does not, however, remain where first placed. If the bees have room it is distributed as much as possible, and when the moisture is evaporated it is carried above.

The bees which leave an air space just under the capping are Blacks, Carniolans, and some hybrids. Ligurians give a thinner sealing and are not always so careful to retain the clear space, but their comb honey is quite presentable, though that of the former is always preferred for its snowy whiteness. Cyprians, Syrians, and Palestines, however, leave no space whatever; in fact it would appear that they even moisten the inside of the cappings, and fill up the cell as tight as possible, hence their comb honey is not at all saleable. The reader will therefore use his own judgment in the matter, and work only those stocks for comb honey that are known to produce the whitest comb surface.

As soon as the wants of the rapidly increasing brood nest are supplied stores begin to accumulate, and presently we find the upper portion of the central combs filled with honey and neatly capped, while one or more of the combs at one or both sides will often be a solid block of honey. Meanwhile the population has been entirely renewed by the brood hatching in successive batches, but presently no more store is to be gathered, and then the drones are destroyed; the size of the brood nest is greatly diminished, until by September brood rearing ceases entirely, unless there be a queen of the current year, and in that case, with plenty of food on hand, it will be continued until late into October. The whole of the stores accumulated by a swarm thus left to itself will seldom exceed 20 lbs., but let the reader compare this with the product of a swarm worked as explained under "General Management," and he will find that there is but poor economy in the "let-'em-alone" policy.

As the cool weather comes on, the bees which but lately appeared to fill the hive, crowd into a compact mass, occupying not one-tenth of the space. The winter cluster is formed where brood has lately been hatched, towards the central lower part of the combs ; thus the bees are able to enter these cells, head to head on opposite sides, as well as cluster between, forming one unbroken mass, and so keeping up the necessary temperature. In this state the bees do not rely upon any outside covering other than simple protection from direct draught. The older the combs are the more protection afforded in Winter ; but one wall of the hive, at least, that on the south side, can hardly be too thin, as an occasional gleam of sunshine penetrates at once, and so enables the bees to shift their position, and re-arrange the stores around the cluster, even though the temperature may be too low for any to fly out. Therefore, wherever the entrance may be placed, it is absolutely necessary that the frames of comb shall stand end on to the south wall.

Providing pollen is at hand, breeding commences in all good colonies soon after the "turn of days," but at first the patches of brood are small, and limited to the very heart of the cluster, to guard against chill. It is not by any means to be supposed that henceforth young bees are brought forth without intermission ; but it is a fact, nevertheless, that a colony, failing through any cause, to produce this early batch of youngsters, will stand in the back ground all through the season, as presently the loss of bee-life will be so great that a late hatch of young ones cannot possibly keep pace with the deaths occasioned by almost daily flights. On the other hand, two or three generations of young bees brought to life before general flights occur, give a colony so great an advantage that no perceptible diminution occurs, and by the time Spring opens, the population has been *almost entirely renewed*, so that henceforth the progress of that stock is rapid.

Presuming that the colony we have had under consideration, has plenty of stores of both kinds, and a good queen at its head, at the approach of May, some of the large cells have eggs deposited in them : these also hatch on the third day and the

larvæ then undergo much the same process of change as does the worker, though each condition is more prolonged, and it is not until the 25th day that the perfect insect begins to bite a way out from its cradle. Nearly every one has heard of these burly fellows, but people generally appear to consider that a drone is so called simply because he will not work ; but the fact is that he cannot work, and has nothing in common with the worker, the latter being a neuter and its whole organism so constituted as to fit it for work alone, while the drone is exactly the reverse, and being the male its sole occupation is that of fertilising the young queens brought to life during the swarming season. It is therefore in view of this colonising instinct that the drones are now brought forward ; this being the first indication that a stock is expecting to swarm at no distant date. If we

Suppress the production of Drones

then, by allowing no drone comb, one step is taken towards the prevention of swarming ; it being well known that those colonies having few or no drones are the least inclined to swarm.

Royal Cells.

The next and more important step taken by the bees, is to build special cells, either on the surface of the combs, or more often around the edges, something in the shape of an acorn ; indeed in their first stage, they are almost an exact counterpart of the cup. They may remain in this state, as they often do, for many days if the weather is not quite favourable ; but in due course the queen deposits in each an egg, and as soon as the tiny larvæ hatch from these they are fed excessively upon what is called "Royal Jelly," a substance much thicker than that given to the common larvæ. From the sixth to the seventh day the developing insect has its cell capped over ; it then spins a cocoon which does not completely surround itself, as the abdomen is not covered, and strange though it may seem it is just there that the cell is torn open by the bees and the immature queen stung to

death by the workers when they have one young queen and decide that the rest are not wanted.

On the sixteenth day from the laying of the egg, the perfect female, or mother bee, emerges from the cell, though she is not fulfilling her destiny, until being established at the head of the old colony or one or other of the after swarms, she mates with a drone when about six days old, and on the second day after begins to deposit eggs in the worker cells only. Contrary to the opinion of some writers, who affirm that a young queen is incapable of producing drones the first year, I have repeatedly had cases in *prosperous* colonies where a queen not two months old produced drones. Nevertheless, it is the rule for after swarms, having young queens, to build only worker cells the first season, hence no drones can be produced, and this would account for the erroneous conclusion arrived at by the old writers. Of course there is a lesson to be learnt at this point: "When wishing to obtain worker combs without the aid of comb foundation, insert young queens at the head of those stocks used for the purpose."

But we have to note the

Condition of a colony nearing the swarming point,

and therefore must return to the period when the queen cells are being capped over. The old queen now shows signs of restlessness and were she permitted would gladly destroy the inmates of the Royal cells, though only a few days previously she needed but little persuasion on the part of the workers, to deposit the eggs in those very cells, soon to become her own rivals and deadly enemies of each other. It is not always the case, but it sometimes happens that the bees cease to stimulate the old queen to egg-laying at this stage, and hence she is the better able to fly, as her ovaries are much reduced in size.

The bees have not always time to finish capping all the queen cells started ere the excitement culminates in the issue of the first swarm, the old queen coming with them, seldom first or last, but generally when half of the bees are on the wing. Bees of all ages

come out, including those but just emerged from the cell. If the weather is warm, even these soon gain sufficient strength to fly and settle with the swarm; otherwise, if they cannot crawl back to the hive, many will perish; thus showing the necessity of a wide board reaching from the ground to the entrance, not only in this instance, but at all times, as many adult bees are lost in failing to reach the entrance during chilly weather. The workers out in the fields at the time of swarming and the large number of young hatching soon make up the strength of the hive and prevent the remaining brood getting chilled.

Securing the Swarm.

If the apiary be located near high trees the swarms (if permitted to issue) will often give trouble by clustering in them; though they may as often settle upon any low shrub, or even a post or wall. In the former case a straw skep must be carried up and the bees shaken into it when inverted under the clustering mass; descend the ladder as rapidly as possible, keeping the skep the same way, and then turn it the right way up on to a sheet previously spread upon the ground, with a brick or piece of wood under it, so that one edge of the hive may be raised to enable the flying bees to draw in. Where the cluster is formed on a wall or any other like place, brush the bees off into the skep with a wing; but if among branches of wall trees, little can be done in that way, and they must be driven up into the skep as it is fastened above them, by the use of smoke; or, better still, make everything more certain by first capturing the queen and secure her in a cage fastened under the edge of the skep when placed on the ground: in this case if only a handful of bees can first be brushed into the skep, all the rest will follow. On no account, in any instance, expect the bees will go up of their own accord into a hive placed above the cluster; it will only cause waste of time and disappointment; it has to be done, therefore carry the thing through at once.

Hatching of the Young Queens.

In about nine days from the issue of the first swarm, one of the young queens bites her way out of the cell, leaving the cap hanging attached at a part of its edge ; this covering will sometimes get back into its original place and be again sealed by the bees, and should a worker be in, clearing out the residue of food at the time, its fate is sealed. Such occurrences, simple to a careful observer, have at times given rise to unfounded theories ; but at the same time it shows how it is quite possible to leave a useless queen cell in the hive when cutting out all but one to prevent after-swarming : a wanton waste of time by the way which cannot be tolerated in a modern apiary.

As a rule the first hatched young queen leads off, or rather goes with the second swarm ; though the after, and sometimes even the second swarm, is accompanied by more than one virgin queen. Though I am well aware that such queens will, if placed together, immediately fight until one receives its instantaneous death wound ; when several accompany a swarm, or in case two or more swarms settle together, each having a fertile queen, the bees themselves settle the matter by "balling" those not required. After the hive is so weakened that the bees know it is useless to attempt to swarm again, or should the weather be unfavourable, the queens still unborn are destroyed, as I have reason to believe, by the workers tearing open the side of the cells and there stinging their helpless victims, or tearing them out piecemeal.

Within seven days after the issue of the first swarm there is no more uncapped larvæ, and therefore no more feeding required from the nurse bees until the last remaining young queen is laying, a period of about twelve days, so that if excessive swarming is not indulged in, stores continue to accumulate while there is a reduced force to gather it. It is well that this is so, as the young queen is generally so very prolific that unless the workers can get in advance of her requirements at the start, they are liable to reach Winter with no stores on hand.

I have here shown in a general way the natural condition of a swarm during one year of its existence, but under modern management the state of things will be much altered ; at the same time I hope the foregoing will enable the uninitiated reader the better to understand and follow such methods as will hereafter be described.



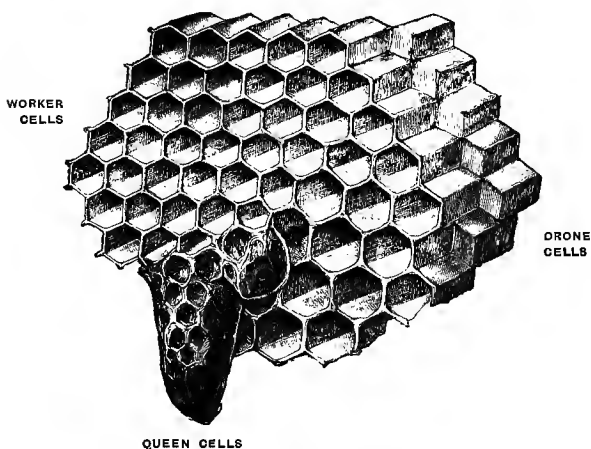
QUEEN



WORKER



DRONE





CHAPTER V.

VARIETIES OF BEES.

THEIR CHARACTER AND DISPOSITION.

IT will be my endeavour to give an impartial account of the different varieties as I have found them ; and while drawing attention to the great value of the foreign races for crossing with the bees we already have, I must advise the reader not to invest heavily in either of the foreign varieties, but first obtain one or two queens and then compare them with those he already has for two or three years before making any radical change.

THE BLACK, OR NATIVE BEES

are still cultivated in many apiaries, principally because they are well adapted to the production of comb-honey. Their newly-stored combs are beautifully white, and therefore comb-honey produced by them commands a good sale. They are not so prolific as other races, and hence do not give as much surplus, and consequently are of little use in an apiary where increase is desired ; in fact, I can assert as a fact that the bee-keeper who expects to build up a large and prosperous apiary from black bees alone, will be certainly disappointed. When,

however, he has all the stock he requires, no objection can be made to the sole use of this race where comb-honey alone is sought for.

Though, generally, the hives are less populous than those of other kinds, these bees have many valuable qualities. The young commence work outside at a much earlier age than the yellow races; they have great conservative energy; and a given number will produce and maintain a much larger amount of heat than the same number of any other race. Here is the sole reason why these bees are always more ready to take to the supers and are better comb-builders than others, though they may be occupying the same space with less than half the population. This I have observed for many years past with colonies standing side by side with the yellow races. For the same reason a Winter cluster of black bees is not so densely packed as one of the same size, consisting of the yellow varieties. These remarkable peculiarities have not before been mentioned, and possibly never observed by other writers; but here is shown the very best of material for laying the foundation of a vastly improved strain of bees—starting with a race which has immense vitality; but requiring the admixture of foreign blood to get (1) greater laying powers in the queens, (2) a better disposition, and (3) to eradicate their inclination to cease storing while honey is yet to be gathered towards the close of the season.

To Perpetuate their Working Qualities

I have always found it necessary to breed from a queen of the native kind, crossing with Carniolan or yellow drone; the act of crossing in itself adds greater energy; while the disposition is received from the male side. For instance, a queen of a mild strain mating with a drone from a vicious colony I have noticed throws workers which almost invariably turn out to be irritable. Again I have had queens produce workers that the average bee-keeper would not attempt to manipulate under any kind of

intimidation ; and yet the daughters of such queens allowed to mate only with drones from stocks known to be easily handled, have given workers that one could do anything with.

I have found many black bees more irritable than any I have ever had, even rushing from the hive to attack a person many yards off ; but by crossing the queens with Ligurian, or by preference, Cyprian or Carniolan drones, we get some of the finest and best tempered workers that can be desired. It has been considered that hybrids are very vicious, but this is only half true ; what I have stated above is strictly in accordance with fact, but when any yellow queen is allowed to mate with a black drone, then, of course, the progeny resulting therefrom will be irritable, while their working qualities will be inferior to those of the cross recommended. Black drones are not required in breeding up a new strain, and should be rigorously excluded.

LIGURIAN, OR ITALIAN ALP BEES.

These were the first yellow race introduced, and though much abused in some quarters, they have gradually gained ground until there is perhaps hardly a district where the native bees have not to some extent, more or less remote, received some benefit by the infusion of fresh blood. Indeed, it is amusing to hear some apiarists assert that Italians are inferior to the old-fashioned sort, and that they will have no more of them ; when as a matter of fact their original stock has been greatly improved by the introduction of the foreigners, short though their existence may have been : and moreover, the probability is great that year after year such short-sighted men are indebted to some distant bee-keeper for the continued excellence of their blacks (?) ; as the new blood is carried from one apiary to another, through successive stages during succeeding seasons ; each cross showing less of colour, until in the end there is scarcely any evidence to show that the dark bees of the neighbourhood have foreign blood in their constitution.

The advantages claimed for Ligurians are as follows : They are more prolific, and consequently gather more honey than blacks, more especially as they can work upon some flowers not accessible to the others, and continue to gather until Autumn is well advanced. Strange to say, natives often do best early in the season, but in Autumn I have known Italians draw out foundation rapidly and store heavily, while at the same time the former would not attempt to work upon a sheet of foundation placed in the centre of the brood nest. The Italians are more gentle, and together with their beautiful markings, this has done much to make them popular.

They are considered to be an all-purposes bee, but their comb-honey is not quite so good as that of the native kind ; they are not equal to the latter as comb-builders, and are often hard to persuade to enter the supers ; while they are quite useless for queen-raising purposes, as often they will start but one or two cells, and of poor quality at that. A mixture of the two races however, as previously stated, will give energetic workers, and there is no doubt that the "leather-coloured" Ligurians mentioned by many Americans as being superior to any, are nothing more nor less than hybrids.

As with all yellow races, Ligurian workers have three yellow bands on the upper part of the abdomen, beginning at the first segment. Creamy white lines of hair intersect and follow the broader yellow bars, down to the extremity of the body, giving the bee a handsome appearance. The queens vary in colour from dark to light yellow ; while the drones sometimes have patches of yellow on the abdomen, and others are hardly to be distinguished from those of the black kind.

CARNIOLANS.

Of all pure races, these are undoubtedly the best "all-purposes" bees known. Scarcely a fault can be found with them, and while they are not quite such good honey gatherers as

Cyprians, the latter cannot compete with them for colour of comb-honey. It has been stated that they swarm immoderately, but this is more the result of bad management than a fault on the part of the bees. There is one thing, however, which would give that impression: the demand for imported queens has been so great that I am afraid many old queens have been sent over, more especially as none of the native holders make any attempt to raise queens for the market. Therefore, in the natural order of things, the old mothers would be superseded, and a number of swarms come forth headed by young ones. Where old queens are avoided I am aware that there is no more trouble with these bees in that direction than with any others.

Mr. F. Benton has now established an apiary in Carniolia; so that in future bee-keepers generally can depend upon getting good imported queens of this variety.

One great point in their favour is their

Good Temper.

Without smoke, or other intimidants, hive after hive can be opened, and no stings are received; and without a doubt the introduction of this variety will do more to make bee-keeping popular than any device in hives which has been brought forward for the convenience of the novice. Carniolans are *the* bees for beginners, and none should now start with any other kind. By working with these, confidence will be rapidly gained, and presently, if desired, one may with greater assurance give other kinds a trial.

Carniolans are very active during the summer months, and yet are restful while confined during winter, in fact they come from a cold mountainous region and there is, therefore, no doubt either as to their energy or good wintering qualities. It is reasonable to suppose that they at one time were a cross between Cyprians and the German bee; the Cyprian element, however introduced, must have subsided, and the colour reverted to that of the majority, though the extremely broad white bands on the

latter segments of the abdomen of the yellow race have been retained, thus distinguishing the Carniolans from blacks.

The above conclusions may be justified when it is stated that in crossing a Carniolan queen with a Cyprian drone, in most cases her bees are even more beautiful than Cyprian workers. In all cases the yellow element predominates, while few are less yellow than a nicely marked Ligurian. On the other side, a Cyprian queen mated with a Carniolan drone does not throw a single dark worker. Again, I have had many hybrid crosses from a queen on the Cyprian side, after running through a few generations, each time with a black drone as the sire, when a bee resulted that could hardly be distinguished from the Carniolan of to-day.

The queens vary in colour from yellow to black ; some being "ringed," the colour of the abdomen shading alternately from light to dark, but all produce workers of the typical sort, having on the abdomen near the thorax a mere shade of bronzed yellow, and then follow several extremely broad white bands, giving the bees an attractive appearance.

Many of the queens imported throw workers having one or two distinct bands of yellow, which show that the native bee-keepers have lately introduced some of the yellow kinds. This is unfortunate, though I find by careful selection at home that the typical race can be retained.

CYPRIONS.

Among the yellow races these are destined to take the lead. Though not suitable for the production of comb-honey, they are very active honey gatherers and extremely docile, while their great beauty is undeniable. They have three bright yellow bands on the abdomen alternating with broad bars of light yellow hair. Unlike Ligurians, the yellow extends to the underside of the body, as it does also in a less degree with Syrians. The body is much smaller than that of the native variety, tapering to a fine point, quite unlike the more rounded form of the other.

Some writers have given their experience as being very unfavourable with Cyprians, considering them vindictive and difficult to winter. They have faults of course, such as being prone to develop fertile workers and using much propolis ; but all the stocks I have had could be handled at any time without intimidation ; and as to wintering, the fault appears to be rather in the bee-keeper than the bees themselves. If the queen is not inserted into a colony too late in the season, and their stores are given at the proper time these bees will winter not worse, but better than many others. When I say that I have had Cyprians hatched in August and September, continue in good health until the following June, it will be admitted that there is not much wrong with them ; and this happened in the most protracted winter we have experienced for many years.

SYRIANS.

These are, in appearance, much like the foregoing, though of a darker shade, and sometimes are not so well marked as Ligurians, though always yellow on the underside of the abdomen. Instead of having cream coloured bands of hair like Cyprians, these have corresponding bars of a bluish white colour, much like the Albinos bred from an offshoot of the Ligurian variety. While some condemn these as utterly unmanageable, others claim that they have many valuable qualities.

I have found among them queens producing workers almost unmanageable, while a larger number gave bees that could be handled like flies. How misleading then is it for persons who possessing only one—or perhaps two —queens, which upon throwing irritable workers, are induced to condemn the entire race and thus prevent many from obtaining what would prove a really valuable acquisition. The whole matter resolves itself simply into this—select those of gentle disposition and breed only from such, destroying any queen which throws disagreeable bees.

PALESTINES.

These are, perhaps, more yellow and beautiful than Cyprians but can hardly be recommended, as they develop fertile workers to an alarming extent, use more propolis than any others named, and while being handled have a very disagreeable habit of biting the fingers. These have often been confused with Syrians, but the two are quite distinct : Palestines come from the Holy Land proper, while the others are found farther north, in the Lebanon mountains.





CHAPTER VI.

HOW TO OBTAIN GOOD WORKING STOCK.

IN all apiaries it is found that a certain colony, or perhaps a few stocks, surpass all the rest in the amount of honey collected; and the remark is often made that of two colonies standing side by side, apparently equal in every respect, one gave a large surplus while the other did almost nothing. Reader, let us reason together, and see if it be not possible to explain the apparent mystery. As a matter of fact the whole

Secret of Successful Honey Production

consists in always maintaining the proper proportion of adult working bees in relation to the quantity of brood and young bees on hand. Here then can be discerned the difference. One colony was so favourably constituted that the queen was able to produce the full working force *before* the honey flow came on; while the other could not breed to her fullest capacity until *after* the season commenced. In the latter case the working force is unable to do much more than keep the rapidly increasing brood

nest and large population of young bees supplied. With such an undue proportion of consumers on hand the queen now has it all her own way, and her combs are one mass of brood.

The colony which gained the proper balance of population at an early date, on the contrary, has much reduced its brood nest by storing some honey and large quantities of pollen. This is the hive which will give the heavy surplus, and the other can never compete with it, even though it has twice the population. Of course excessive breeding can be to a certain extent modified by contracting the size of the brood nest, but nevertheless the actual working force will not be in excess until the season is far advanced.

We must now consider the causes of such a wide difference. They are many; one of the first being that the queen may be stimulated to breed too late in the autumn; consequently she will be late to begin breeding the following season. The hive may have been short of stores, or the combs so overloaded in early spring that there is really no chance for the bees to develop the brood nest. Perhaps they were thrown back by being too much exposed, instead of having warm material above them. In either case an early hatching of young bees would be out of the question; and these are the mainstay, compensating for the loss of many veterans when frequent flights become necessary. Consequently the best powers of the queen are not expended before the season opens.

To obtain good Stock,

it is absolutely necessary that one keep only the very best queens—young, highly prolific and well-developed. When I mention young, I mean just what I say. How wasteful and unnecessary! you say; but I assert as a fact that to enable one to keep his stock *generally* in the highest state of efficiency, he must retain no queens that have seen their second summer. Take a queen raised even so late as August; she will be in full profit

the following season : keep her till another season and her colony will be hardly second-rate.

To be prolific a queen must not simply keep pace with her workers while building up in preparation for the season, but must actually force them to make room for her. Such queens are to be had, and with them no "brood spreading" by the apiarist is necessary.

A well-developed queen is more hardy and energetic than a smaller one ; and, as a rule, will get mated in risky weather when twenty others fail to meet a drone.

The finest queens are obtained from young mothers. A queen is in her highest state of excellence soon after she commences to lay, and should be used for breeding, if from stock of known excellence, as soon as it is found by her hatching bees that she has mated correctly.

Queens cannot be too Prolific.

I am aware that there are some bee-keepers who consider that a queen can be too prolific. It may be so with their management, but as a simple matter of fact the more prolific the queen, the larger the surplus stored, *but* one's management must provide that she does her best before the season opens ; thereafter she will simply keep pace with the wear and tear upon the life of the workers.

It will be asked, "And how are we to provide that the best powers of the queen are to be used up before actual storage commences?" Some important matters having reference thereto I have already given ; but one way of doing this is to unite two or more colonies, making them very strong in the Autumn wherever it is found stocks are at all under full strength. Another plan is to unite about ten days before the season is expected to open.

As a rule, especially where no honey is obtained after July, the best results are obtained by preventing the issue of swarms ; but nevertheless unless

The Equivalent of Swarming

is allowed our stock must deteriorate as a natural consequence. Therefore select one out of every ten colonies and devote it to queen-raising (see chapter on same), and allow one nucleus with a young queen to stand by the side of every stock. By the Autumn such nuclei will have themselves become fairly strong, when the old queens can be destroyed and the two lots respectively, united the following evening.

Having studied the general rules to be observed if we wish to have only good working stock, we must now consider which are the

Most Suitable Bees

for our purpose, whether we intend to work them for comb or extracted honey.

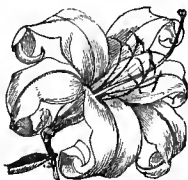
The advantages to be derived from the foreign varieties can hardly be over-estimated, for by crossing with queens of the native kind, we get greater fecundity, and better honey-gathering powers than either pure race possesses. In a former chapter I have already shown that a black queen must form the basis from which to build the very best working strain. Select such queen of known excellence and for the production of comb-honey use Carniolan drones to mate with young ones raised from her; the first cross being the most suitable.

For extracted honey the second cross to Cyprian drones will be found to give the best results. Pure black bees are not at all desirable for either purpose, as they cease storing quite a month sooner than the foreign varieties or hybrids; moreover they are frequently troubled with the wax moth, while the latter never are. Pure Cyprians, Carniolans, Syrians and Ligurians, in the order named, are also suitable for producing extracted honey.

Let it be observed that black (native) drones are to be rigorously excluded, as these give bad-tempered workers when

crossed with a queen of either of the foreign varieties. Syrian drones also should not be allowed, though queens of that variety crossed with Carniolan drones produce excellent bees.

In concluding this chapter I must insist that unrestricted or indiscriminate swarming, as hitherto generally practised, *is totally at variance with all true principles of breeding*. To obtain the best results it is absolutely necessary that all queens be carefully bred from the best stock only. Our motto should be "Excelsior !"





CHAPTER VII.

PLANTING FOR BEES.

HAVING shown how to secure good stocks, the next thing is to provide employment for such vast populations throughout the summer. In the best of localities there is always some interval when nothing of importance is in flower, while many districts are so poor in honey-producing plants as to be quite unsuitable for carrying on bee-keeping extensively. Judicious planting, therefore, will make the culture of bees a safe and reliable investment, as the crops will be *near at home*, and always ready for the bees, whenever the weather is favourable for the secretion of honey. Indeed, with a "sea of bloom" close at hand a surplus often accumulates during dull weather, when otherwise the stores of the hive would be diminishing.

Do not think of planting mere patches of various kinds of flowers ; such are but a "drop in the ocean," and if you cannot provide more than a few acres, then put in some one thing that will come in as a main crop, if your district is short of bee forage; such as white or Alsike clover, the latter by preference. If your surroundings are fairly good, then let the crop be arranged to come right for a time of scarcity.

Area required for 100 Colonies.

You may be able to spare many acres for a continual supply, and in that case provide not less than 20 acres for each succeeding

crop to every 100 colonies. I have by actual experience found 100 average colonies store a surplus from 10 acres of an average yielding plant, and should consider 20 or 25 acres would give full occupation for that number of stocks with which to commence the season.

It should be remembered that the honey is obtained at no expense to the crop of hay, unless the same be allowed to stand too long before being mown. Even for the sake of the bees most crops should not stand until the greater part of the heads die off, as such ripening process destroys the chance of a second crop.

As a rule then, those

Plants should be Grown that are Useful for Hay,

after the bees have had their gathering. There are only two kinds that I can recommend for bees which are scarcely suitable for cattle, and those are Melilot clover (*Melilotus alba*) and Borage. There may be many others that give much honey, but there is this about them—they require constant care and attention to keep the ground clean, therefore for honey alone such plants are quite out of the question. The two named however can take care of themselves; they outgrow everything else, yield large quantities of the best of honey, and require only that the ground be turned or ploughed, in the case of Borage every winter, and the other each alternate winter. The latter flowering only in its second year, two or more layings must be provided to maintain a succession. Borage comes best with the ground turned up roughly and needs no further care, but Melilot requires that the earth be harrowed and then rolled as often as possible whenever the surface is dry. Do not neglect to roll again the second year, both before and after the leaf begins to show. The omission of this very important matter is why the crop fails with many. We are sometimes told that this plant does well on poor ground; I have had it on both that and rich land, with the advantage of three to one in favour of the latter. Facts speak for themselves.

For a Succession,

the following will be found most serviceable. *Trifolium incarnatum* is an excellent honey plant used for early greenmeat, flowering generally in May, but can be sown to give a good succession. White or Dutch clover would follow at 15th of June till first week of July. Alsike cut for greenmeat just before it would flower will then follow white, which will keep up the succession till Melilot is in full flower at end of July, the latter remaining in bloom as late as desirable.

Late Forage Undesirable.

While we can hardly plant anything that will come in too early, it must be distinctly understood that nothing should entice the bees to work one day later than the 15th of September. Therefore if you have Melilot or any other large crop flowering at that date, do not delay, but cut it down. Bees need at least six weeks to regain lost numbers after winter is past; they require just as much time to settle down quietly before the cold season comes on.

Cultivation.

It will be understood that most of the above clover crops, etc., are sown over corn in the spring, the plant being well established by the time the same is harvested and having the ground all to itself the second year. As to manure, that question is left to the reader to feed his crops as he will, remembering that what is worth doing at all is worth doing well.

Sanfoin is an excellent plant on chalk soils, giving two crops yearly, as also will several of the clovers if treated liberally. Yellow trefoil or hop clover should be mixed with clover and sanfoin to make a good first crop. After the first mowing the trefoil does not again appear, but the main crop then branches out and fully covers the ground.

I have found that for all small seeds such as clovers, the ground should be finely pulverised and rolled before the seed is sown. Do not rake or harrow after it is in, but use the roll again and again, when the ground is dry.

Whatever may have been said in the past, it must be distinctly understood that Red Clover (*Trifolium pratense*) is *not* a bee plant. I have had considerable honey from it when the weather has been just right, following a dry time for the growth of the second crop, but should the plant have a favourable season for full development, the bees do nothing upon it however fine the weather may be. A crop yielding only one year in four cannot be tolerated.

When growing plants for honey which have no further use, one must make the most of the land under cultivation. To permit the ground to be occupied by a single variety taking two years to arrive at maturity is sheer folly; and even with those flowering yearly something else must be growing at the same time. Thus in preparing for Melilot clover, put in borage seed at the same time, the latter flowering the first season. Mow the whole in July when the clover is getting rather long, and a second crop of borage will come on, while the clover will shoot out stronger. Cut all again in September and if harvested or used as ensilage some use will be found for the mixture as fodder. The second year, however, the Melilot will be useless for feeding after it has blown, and the growth will have been so rapid that little borage will be seen; but the latter will again come up quite thickly the third year, to be cut twice as before with the new Melilot plants.

Again, when white clover is put down for bees, the ground can be filled with crocus bulbs, planted about six inches apart. They thrive exceedingly well, and being very early will be found useful without in any way interfering with the clover, which can be mown with the crocus grass in July, when a second crop of clover follows; thus we have three crops yearly on the same ground, without further cultivation; the second crop of clover being allowed to seed the ground.

A great Advantage to be Gained from Continuous Bloom

is that the surplus may be removed at any time without exciting the bees to rob, as is too frequently the case when the later harvest is taken at a time they have nothing more to keep them employed.

Systematic Planting makes Profits Certain.

This branch of apiculture has been much neglected, but bee-keeping as a profession can only become a certainty in this country where systematic planting is carried out. Indeed, even in America the same statement would apply to most districts, as there is a frequent occurrence of poor honey seasons, whereas with heavy crops close at home it could be so arranged that a good surplus would be obtained *every* year, though with scattered crops it sometimes happens that the bees store little or nothing.

No one has done so much in America to encourage the planting of bee-forage near the apiary as Mr. T. G. Newman, editor of the *American Bee Journal*. He not only recommends it as being an advantage, but has always *insisted* that it is *absolutely necessary*, and one of the first duties the bee-keeper owes himself. I quote the following from Mr. Newman's *Bees and Honey*:—"In view of the uncertainty of nature providing sufficient continuous bloom, and the certainty of annually recurring periods of cold weather, and long hazardous confinement, the bee-keeper, to ensure success, should as conscientiously provide pasture from which his bees can gather food, as to provide hives with which to shelter them from the storms. *With a liberal allowance of good wholesome honey in the fall, the first requirement for successful wintering will be provided.*"

Observe the last sentence; what a world of meaning the words convey to those American and other bee-keepers who so often lose heavily during winter! Our cousins across the water

put their losses down to bacteria, pollen, cold, etc.; but their late-gathered honey is not always good and wholesome, while in many cases if it is good, it is gathered often so late as October. Thus the vitality of the bees is undermined too late for recuperation by breeding before the cold of winter is upon them. Nothing is so exhaustive as the gathering and storage of a heavy surplus, and thus the too late gathering places a colony at a tremendous discount for wintering.





CHAPTER VIII.

THE AGRICULTURIST AND FRUIT GROWER.

THE value of crops suitable for bee-forage has been shown by the preceding chapter. The bee-keeper who is also a farmer therefore has every advantage and can make profit both ways. But while it is necessary that the extensive bee-keeper should also be a farmer, it is quite as important that the agriculturist should keep a few stocks for the sole purpose of fertilising the clover and other crops he may save for seed, if it happen that few bees are cultivated in his neighbourhood.

It should be distinctly understood that the more bees that can be obtained as fertilising agents, the more seed will be perfected; as well as more fruit. Single hives have been placed in cucumber and peach houses, and though some bees are of course lost in the first instance, the younger portion of the population never having flown outside, have no difficulty in finding their way about. The results have been reported to be most satisfactory, and the plan should be more extensively adopted.

Strange as it may appear to those who are inclined to grumble at the visits of the bees to their fields or gardens, it is a simple matter of fact that if the honey be not gathered it will only evaporate, and none is secreted after the flower begins to fade.

Fruit growers often complain that the bees damage their crops, and in autumn, when there is nothing else to be obtained, because they see a few bees among the wasps and flies, the former get all the blame ; whereas they have never been known to break through the skin of sound ripe fruit, but simply lick up the moisture that may be present where birds, wasps or other insects have first made an inroad.





CHAPTER IX.

ENEMIES AND DISEASES OF BEES.

A LONG list is frequently given under this head, but so far as I am aware, if all colonies are strong there is not a single enemy that can make any impression upon our stocks; and as to birds, the injury caused by them is more fanciful than real. They do occasionally take bees, but according to my own observation nothing but drones and dead workers are consumed.

Of the diseases too, there is but one which requires any serious consideration and that is

FOUL BROOD,

so called until lately, but now designated *Bacillus Alvei* by Mr. Cheshire, who has made most exhaustive experiments, and investigations in regard to this matter, and now tells us that the disease affects not only the brood but the adult bees and queen as well.

It has so frequently been stated that the disease can be discovered by the foul smell emitted by the stock which may have it, that I consider it necessary to warn the uninitiated not to wait for such a rude awakening. At that stage it is very infectious indeed, and it will be a saving to burn the hive and contents at once. With a colony in such a state the novice is certain to do only harm by attempting a cure and it is well to be clear of it.

The disease is first to be noticed by the unsealed larvæ turning yellow, and then dark brown or black instead of ever presenting a pearly white appearance, while some of the capped brood is in the same state, with the coverings pierced and sunken. Now here is a distinction to be observed between the genuine foul brood and simple chilled or dead brood. In the former case none of the larvæ dries up to a white cinder, being always rotten and slimy so that the bees do not, as a rule, remove it from the cells.

Chilled Brood and Simple Dead Brood.

The former is soon removed by the bees, and should any be overlooked it dries into a hard lump without changing colour. Simple dead brood resulting without chill, and with no apparent evidence of disease has in some cells the appearance of the genuine foul brood, but with this the greater part of the nearly mature bees dry up and retain their original form and colour; by this feature alone I have always been able to distinguish the difference between the two, and have put an end to the more simple affair in all cases by destroying the queen and giving a young and vigorous one to the colony.

Cheshire Cure for Foul Brood.

Mr. Cheshire has presented to the bee-keeping world what has in his own hands cured some of the worst cases of foul brood that he could secure. The remedy is absolute phenol or pure carbolic acid, used in the proportion of 1-400th in the syrup fed to the bees.

Mr. Cheshire considers that the queen must not be removed; but on the contrary I have found the first step towards a rapid recovery is made by deposing the reigning queen, and giving a young and vigorous queen bred from clean stock, when the entire attitude of the bees is changed, and great determination and energy takes the place of the former utter inability to clear out the foul stuff.

If the disease begins in early spring it is very likely the colony will go down hill at a rapid rate and the remnant will not be

worth troubling with, and should be cleared out by fire after sulphuring the bees. This should be done in the evening when all the other stocks are quiet, taking care to foul as few things as possible ; burn all you use that is not of much value, and the rest disinfect thoroughly with a solution of carbolic acid, 1-200th part in water. If hives can be first steamed or scalded it will be a great advantage.

My own Experience*

occurred some twelve years since, and a cure was effected by removing the bees from their combs, and confining them in a box or skep until a few began to drop exhausted from the cluster. They were then returned on to frames with starters or foundation, and having consumed all the diseased honey while in confinement, the complaint did not again appear. Though sometimes recommended, the honey is not worth the risk of feeding back to the bees after boiling ; then there is the extractor contaminated, and a hundred other chances of extending the operations of the disease by a little carelessness or want of thought by the inexperienced.

Both Mr. Cowan and Mr. Cheshire appear to consider that honey does not contain the germs of disease ; but that it does, and is the most fatal means of communicating foul brood I have had opportunities of proving to my own cost.

Everything used when manipulating a diseased stock, including the hands, must be thoroughly disinfected before another hive is opened, and in every way the bee-keeper must be on his guard ;

“ CAUTION ! ”

must be his watchword, and extreme vigilance will bring its early reward.

Where foul brood is suspected, every stock should be fed in both autumn and spring with syrup containing the before-

* “A Practical Experience with Foul Brood, and How Cured,” 3d., of J. Huckle, King’s Langley, Herts.

mentioned proportion of phenol. It appears that bees fed upon such medicated syrup have greater energy and build up much faster in spring than others not so treated, though free from disease, and fed without the addition of phenol. It would appear, therefore, that Mr. Cheshire is quite right in stating that bees are troubled with several minor diseases, and these seem to be avoided where medicated food is used winter and spring. The death rate is lower, consequently the hive is sooner populated, and spring dwindling does not occur. The apiarist will take the hint, and will study his own interests by acting accordingly.

Before closing this chapter I wish to again refer to the

Change of Queens as an aid in subduing the disease

of foul brood. It is evident that the continued addition of eggs from a diseased queen only adds to the putrid matter, while on the other hand, when removed and a young one from clean stock inserted after about ten or fourteen days, the workers have had some rest, and immediately the young queen begins to lay, her own vigour is imparted to the workers, and the matter which hitherto they would not touch is at once removed. This is a fact which I have observed in every instance where such change of queens has been made.

A queen is of little value compared with the trouble in hand ; and my own recommendation in all cases where there are sufficient bees to be worth saving, is to *at once remove the queen* and proceed as above, all the time feeding with Cheshire's remedy. It happens however that the bees will not take the syrup when other food is coming in, and at such times it is necessary to pour it into the combs, or better, fill them with a syringe.

There is one thing that appears to have escaped notice ; where sealed honey is present the feeding will not disinfect that, therefore if not extracted *every* cell must be uncapped that the contents may be shifted and re-stored, or used with the medicated food.

Another complaint, but one which seldom troubles stocks well prepared for winter, is that called

Dysentery.

This is known by the bees soiling their combs and the flight-board with their excrement, being unable to rise on the wing before voiding the same. This occurs in early spring, but can generally be prevented by providing that the bees have plenty of good stores, judicious ventilation, and free passage under the frames (*see* "Wintering"). A cure is to be effected by feeding warm syrup on the first fine day, thereby also inducing the bees to take a general flight. If the combs are very badly smeared they should be removed and clean substituted.



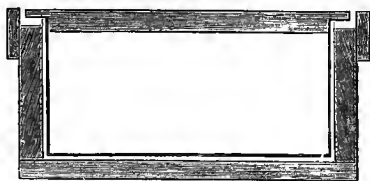


CHAPTER X.

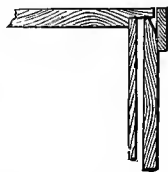
MODERN HIVES.

HOW CONSTRUCTED AND FURNISHED.

THE chief feature of the Modern hive is that each comb is built in a separate frame, enabling such to be removed at will without force; and without in any way soiling or injuring the comb. Each frame stands about $\frac{5}{8}$ -inch from its neighbour, and $1\frac{1}{2}$ inches from the centre of one to that of the next, though this space may be varied to suit different requirements as hereafter shewn. The frame rests only upon or in the hive proper by a lug



Position of Frame resting
on zinc runners.



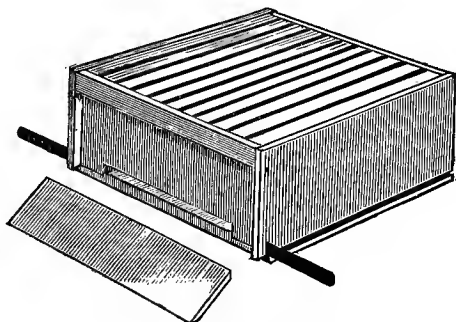
Frame end resting
on bevelled edge.

or ear at each end, and a space of not more than $\frac{3}{8}$ -inch must be allowed between the two end bars of the frame and the walls of the hive; while not less than $\frac{1}{2}$ -inch should be provided between the bottom rail and the floor; or $\frac{1}{4}$ -inch at the sides.

I present to the reader only three forms of hives and frames, all of which can be used in connection with the British Standard pattern without alteration in fixtures.

THE ECONOMIC HIVE.

This is a most simple and yet substantial hive, made from $\frac{3}{4}$ -inch white deal. It contains nine frames and two dummies and the width of the hive inside, measuring across the frames is 16 inches. By removing the dummies there is room for eleven frames for ordinary spacing, or as designed for close spacing in



The Economic Standard.

the first instance, twelve may be used only a $\frac{1}{4}$ -inch apart. I have practised crowding and close spacing ever since foundation first came into use, finding it gave a more compact brood nest and less room for stores below.

The same idea has of late been brought forward in America with the claim that it prevented the issue of swarms, as the bees could not store in such narrow combs, and on the other hand would not breed in the store combs (sections) above. In neither case however is this correct, as I had long since proven that not only do bees store and cap combs that are even thinner than required for brood, but also that the thickness of the combs in

sections above is not the least hindrance to the bees breeding there, as they simply reduce the length of the cells to suit their purpose.

The Economic has a fixed floor composed of one piece of board $17\frac{1}{4}$ inches by 11 inches, and another $5\frac{1}{2}$ inches wide of the same length. The two are halved together and a $\frac{1}{4}$ -inch rabbet cut out round the upper edge to keep wet from settling under. Another $5\frac{1}{2}$ -inch board, bevelled on the edge, does for the flight board and is detachable, being secured by simple hooks, or a small metal plate at each side as may be desired. The chief reason for it being removable is for greater ease in packing.

The entrance is 12 inches long by $\frac{3}{8}$ -inch deep and cut out of the front wall, which is 16 inches long by $8\frac{5}{8}$ inches deep; the back wall being of the same dimensions. Both of these boards are bevelled along the upper edge, to give a thin ledge for the frames to rest upon. The two side walls are each $17\frac{1}{4}$ inches long by 9 inches wide, and overlap the back and front walls so far that exactly $14\frac{1}{2}$ inches are allowed between the two, being $\frac{1}{2}$ -inch to spare beyond the length of the 14-inch standard frame. A plinth, 16 inches by $2\frac{1}{2}$ inches, is inserted at the top between the two 9-inch sides, filling in the space left at the ends of the top bars, and at the same time being a very convenient arrangement for lifting the hive. The entrance is regulated by simple zinc slips running in a saw cut.

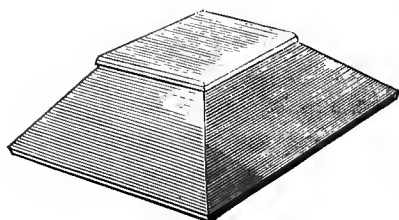
The Cover

is cut from 11-inch stuff as shewn; the long edge being 21 inches and the other $7\frac{1}{8}$ inches. The bevelled edges for



mitreing at the joints are cut off on the saw bench, but

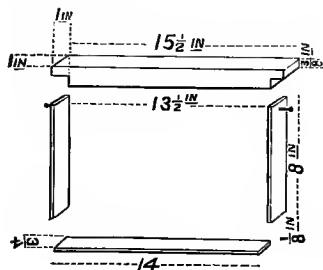
where such cannot be obtained, the inside edge should be gauged at $\frac{3}{8}$ -inch and then planed down to the mark, leaving the outside edge untouched. Nail together with at least five 2-inch brads down each side. The top square is 9 inches across and screwed on from inside. There is no



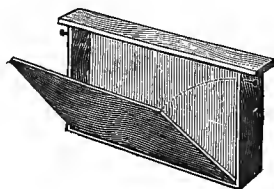
The Cover.

economy in planing the wood other than on the outside; but where this is not done it requires very much more paint and is liable to rot, as the surface cannot be so well covered.

The frame and dummy are as represented; the top bar of the former being $\frac{3}{4}$ -inch thick instead of the usual weak bar of only $\frac{3}{8}$ -inch thickness.



Standard Frame.



The Feeding Dummy.

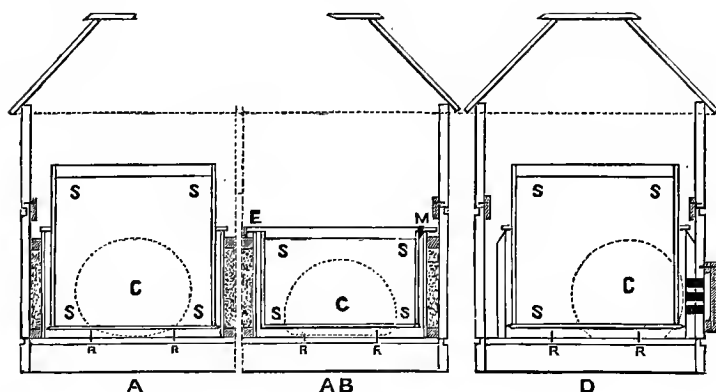
All covers must be painted also on the lower edge and two or three inches up underneath as well. The floor requires painting at least three inches from the edge all round both top and bottom, as also the bottom edges of all compartments. This is too frequently omitted, and the hive does not last a fourth of the time it should. So long as all in sight is painted that is generally considered sufficient, whereas the very parts left undone happen to be the most vital, as it is at the joints that the wet settles and soon causes mischief.

The next to be described is the

UNION, OR UNIVERSAL HIVE.

This is so arranged that it will take either the "Standard" frame; the shallow extracting frame as used by Mr. W. B. Carr, and many other advanced bee-keepers; and the large frame as adopted by myself in connection with such shallow frame as the extracting medium.

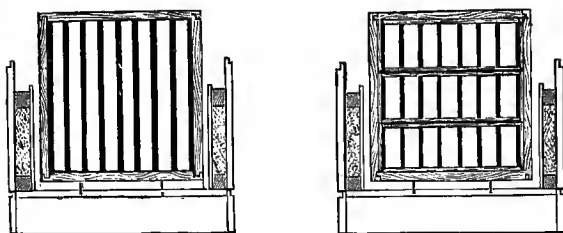
The following illustrations will give a better idea of the hive than pages of descriptive matter.



Cross-section of Large Hive showing relative positions of large and Standard frames.

The Hive as used by ourselves without packing.

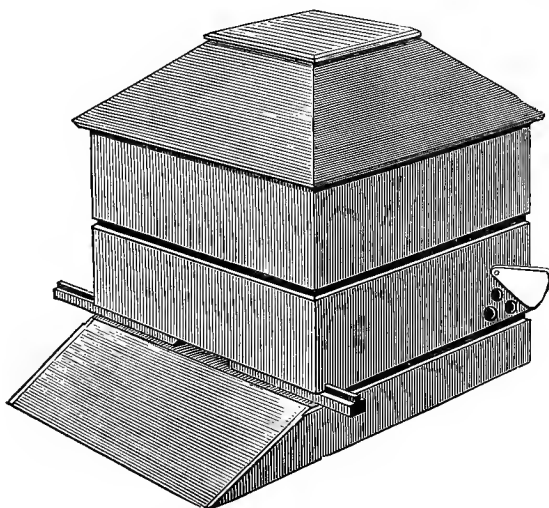
A AB show how the new frame rests upon the same ledge as the "Standard." **S** Relative position of stores as arranged in large and small frames. **C** Respective situation of clusters in winter. **E** and **M** show that the large hive will take either the plain 15½-inch top bar as at **E**; or the 17-inch with metal ends as at **M**. **R** Metal rests for extracting and comb supers to stand on when placed on end, but which do not touch the bottoms of frames. The illustration shows the lower chamber with wall, 11 inches deep; but I prefer to use 9-inch boards, so that the same may be used for doubling or tiering up.



Position of Extracting Super and Section Crate
when used at back of large frames.

The Body

is 19 inches by 19 inches outside, with two 9-inch stories and deep roof as made for the Economic, and exactly the same size. There are two double walls as shown at each end of the frames, leaving the usual $14\frac{1}{2}$ -inch space between. An entrance is provided at each end, so that a nucleus for queen-raising may be



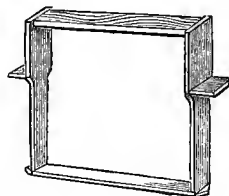
used if desired at the back. The front or flight board gives every advantage to heavily laden bees, as it is 11 inches wide, and firmly secured as part of the floor.

The Large Frames

are 14 inches by 14 inches and $1\frac{3}{8}$ -inch wide for a depth of $5\frac{1}{2}$ inches from the top, where are fastened the projections whereby they rest upon the bevelled edge as provided for the usual Standard frames. There is one plain dummy and one for dry sugar feeding.

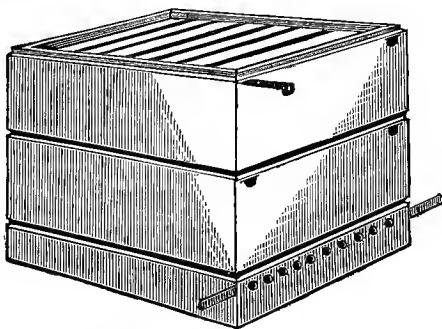
For my own use I find a 2-inch auger hole in the centre of the floor to be of great advantage; giving more thorough ventilation in Winter and enabling the bees to keep the floor clean at all times.

I have long since discarded outside plinths, for covering joints, finding them of slight use in keeping out wet after a little exposure; therefore to keep the upper body in position a plinth is secured inside at the ends of the frames. The outer top edge of all floors and body boxes have a $\frac{1}{4}$ -inch rabbet as seen by the illustration; thus no wet can penetrate.



The large Brood frame.

THE SHALLOW EXTRACTING SUPERS

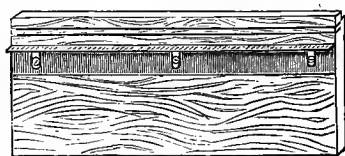


can be used independently as here shown, somewhat on the Stewarton principle, with a smaller cover of the same shape as already noticed.

Much attention has recently been directed to shallow brood chambers by the introduction of the "Heddon" hive in America. Though extensively patronized there the same has gained few adherents in this country, as the construction is quite out of character with our ideas of simple management. The hive was heralded as the best for inversion, but it had no sooner been introduced than the craze for inverting hives and frames began to subside, as was evident would be the case, and as was foretold in *Non-Swarming* pamphlet. Nevertheless the hive offers many advantages, such as being suitable for contraction; rapidity of handling; and the manner in which the bees may be "thrown" out without removing the frames.

For my own part I prefer the large frame as giving greater security in Winter, and being far in advance of any for breeding up in Spring.

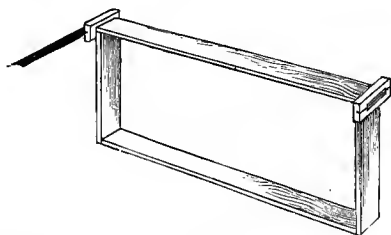
These supers are also well adapted to the Economic hive, being 14 inches by 14 inches outside, and $6\frac{1}{2}$ inches deep; holding eight frames, each of which are 12 inches by 6 inches and $\frac{7}{8}$ -inch wide. These stand a little more than the $1\frac{1}{2}$ -inch from centre to centre and are spaced by simple metal ends, with a slot in each, corresponding with a similar cut in the ends of the frames.



Side Wall of shallow extracting chamber, showing grooves for key and manner of raising frames, by adjusting the $\frac{1}{8}$ -inch ledge upon which they rest. Keys can be dispensed with for old style of working.

There are two corresponding grooves in the side walls and a metal key passing into these and through the ends of the frames holds all in place. By using the lower groove the frames hang with the bee space above them, and when the metal key is

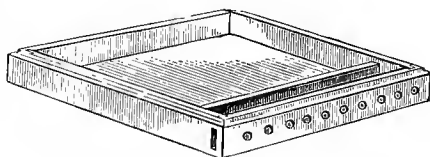
inserted in the upper groove a half-bee space* is allowed both top and bottom, so that the craze for inversion may be followed, if one desires to give the plan a trial, without alteration in fixtures.



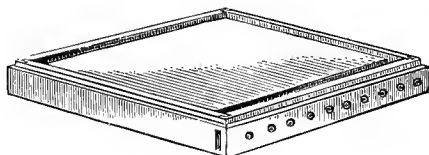
Shallow extracting Frame, 12 inches by 6 inches by $\frac{3}{4}$ -inch.

The Floor Board

is arranged as illustrated when the extracting super and the comb super are used independently ; one side being sunk $\frac{1}{2}$ inch, to give space under the frames, and the other about $1\frac{1}{2}$ -inch to act as a feeder when inverted.



Floor Board. Inverted for feeding.



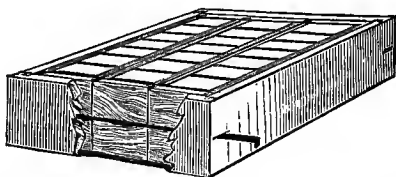
Usual way.

*The "half-bee space" originated with J. Heddon, of Dowagiac, Michigan, for the purpose of inversion.

The metal key, holding all the frames in position, the whole set of 8 may be worked as one large frame in the body of the large hive at the back or front of the large frames as well as on top.

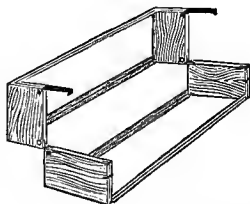
THE COMB SUPER

is arranged in like manner both to permit of inversion if desired, and to enable the whole set of sections to be started below; when the crate entire may be lifted above with the adhering bees, thus saving much separate handling of sections.



The Comb-honey Super: containing three skeleton folding frames, each holding seven $1\frac{3}{4}$ -inch sections. Metal key keeps all in position, when placed on end at back of large frames.

The great secret of having the largest results in comb-honey is to get a good stock of clean white combs built out before the season comes on, and this is best accomplished by placing nine sections in a large frame, or six in the "Standard," with a full



The Skeleton Folding Section Frame.

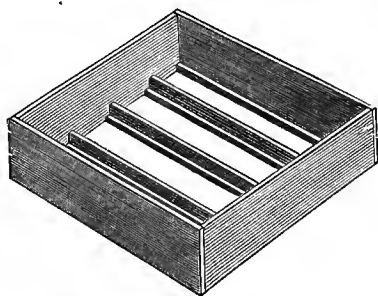
sheet of foundation in each, right in the centre of the brood nest. Remove these the next day, and insert another set to be treated in like manner. By constant attention many partly worked combs

are ready for the first flow of honey, free from pollen, and should there be a few eggs, these are dried up before the combs are returned to the hive, and are soon cleared out by the bees.

The comb super contains three folding skeleton frames, each frame holding seven sections $1\frac{3}{4}$ -inch wide. These can be used independently, enabling the sections to be handled rapidly, or to be used in any position desired. My own preference is for the half-frame using a thin board at each end to fill up the space.

OTHER SUPER CRATES

may be used of a more simple pattern which can be used in only one position. To hold from 21 to 27 sections, they can be made as follows: Make a plain box of the size desired with neither top nor bottom, and wide enough to take three $4\frac{1}{4}$ -inch sections across besides the thickness of rails supporting them. Such rails are in the form of an inverted T; the sections resting

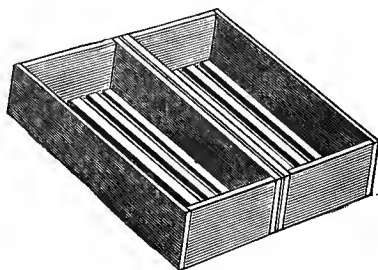


Crate with T rests.

upon the ledges which must not be more than $\frac{1}{4}$ -inch thick, giving that space between the sections and top bars of the frames. Any space left at the one end of the sections must be closed by a piece of wood to act as a dummy. This I prefer to fit only just tight. as both wedges and springs seem quite unnecessary. With all crates in general use, the

Space between the sections and top bars

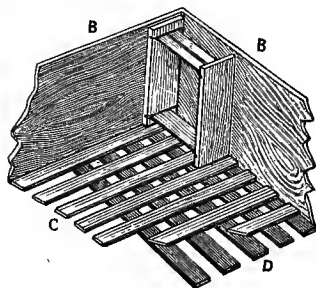
of the frames is objectionable, in that brace combs are nearly always attached to the underside of the sections. To avoid this entirely, in 1881 I adopted a crate with the bottom composed of slats standing $\frac{3}{8}$ -inch apart. When in position these slats come



Simmins' Twin Crate.

close upon the frames, but at right angles to them ; thus the bees have simply a number of small holes for passages—about $\frac{3}{8}$ -inch by $\frac{1}{2}$ -inch, which they are *compelled* to keep open ; no brace combs are built in consequence, as those are always continued from the wax that may be along the sides of the frame bars. During the seven years I have used this style of crate I have had no brace combs attached to my sections.

The annexed illustration in section will give a good idea of the



manner in which the said square passages are formed ; c being the bottom slats of the crate, and d the frame-bars.

But now having the slats close upon the frames it will be readily understood that a full-sized crate could not be used without much inconvenience ; I therefore made it in two, each

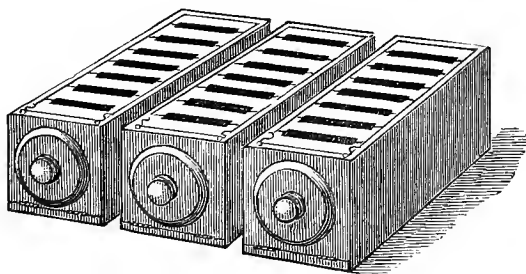
holding twelve to fifteen sections, and have had no more difficulty in removing one-half at a time than in taking out a frame of

comb. In replacing them a gentle horizontal motion will cause every bee to run down out of the way, though smoke first used would at once clear the course.

But perhaps the most important point, with my twin crate, is that as the central combs are completed, by simply turning the outer row to the centre, the whole are finished off more evenly and in less time, and thus the usual outside thin sections are a thing of the past.

With this class of crate I have generally used my bee space sections giving their own passage under, but if the one-piece section is used strips $\frac{1}{4}$ -inch thick must be inserted for the lower corners of the sections to rest upon.

The Rev. Geo. Raynor has introduced a crate in three parts, and though rather expensive with the glass and shutters at the end, many bee-keepers would appreciate the same. Of course



the windows can be dispensed with, but, for my own part, having tried crates in three sections, I find the twins far preferable.

SECTIONS.

The one-piece sections wherein the new comb-honey is built are made in two forms, either with a bee space at top and bottom, or such spaces on all sides. In the latter case it is proposed to give free communication throughout the entire crate instead of through each row of sections only. The advantages of inter-communication are doubtful, while the section of comb is

certainly more difficult to handle, does not look so neat, and can not be so conveniently packed for market as the old style.



The widths in general use are—2 inches to be used with separators, or $1\frac{3}{4}$ inches without; each $4\frac{1}{4}$ inches by $4\frac{1}{4}$ inches, to hold 1 lb. of honey. Sections to hold 2 lbs. are not in demand, but those to contain about one-half pound may generally be disposed of: these should be $1\frac{1}{2}$ inches through, $4\frac{1}{4}$ inches deep and barely 3 inches wide. The Illustrations show my plan of inserting full sheets of foundation with saw cuts on three sides of the one-piece section.



Improved One-piece Sections.

Folding Sections.

By making a block to fit the inside of a section, fastening it horizontally to a table; the operation of folding can be carried through at a rapid rate, and one can always be certain of them coming true to square. With a lever and cramp motion to take the strain at two opposite corners, the tenons may be locked together as fast as the sections can be laid round the block. In dry weather these sections must first be damped at the V-cuts, or many will break.

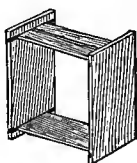
The one-piece section has now taken such a hold in general estimation that no other shape or style will ever supersede it; but where the apiarist has the time and convenience to make for his own use, my simple bee-space section will cost him even less than the other.

Simmins' Bee-space Sections.

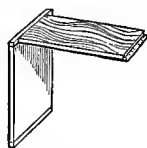
These were introduced some ten years since, and have been much appreciated wherever offered for sale. Glass was used for the top and bottom rails in the first instance, and the top rail was split to receive foundation.

The side bars are each $4\frac{1}{4}$ -inches long by $1\frac{3}{4}$ -inch wide, with a sawcut across each end, at $\frac{1}{4}$ -inch from the edge, into which the top and bottom rails ($1/16$ th inch thick), are fixed securely; these being $1\frac{1}{2}$ -inch wide and $4\frac{1}{8}$ inches (bare) long. For half-pounds the sides are $4\frac{1}{4}$ inches by $1\frac{1}{2}$ -inch, and the thin rails $1\frac{1}{4}$ -inch by $2\frac{3}{4}$ inches.

If the sections are required flat, the top and bottom rails must be a little thicker with a tongue and shoulder as shown by No. 2.



No. 1



No. 2.

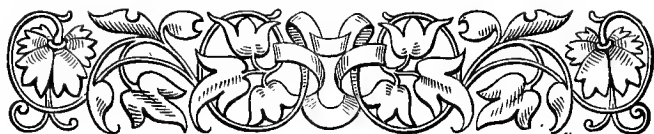
In that case the sawcut in the side bars will be only the thickness of the horizontal rails from each edge.

SEPARATORS

are made of either thin wood or tin, and are generally arranged to allow a space above and below them of not less than $3/16$ th inch from the upper and lower part of the sections. One, with slots, suggested by "Amateur Expert," who contributes to the *British Bee Journal*, and now manufactured by Mr. Blow, of Welwyn, is as here illustrated with slots to correspond with the side bee-spaces in sections.



Where there are no side spaces in the sections, the slots are dispensed with.



CHAPTER XI.

FOUNDATION.

I HAVE been using this word while some of my readers may not as yet known what the article is. The two or three frames illustrated, showing the same in the centre, will convey some idea as to its use. It is really pure beeswax, and the sheet is first obtained by dipping nicely planed pine boards into the hot wax, the plain sheet thus made is afterwards passed between rollers, which are so engraved as to give the wax the exact form and appearance of the natural mid-rib of all comb as the bees make it when left to their own devices, except that the comb foundation made by man gives the base of a more perfect, because more regular, comb than the insects produce. The foundation is gauged to the size of worker cells (five to the inch); therefore drone cells, and consequently drones, are excluded, while our combs are as flat as boards.

According to the thickness of the sheet required, whether for thin super foundation or for use in the stock frames, so many dips have to be made before the wax is peeled from the boards. Of these two or three sets are required on hand standing in water, to give time for cooling and saturation.

There are a number of machines in use such as the Pelham, Root, Dunham, Given, Van Deusen, &c. Of these the latter gives the most beautifully finished foundation I have seen, but being flat bottomed, the bees appear to waste much time in converting to the natural base; though it must be acknowledged that

in doing so comb is produced that has so thin a septum as to be equal to any all-natural comb. I have been very favourably impressed with the Pelham foundation, principally because there is no pressure on the side walls ; but I suppose this might be so with all machines if thinner sheets were used, so that the same need not receive sufficient pressure to be driven tight into the matrice, while the same thin base would be retained. There is no advantage in having high side walls in super foundation, as I find the same nearly always scraped off to the base before actual building is commenced by the bees.

Foundation in the brood chamber gives a great saving in time under some conditions, as hereafter noted, but there are times when it is an unnecessary expense, more especially when the bee-keeper has all the stock he requires, when he will become a producer of wax instead of a consumer of that article.

How to insert Foundation in Frames and Sections.

The original method, and the one still practised by Mr. Raitt, myself and others, is by melted wax run along the sheet of foundation on both sides where it meets the top bar. A board, 7 inches wide and 13 inches long, has screwed on the back two strips of $\frac{3}{4}$ -inch stuff, which project about an inch over. The two projections on one side I have arranged as shown with a wide-headed screw to each, enabling the gauge to be regulated to a nicety. When set upon the inverted frame it stands $\frac{1}{8}$ -inch off from the centre of the bar, thus providing for the thickness of the foundation that it may hang exactly in the centre. For

Melting the Wax,

use a common glue pot, with a small brush to dip in, allowing the drip to run down the angle, joining the foundation and frame securely. Remove the gauge-board while reversing and then wax the other side, with the frame always held at a slight incline, starting the wax at one end, and allowing so much that it will just run to the other end. Be careful that the wax is kept at an even

temperature, over a small paraffin stove ; if too hot it will weaken the sheet, and if too cool it will not hold the foundation in place.

Another Plan

is to have the top bar split nearly its whole length to receive the sheet of foundation, when two or three nails or screws are driven through, holding the two halves together with the impressed wax between. There is little economy in so weakening and disfiguring one's furniture permanently simply for this preliminary operation, while the open cut along the top of the bar is the very best harbour for the wax moth, as the covering over the frames adds still further protection to such crevices.

Still another step has been made towards complication in that a frame has been brought forward with both top and bottom bars split throughout their entire length ; thus we have six pieces to handle instead of four, for no apparent benefit whatever. In the first place it was considered that the foundation being simply inserted between the two halves, the latter upon being pressed together, would be held sufficiently tight in the dovetail working on the side bars at each end that the sheet could not fall. Already the usual nails are advised for fastening together the two sections of the top bar ; but it should have been evident in the first instance that while a sheet of wax would be held firmly, even if weighted while cold, as soon as placed in the heat of the hive with the bees clustering upon it, the whole would come down, unless the bars were secured at the centre where bulging would naturally occur.

As a matter of fact I have had no difficulty in getting combs built out perfectly true from foundation simply waxed to the top bars ; but the frames *must* be placed closer together, so that many bees do not cluster upon any one sheet. Through many apiarists failing at this point, foundation for brood frames has been made much too heavy, being only four or five sheets (standard) to the pound ; whereas I have no trouble in working full sheets at eight feet to the pound ; indeed ten feet to the pound have been frequently worked without sagging.

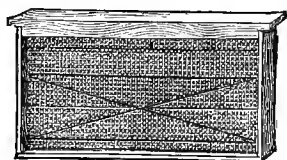
Where Swarms are Hived upon Foundation,

the frames should be spaced not more than $\frac{1}{4}$ -inch apart, with very light covering for the first few days, and a wide entrance.

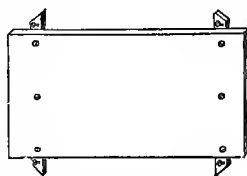
Those who desire extra tough combs and well-filled frames, will find the most satisfactory plan to be that of

Wiring the Frames.

This is done by piercing holes through the top and bottom of the frames about 2 inches apart to receive the wires, while another is run from side to side in the shape of the letter **V**. The parallel wires may run from side to side as the bottom rail is generally too weak to stand the strain, but in this case the sheet of wax must be secured to the top bar. Fine tinned wire is used for the



Wired Frame.



Foundation Guide.

purpose, and the starting point and finish should be at the same place where both ends are wound round a tack, which is then driven home holding all securely. See that all the wires are drawn tight; place the sheet of foundation on your block; the wired frame upon that, and now press the wires into the mid-rib. Various instruments are used for the purpose, but a

Simple Imbedder

can be made from a common nail filed up round at the point, with a slight indentation to run over the wire, which can be used at a rapid rate with a convenient handle. If the instrument is used cold the point must be frequently passed over a cloth saturated with oil.

Sections should be Filled

with new white combs if possible, and never with anything less

than full sheets of foundation. The former should be cut to go in tight ; the latter with about $\frac{1}{8}$ -inch to spare on two sides, and fastened by melted wax at the top and one side. For gauging to the centre, I use a block similar to that for large frames, but regulating screws are placed on each of the four projections, so that the same block will do for any width of section.

Another plan is to make a saw-cut in the one-piece section as shown, and when folded the foundation is readily inserted in such a manner that the most perfect combs are obtained, while for packing to travel long journeys, nothing can excel those worked in this manner.





CHAPTER XII.

HOW TO STOCK THE FRAME HIVE.

I HAVE shown the reader how to construct and furnish his hive, and will now explain the different methods employed for stocking the same.

The most simple way is to insert a swarm. Good swarms of native bees can generally be bought from a cottager in May for 10s. or 12s. each. They would, in that case, be brought home in a skep towards evening, when they may be shot out upon the frames spaced as already shown and provided with foundation, when a piece of ticking should be laid over them so as to not quite cover the whole surface of the hive when all will soon draw below. When they are quiet, arrange the quilt carefully and place on the cover, and give an entrance at least 6 inches wide. As the centre combs are built out and filled with eggs, part them and insert one or two of the outside frames of foundation in the centre of the cluster until eight or nine are well filled. By this time close the entrance to about $1\frac{1}{2}$ -inch, having previously added warmer material above, such as two or three thicknesses of carpet above the ticking, or a tray of chaff or cork dust 2 inches thick.

Best Time to Transfer.

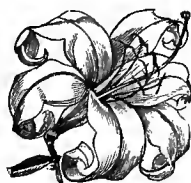
Where one has straw skeps he will desire to transfer his bees to the frame hive. This can be done in April to great advantage, as it is just then that the stimulation does most good, and excites the bees to extend the brood nest.

The bees are first to be removed from the skep by either of the methods before mentioned (pp. 17, 18), when the best combs are to be cut to the right size to fit exactly tight into the bar-frame ; all edges being cut quite square so that they go together well and can be more readily secured by the bees. Tie two or three pieces of $\frac{1}{4}$ -inch tape round the frames to keep all in place, and return the combs to the bees which may first be shot into the bar-frame hive. They will soon draw among the newly-transferred combs and clean up their house, where, after a day or two, one will hardly tell where the joints were. Close up with division boards, cover up warm, and keep the entrance not more than one inch wide until it is absolutely necessary to make it larger. Should the bees appear crowded with only the combs transferred, give a frame of foundation in the centre, and another as soon as they begin to cluster on the outside of the division board. Feed carefully so that there is always a little store in hand, but not enough to hinder the operations of the queen. Continue such stimulation until honey comes in.

It is so frequently recommended that the contents of fixed-comb hives should be transferred twenty-one days after swarming, that I consider it advisable to show that this waste of time is quite unnecessary. The swarm should be hived upon six or seven sheets of foundation close to the parent colony and facing the same way. Within ten days the young queens will be hatching out when a cast or second swarm would issue. This appears to have been overlooked ; therefore I advise transferring on the seventh day after the issue of the first swarm, first carefully removing one of the queen cells before drumming on the hive. While shifting the combs remove all the other royal cells, and after the operation return the one previously removed, which meanwhile should have been placed above the first swarm between the quilting to prevent chill. As soon as the young queen is laying freely, destroy the other and unite (p. 19) the two colonies on the second evening following, when supers may be at once put on.

It is better that transferring operations be carried out in some

warm room, or manipulating house, first laying a sheet of paper on the table whereon the tapes are to be arranged, with the frames on those, so that all is in readiness for tying as soon as the combs are fitted. While it is not absolutely necessary that the combs be fitted in just the same way up as they were built, it is not desirable to have them inverted, but to save material it is often advisable to put them in on end, or half inverted, as I have done for many years past. Certainly there is the brood to handle if transferred before the twenty-one days have expired, but with ordinary care this is not damaged, except where the knife cuts a straight line, and that is far preferable to having the combs full of honey.





CHAPTER XIII.

GENERAL MANAGEMENT.

WHILE it is my intention to go through twelve months' management, I shall begin with the

AUTUMN,

as everything depends upon proper treatment at this period.

If the apiarist keeps only young queens he will have no need to stimulate the hive for the production of young bees at this time ; while the *only reliable stimulation* for early spring breeding is secured by correct autumn preparation. If any colony has not sufficient food to last till the following April, give all it wants rapidly before the end of September. Among novices there is much uncertainty as to the quantity required to store a colony for winter, but not less than six square feet of sealed comb (including both sides) should be provided ; if more, so much the better. (See Feeders and Feeding.)

Unite Stocks of doubtful Strength.

As mentioned elsewhere, all weak colonies must be united before feeding takes place ; and not simply weak lots, but others about which there is the slightest doubt as to them coming through all right. The reader will ask : " How are those others constituted about which there can be any doubt, other than really weak stocks ? " In the first place I should say those which have old, or otherwise unsatisfactory queens ; those which through any oversight may

have been without a laying queen for a few weeks during summer ; as well as those which may be short of stores. It will be found impossible to alternate the combs with ten or eleven-frame hives where they are populous, and in that case place the whole hive upon another near to it ; or if a little too far apart, bring each hive half-way ; and in all cases of uniting, place a wide board from the ground to the flight board, not only to attract the flying bees, but also that both lots may be aware of a strange location ; and so have no inclination to fight. (Refer to Uniting, p. 19.)

So far as food and strength are concerned, we are now ready for

WINTER,

and the next thing to be considered is whether or not more warmth, in the shape of packing is required. Mr. Raitt says that the best packing for bees in winter is "bees," and I quite agree with him ; in fact I use nothing more about my hives than they have had all the summer, and at all times consider that the most vital point is the top of the hive, where they are always covered with warm material, such as chaff, or cork-packed trays, pieces of carpet, or sacking.

It is not important whether there are chaff-packed dummies on the outsides of the brood nest, or not ; though of the two I give the preference to old tough combs.

Position of Frames.

All hives should stand so that the frames are "end on" to the south wall, that every seam of bees is warmed up during a gleam of winter sunshine, enabling them to change their position and take food, while bringing stores nearer the cluster. Bees will winter all right if so situated and in good heart, but where placed behind thick walls, they are subject to a continued low temperature, as the mid-winter sun does not penetrate to the cluster. There is no warmth in double walls at this time, just when it is most required, though of course I admit that they are a benefit as soon as the cluster expands, retaining the heat given out by the bees.

Mr. Abbott when editor of the *British Bee Journal* was quite aware of the immense advantage of admitting the sun's rays during winter, and recommended that a piece of glass be let into the outer wall of double-sided hives. However, double-walled hives do not pay for the extra expense as compared with single walls, and besides being more cumbersome, are a positive nuisance during the heat of summer, when shade only is required, rather than additional heat. For as a matter of fact packed walls cannot be cool in summer, as the advocates of the same would have us believe. Why the more frequent swarming complained of with these? and are we not told that more warmth is given in winter? how much more then, in excess, in summer?

One thing of the utmost importance to which I have often had occasion to call attention, is the

Space below the Frames.

The regulation distance of $\frac{3}{8}$ -inch is certainly allowed between the bottom rail of the frame and the floor of the hive when first made, but this is not enough as the exposure causes the side walls to shrink fully one-fourth of an inch. This is quite inconvenient and disagreeable in replacing frames, as well as where hives are tiered up; and though $\frac{5}{8}$ inch clear may not work quite well between upper stories at first, it will soon come right by shrinkage when anything like 9-inch stuff is used, though it may be considered that the wood has been already well seasoned. Now the $\frac{3}{8}$ -inch space is not sufficient for winter, and where a lower rim cannot be added to the hive, a circular hole should be cut in the centre of the floor board, about 2 inches in diameter, which will greatly assist ventilation, while providing the inmates with a ready means for disposing of their refuse, dead bees, &c. Failing either of the foregoing, the frames can be raised by placing $\frac{3}{4}$ -inch strips under the projecting ears.

Dysentery and other ills are brought on by the too common neglect of this matter: dead bees drop to the floor and clog the too shallow space under the frames, then getting into a mass ventilation is impeded, and when a fine day does occur the bees have enough to do to find the entrance while the dead and

rubbish remain untouched, only to be added to during the next cold spell. Insufficient ventilation and foul matter now begin to tell upon the constitution of the population, and there is little chance that the stock will ever be of much use unless it has immediate attention, as many of the bees are now unable to fly when warm days do offer them a chance ; particularly is this the case where the frames run across the entrance with double walls. With single walls and the frames end on to the entrance the bees are not so liable to be blocked in.

Covering above Frames.

Much uncertainty exists among novices as to whether the frames should be covered with porous or non-porous material ; but, dear Reader, it is just this : if you use porous material above your winter cluster, an entrance not more than three inches in width should be allowed ; if a non-porous covering such as American oilcloth be used next above the frames (of course with warm material above that), then a wider entrance must be provided according to the strength of the colony.

Again, where the form of hive will allow it, I have found the

Most Perfect System of giving Winter Ventilation

to be as follows. Place the combs to one end farthest from the entrance ; there may or may not be a dummy on that side nearest the vacant space, but such dummy must not touch the hive side, and will hang as an ordinary frame ; for my own use I prefer no dummy. Cover the frames with non-porous cloth as usual, but allow clear communication from the entrance to the roof, which is of course ventilated. Thus we have no draught *through* the brood nest, but a thorough ventilation in front of the same, with a certain change of air for the occupants of the hive.

As an instance, I have put up driven bees in Autumn on standard frames of empty combs ; closed up with chaff-packed dummies ; a medium entrance, and warm porous covering on top, with no direct through ventilation. They were fed carefully and

had young queens. Others were made up on large frames (14 inches by 14 inches) of comb, same strength, and same food, but the combs were placed to one end of hives where the wall was only $\frac{1}{2}$ -inch thick; at the opposite side nothing protected the comb, where was a large unoccupied space, with three 2-inch holes in the side wall, and one in the centre of the floor. Communication was quite open to the roof where was ten times the space generally allowed for ventilating; the frames were covered with porous material, and yet with all this extra ventilation and no dummies, these stocks came out 5 to 1 better than those prepared as usual on Standard frames.

Where bees are wintered on Standard frames in long hives, whether the brood nest is placed at the back or front of the hive, the dummy next the open space must stand clear of the side walls just as the frame does. Those who have followed the advice sometimes given, to the effect that such dummy must be tight fitting and have an entrance of only two inches or less cut out of the bottom edge, will have reason to appreciate the loose fitting board.

When keeping bees in a loft, Mr. Cowan, the present editor of the *British Bee Journal*, raised the crown board of his hives with small pieces of wood such as match ends, as well as giving the same space between the floor and body of the hive. Perfect ventilation was in this manner secured without draught, being in a large closed space; but the same plan could not be thought of with hives standing in the open.

Really there is nothing to be done to the bees during the winter months, and all the foregoing provisions have to be settled before the cold weather arrives. Cold, with judicious ventilation, and clear space under the frames; a good cover, plenty of stores, and stocks in good heart, can do no harm.

SPRING.

About the 21st of December the queens will begin to deposit eggs; in due time the young will hatch out, and slowly the brood nest is enlarged, until by the time the older bees begin foraging,

the consequent heavy losses are fully compensated by those brought to life while outside all appeared quiet.

The production of young bees at this early date is not always without intermission ; cold in itself never hinders it, as the brood is at the very heart of the cluster, but if unable to obtain water for many days together brood-rearing ceases, only to be renewed as soon as the workers can get abroad. Pollen is as a rule always present in well-stored stock combs, and when this comes in freely, all fresh from the fields, the brood nest is rapidly extended. Now is the time to see that the bees have more than sufficient food to keep them going. With a good queen it can hardly happen that the combs will be too heavily charged with honey at this season, but by taking the outside combs, one at a time, and inserting them in the centre of the brood nest after the cappings are first bruised, great progress will be made. One such comb as yet at an interval of seven or ten days as needed will keep the bees and queen busy, and by May 1st the whole ten or more combs will be one mass of brood, and the hive so crowded with bees that another set of combs will be required *below* the stock hive. If one has no combs on hand, then use sheets of foundation, alternating them with the combs of brood throughout both stories, and see that the older brood goes below, with the pollen combs near the outside. Now proceed as explained for extracted honey, but if comb be desired let the lower storey have starters only in the frames. In any case feed from "hand to mouth," until honey comes in freely, as such a large population is liable to be rendered perfectly useless by the loss of the brood, by the slightest neglect at this time.

SUMMER

treatment will consist in management of the surplus receptacles, for comb and extracted (or liquid) honey ; and as these subjects require careful consideration, separate chapters will be found devoted to such management.

Queen raising also, and increase by natural swarming, as well as by division, are given in due order.



CHAPTER XIV.

SIMMINS' NON-SWARMING SYSTEM.

THIS System of Management was first made public by the issue of my Pamphlet on the subject in February, 1886. In the same work I claim that "*No colony in normal condition attempts to swarm unless it has all its brood combs completed;*" and, further: "To reduce the matter to a greater certainty, while admitting that bees may sometimes swarm if such open space and incomplete *brood* combs happen to be situated at the back, or the point farthest from the entrance, the author *insists that the open space and unfinished STOCK combs shall always be at the front, or adjoining the entrance.*" That is, at the front where long hives are used; or between (and under) the brood nest and the entrance where hives are tiered one above the other.

The idea had been long fixed in the minds of bee-keepers that unless the bees were crowded into the supers nothing would induce them to work there. On the contrary, however, I have had them storing freely in several sets of supers, while at the same time they had eleven empty "standard" frames immediately below the brood nest, with free communication between.

But an important item in the new management consists in supplying every section with fully-worked combs, so that the bees are induced to store above rather than build to any extent either in front or below as the case may be, where frames with $\frac{1}{4}$ -inch starters only are placed.

If through any inattention to the supers, or a sudden influx of honey, the bees have no room above, no time is lost, and they

can go on building below. Nevertheless, these frames with starters must never be allowed to have finished combs, and should any be nearing completion they are to be cut out to be used in the sections, first extracting the honey if any, and exposing for two or three days those which may contain eggs, that they may be removed by the bees when such combs are returned.

Let it be borne in mind, however, that

The True Principle of Management

consists in so manipulating the supers that none of the frames with starters have finished combs all the season.

The space below and in front of the brood nest gives ample ventilation, keeping the hive cool; and the combs never being completed the desire for swarming does not exist.

As will be seen the system is particularly applicable to the production of comb-honey, and without doubt is the only process that will prevent the issue of swarms while producing that article. At the same time it makes a greater certainty of prevention while working for extracted honey, though generally in getting the latter article stored no swarming would occur, as there is no object in having the combs well finished, and unlimited room can be given.

This is the first time the long-vexed question of prevention has been reduced to systematic management; but, as usual with anything new, there are not wanting those who claim that there is nothing original in it. The editor of the *British Bee Journal* endeavoured to prove that it had been in use many years since, and that the Stewarton Hive was worked upon the same principle; and while attempting to show how to produce comb-honey without swarming, I find he could not tell how to work *entirely* for that article with any given colony; but only that a limited quantity could be obtained while at the same time using many combs under the sections as and for extracted honey—a most unsatisfactory process, by which not one in a hundred bee-keepers would obtain a dozen finished sections, unless my plan of filling the same with worked-out comb is adopted.

Bee-keepers generally have saved unfinished combs over from year to year, and these were found to give a good start to the bees, but nothing was done to institute the systematic production of such new white combs for all sections before being placed on the hive until the present system was inaugurated.

All that has ever been given as to the manipulation of the Stewarton Hive relates chiefly to the insertion of several swarms into the set of boxes. This does not look like prevention, and moreover, whether with swarms or established stocks the principle did not consist in keeping the same or any empty chamber *always* below the brood nest. In hives 3 feet long it is claimed that in America the plan was tried twenty years since. The bees in this case working from back to front all on the same level. Here the combs were removed *as completed* at the front.

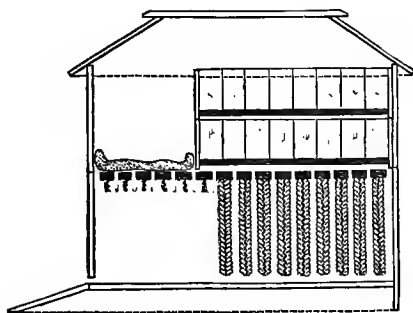


Fig. 1.

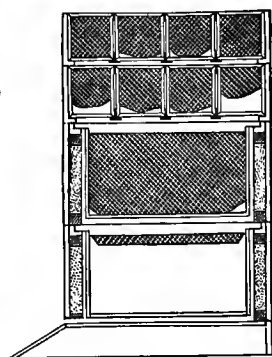


Fig. 2.

Just here the Reader will not fail to see the difference—a contrast decidedly in favour of my own plan, which is this: The surplus is worked and continually removed from *above*, while no attention is needed below or in front of the brood combs; as in the first place no combs are there permitted to become completed, and the same frames remain in the same place all the season, because with careful attention above little or no comb is built in them, as my own experience has shown.

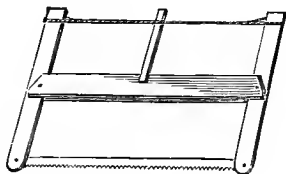
While many consider that they have no need to prevent the issue of swarms and can obtain better results by allowing one swarm to each colony, there are many districts where the season is of short duration, and the largest surplus is only obtained by prevention. The system, moreover, should be of advantage to all, enabling increase to be made at the most fitting opportunity; and not, as is too often the case, just as a good honey-flow is on.

My non-swarmer system is here illustrated for the better guidance of the reader. Fig. 1 represents the manner of proceeding where long hives are used, with the empty frames arranged on the same floor, between the brood nest and entrance. Fig. 2 shows the plan adopted when tiering up, with the lower hive having empty frames. Both sectional views exhibit two crates of sections above the brood nest.

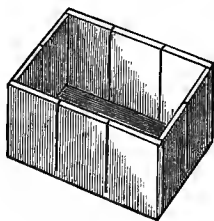
The Worked-out Combs for Sections

are obtained in several ways, using foundation 8 or 9 feet to the pound, having a very thin base; otherwise, an objectionable mid-rib will be found in the centre of the combs.

A large number of combs can be obtained early in the season by inserting full sheets of such foundation in the centre of the brood nest in the afternoon of one day and removing them the next morning, thus avoiding pollen. The combs, when cooled,



Home-made frame-saw.



Box for cutting comb to gauge.

are then cut up at a wholesale rate, with a fine frame saw, using a box gauged with saw-cuts to make each piece exactly the right size to fit tightly in the section. The same gauge will also do for foundation, the saw being superior to knives or wire.

As the honey season approaches and colonies are getting strong, the foundation can be worked out on a much larger scale. Take a strong colony which is being fed with a dry-feeding dummy on each side of the brood nest ; lift these feeders into an upper storey with the bees crowding in them ; let full feeders take their place below and fill up the upper chamber with frames having full sheets of foundation, such frames standing not more than $\frac{1}{4}$ -inch apart. With a good colony most of these will be drawn out within forty-eight hours, and a fresh set may be inserted.

Though the foregoing will give the earliest and larger number of combs ready for the sections, there is a little extra trouble in cutting them up, which may be considered objectionable ; but then one has the opportunity of placing such combs in the rack so that they may be bleached and produce the whitest of honey comb.

The foundation may be inserted at once in the sections, when with long hives from six to nine may be placed in the usual stock frame and inserted at the centre of the brood nest. In warm weather these will be drawn out in about twenty-four hours, when another set should be inserted. With smaller hives tiered one above the other, one must wait till the first honey glut ; and as mentioned in my *Non-Swarming Pamphlet*, crowd the brood-chamber, place on a crate of sections, and keep them well covered up. In twenty-four hours the foundation will be built out, when another set is to be placed between the crate first arranged and the brood-chamber. Within the same space of time another crate can be placed under the other two ; but the upper one should now be removed, and the vacant space allowed below the brood-chamber to prevent swarming. As soon as it is found the bees will not work out fresh sets next above the brood frames, such removed crate of worked combs will prove of great advantage, taking the place of a completed set that may be taken off.





CHAPTER XV.

THE PRODUCTION OF HONEY.

THE system hereafter to be described will be based upon the non-swarming principle just explained ; the Reader will therefore understand that though not always expressed it is understood that the vacant space, having only empty frames, is to be provided either below or in front of the brood nest, according to the style of hive in use.

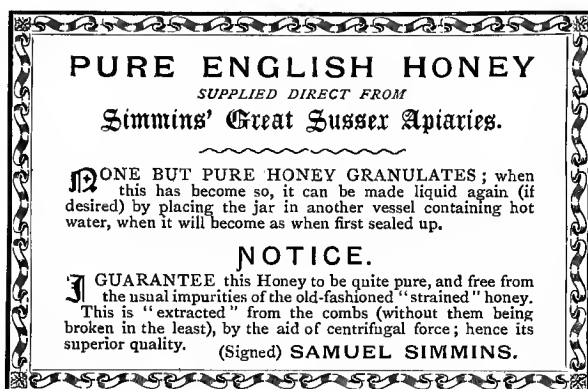
EXTRACTED HONEY

is that which is removed from the combs by centrifugal force, without breaking them up ; while the liquid is consequently clear, and of far superior quality to that which by old-fashioned methods was obtained by straining the whole mass of honey, pollen, comb and larvæ, through a cloth.

A common practice is to remove the honey before the cells are capped over, and large weights of such "green stuff" are often boasted of. As a matter of fact, however, such honey never equals that left in the upper tiers until thoroughly "ripened" by the heat and perfect ventilation of the hive. When the combs are at least two-thirds sealed extraction may commence, when generally an article of good consistency will be procured.

In the process of ripening, this green honey loses considerable weight by evaporation of the excess of water, and being passed over a series of heated plates, its quality is inferior in every respect, as both the colour and usual characteristic aroma of honey is impaired. The sooner bee-keepers give up these honey-ripening fads the better it will be for themselves and their customers ; the best article only is that which will create a demand.

The word "extracted" has been objected to in the *American Bee Journal* as being inappropriate, and that the consumer does not understand it. Nevertheless the term will stand as long as the extractor endures ; and if the public mind is likely to be impressed with the idea that "extract of honey" is being offered, all the apiarist has to do is to show on his labels *why* it is called "Extracted" honey, and in what manner it is removed from the



combs ; as seen by a copy of my own label used for several years past, which has brought a demand for my own grade in preference to that of others. The word "liquid" is certainly out of place, as our commodity is not always in that form, while the honey is liquid in our beautiful sections.

Bottled Honey.

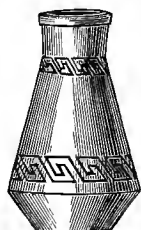
In glass the only wholesale demand is for 1-lb. jars. The most popular kind is the jelly glass, and being in such demand the manufacturers are of course enabled to place them at a lower figure than any other kind can be produced. They are neat, elegant, and with a nice label, most attractive ; costing 10s. 6d. per gross ; with corks, 12s. 6d. ; so that including carriage, bottling, &c., the total cost is a little over 1d. each. Half and quarter-pounds can also be retailed at home, but are useless to the trade.

The bottles illustrated are especially suited for honey. No. 1 makes a good exhibition bottle; 2, the Greek design jelly glass; 3, a bottle very much appreciated by customers generally. These are manufactured by "Breffits," 83, Upper Thames Street, London.

For bottling, the honey must be particularly clear; and whatever shade of colour it may have, it should be bright and in all cases as before stated of such a consistency that it "piles" up well when drawn off.



No. 1.



No. 2.



No. 3.

Fill all bottles as evenly as possible and cork up at once, driving the latter home with a mallet, while holding the bottle in the left hand clear of any bench or shelf. Having filled your bottles of course they need some finish, and for capping the whole nothing is more simple and inexpensive than

Sealing Wax;

but this article must be made at home. Procure common yellow resin and heat it above a small oil stove in an earthenware vessel, or if preferred a large glue pot. Use one part of beeswax to three of the other to toughen it and make it hold to the glass. Now an important item is the

Colour

of the sealing wax. A *bright* colour will contrast well against the contents of the bottle, and the colouring matters used in common paint answer every purpose. Stir all thoroughly to get an even mixture, but at no time let the wax boil.

To Wax the Bottles

invert them with the cork and upper surface of the bottle just hidden in the heated substance for a moment. The operation can be rapidly carried out, and in lifting the bottles, give one or two turns that no bead of wax may run down the side. Now all is ready for the label, which must be of such a character as to contrast favourably with the contents.

Canned Honey.

With prices much lower, as they will have to be to create a general and increasing demand, honey in tins is becoming popular. Two, three, and six pounds seem to be mostly in demand, and at reasonable rates large quantities of good honey can thus be disposed of. Colour is not of so much importance, and when granulated this is a good way to dispose of our produce ; but the article must be thoroughly ripened, and of good flavour. The most elaborate label that can be obtained is required to make tins attractive.

Bee-keepers frequently complain that they cannot dispose of their honey ; but if they only take the trouble to work their own neighbourhood at a *selling price* they will be surprised to find that instead of producing more than can be disposed of, they will be unable to supply the demand. Honey has to compete with many other articles, themselves much reduced in value in these "cheap times," and supply and demand must regulate the price. Only recently I have been offered honey in considerable quantities at rates higher than what I could myself obtain ten years ago ; but sooner or later bee-keepers will find they will have to keep pace with the times, or give up.

Having shown how to prepare and market extracted honey, we have yet to consider the best means of obtaining it. First we must

Provide for Extracting

by arranging our hives in the best manner for its production. A good stock of worked-out combs are invaluable for this purpose, as we desire to give the bees plenty of storage room.

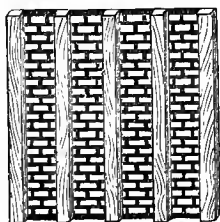
A Modern Bee-Farm

Those hives only are suitable for extracting purposes which admit of tiering up one above the other. Such chambers may all be of the "Standard" pattern; though with the stock hive only having the standard frames, and that surmounted by successive stories of shallow frames would be better. In either case use the empty chamber below, which will to some extent prevent the queen ascending higher than the brood nest proper.

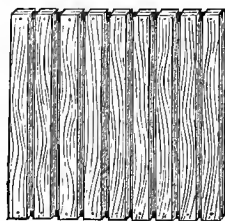
Perforated zinc is frequently recommended to keep the queen down, having apertures $\frac{5}{8}$ -inch wide which presumably admit neither queen nor drones. Where a recess is allowed above the frames the

Pliable Excluder,

as illustrated, can be used if desired with the slats across the frames. The plain slatted and also pliable adapter will be found more satisfactory for totally excluding brace-combs, these slats also being placed across and close upon the top bars of the frames.



Pliable Queen Excluder.



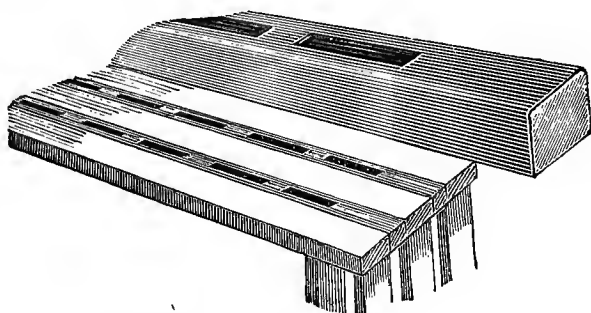
Plain Slatted Adapter.

The deep frames (14 inch by 14 inch) will rarely be left by the queen, and with the shallow extracting super, with its frames placed at right angles to those below, no adapter is needed.

With the large hive, the stock chamber will be reduced to five brood combs, having three or four frames with starters between the same and the entrance. All combs arranged for extracting should stand at a set distance apart all the time, as the combs will then be finished off evenly, thus making the uncapping process more rapid. Shallow combs are filled better than deep ones, and where standard combs are used, it will pay to get them worked between dividers.

Metal ends are used where frames are spaced at set distances, but none such are in use for extracting purposes, as then the frames should be farther apart—about $\frac{1}{4}$ -inch more than usual.

Where there is any difficulty in restraining the queen, as where all shallow, or all standard frames may be used ; if the queen excluder is objectionable, then place all succeeding sets of combs *below* the brood nest as recommended in Non-Swarming pamphlet.



The illustration shows Mr. Howard's new excluder, which can be inserted between the frame bars, thus spacing the frames at the same time, and being adapted to few or many frames.

Spare Combs

for extracting may be obtained early in the season by inducing the bees to build out foundation (wired or otherwise), inserted in the brood nest ; or later above it, as explained for drawing out thin foundation. The combs will be tougher, and a larger population will be obtained if such new combs remain in the hive for breeding purposes, while the outside old combs can be removed for storage.

With plenty of store combs and the "safety valve" below, the bees cannot well be idle if there is anything to be gathered. A common practice is to lift the upper storey and place another under.

When removing completed sets, let it be done during the busy hours of the day, when what few bees are in will soon leave if piled up in a room with large windows arranged as explained under Bee-houses. Another way is to shake the bees from

the combs, using a feather for the stragglers; and still another, with shallow frames when fixed securely, is that first adapted to modern hives by James Heddon, of Dowagiac, Mich., who had not the slightest knowledge that his "shaking out" process, had been long practised in this country with fixed combs, where we call it "throwing."

Empty sets of combs must be in readiness to give the bees where more room may be required, and when full combs have been emptied, they should always be returned in the evening, that all may be cleared up, and the consequent excitement subsided before another day's work commences.

Well, we have our stored combs in the outer honey house, and now they must go forward into the extracting room, having been cleared of bees.

We must first be sure that our

Extracting Machine

is quite clean, and that it has been firmly secured in a convenient place, high enough that the honey may be run off into another large cylinder or tank, which again must have a treacle valve at a convenient height for drawing off. The strainer must cover the entire mouth of the tank, and be placed directly under the valve of the extractor. We now require an

Uncapping Can

which is to be in two sections; the upper part to receive the cappings, with a strainer at bottom and one or more bars of wood across the top whereon to stand the comb, while with the

Uncapping Knife,

resting one end of the comb on the bars, and the upper end held by the projecting ear in the left hand, with the top bar towards you, with a slightly diagonal and sawing motion carry the knife from top to bottom, removing not only the cappings but all comb that may project beyond the plane of the frame; reverse, and serve the



opposite side in like manner, when the comb is to be inserted in one of the cages of the extractor with the top bar standing in a direction opposite to that in which the revolutions are to be made ; as the cells inclining towards the top bar the honey leaves more readily. Now, unless the

Rate of Speed

be carefully regulated, the operator is liable to break his combs, and thus render them difficult to handle ; but by turning slowly while emptying the first side the great weight of the other will not force the combs into the wire netting. Now reverse all combs, at first turning slowly, but gradually increasing the speed, until you may set the machine going as fast as it can be made to revolve, as you have already removed the bulk from the opposite sides, though at a slow pace. When at full speed, slip off the multiplying gear if on the horizontal pattern, when a great many revolutions will be made while you can go on uncapping. The combs should again be reversed, and the sides first done are to be rapidly turned round in the same way. In this manner no combs are damaged, while every drop of honey is obtained ; and *most of the revolutions take place while the next set of combs are being uncapped.*

Away ! then, with the idea of again using simple motion that is creeping in, being recommended under some false notions of economy. In these days of competition we cannot afford to "creep" along at a snail's pace, and if we can do double the work in a given time better and cleaner than the "slow-coach" method, surely we are threefold the gainers.

Combs containing Brood

can be extracted from only in warm weather, when the speed required for the first side of heavy combs to prevent them breaking must not at any time be exceeded. With care, none of the larvæ will be displaced, and here again the multiplying gear will give the more even motion.

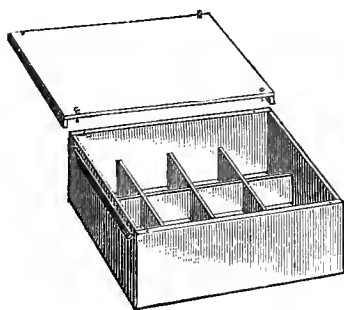
Storage.

Our honey is running through the strainer, and presently the tank will be full ; when it will be necessary to draw off and again strain into other receptacles, all of which must be convenient for filling smaller vessels as needed. In lieu of lids the storage tanks must be covered with cloths carefully secured, when the honey will be more perfectly ripened, and after a few days it can be drawn off and will be remarkably clear, with the exception of two or three inches of the upper surface, which may be again strained and placed with other surface honey. I have found no harm resulting from honey being stored in galvanized vessels, but where it may be required to stay for a considerable time, tanks should be of tin, though more expensive.

The produce of an apiary varies considerably in colour according to the plant it may be collected from, and each kind must be extracted and stored separately, as the different grades have varying values ; while one kind may granulate more rapidly than another, and if all were mixed together the entire mass would soon follow the action of the smaller proportion.

To prevent Granulation,

it is recommended that honey be heated to 190 degs. Fahr., and then corked up ; nevertheless some kinds will granulate in spite of this.



Bottle Crate.

Crates

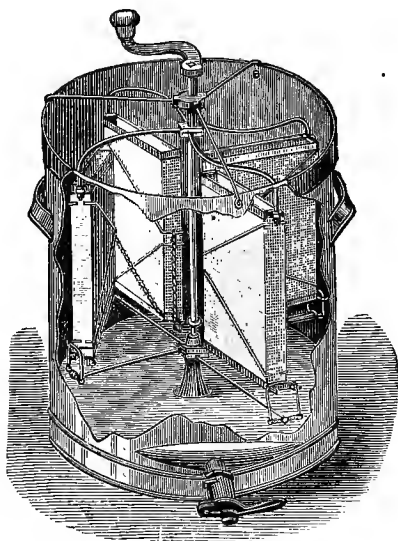
for bottles should be made to hold either one or three dozen, the latter being most useful, as being the extent of the more frequent order. The divisions are best made of thin wood crossing and halved together, to form square recesses to take the bottles just tight.

For tins little is needed except a plain strong box of the right depth to take a 6 lb., two 3 lbs., or three 2 lbs.; all of which must be of the same diameter, a point too often overlooked, but an advantage appreciated when packing a large number, and being able to use one-sized crate for all.

Extractors.

The machine illustrated is of American make (Stanley's Automatic), in which the comb baskets are shown to swing either way as required for emptying the reverse sides of the combs without removing them each time. The illustration is selected as presenting the unin-
itiated with a good idea of the manner in which extractors are made. The advertiser claims that it is the only one of the kind in the world; but it is a matter of fact that Mr. T. W. Cowan was the inventor of the principle many years before the above was brought out; his "Automatic" having gained many honours.

However, there appears to be some objection made to these, as the parts are liable to get out of order, and many bee-keepers prefer the old style where the combs have to be lifted out each time they are reversed.



Stanley's Automatic Extractor.

Mr. W. P. Meadows, of Syston, has introduced a very important improvement in extractors. As shown by the accompanying illustration, the wire cage against which the comb rests is itself backed by a sheet of tin; the two being firmly fastened together, with an intervening space. The cage is made incapable of bulging by strips of tin secured to the back at right angles to the same, and running from top to bottom; thus permitting of a higher rate of speed without danger of breaking the combs. The extractor requires multiplying gear to make it more perfect.



Exhibition.

Extracted honey for show purposes must be bright and transparent, enclosed in a bottle having a screw cap, that the contents may be readily reached. The glass must be of the finest quality and the jar as narrow as possible.

Messrs. Abbott, of Southall, provide a very neat glass as illustrated, designed especially for exhibition purposes. The jar already mentioned, in 1 lb. and $\frac{1}{2}$ lb. sizes, will also be found very suitable.



COMB-HONEY.

So far many more people have gone in for producing this article than that in the liquid form; consequently the price

has gone down considerably during the past seven years. It has fallen something like 6d. to 7d. per pound whereas the other has come down about 2d. It is time therefore that extracted honey had more attention if only to place comb at a better paying rate, as it is really much too low at present. Supply and demand however must regulate the price, and it is no use bee-keepers asking as much now as they obtained when the article was scarce, as wholesale and retail dealers alike are quite powerless to alter the state of the market.

The greater trouble, however, is that all the small producers throw their comb-honey upon the market at the start, and thus a false impression is made, and prices rule low, accordingly, though the probability is that the total out-put may be under the average.

Sections

have already been noticed in their various forms; and the kind one intends to adopt should be on hand before April 1st, when the foundation can be inserted during that month; that all may be in readiness, as a flow of honey is liable to occur any time after May 1st, or even earlier. In

Preparing Stocks for Comb-Honey

it has been shown under General Management that the brood nest should not be increased beyond the capacity of a ten or eleven-frame chamber. The hive may appear overcrowded, but while you are waiting for the honey flow, put on an upper storey and work out foundation, feeding as elsewhere shown, for inserting in the sections. It may be asked

Why the Brood Nest should not be Extended

at this time? As a matter of fact having already a complete brood nest, every day passing without an extension *adds a balance of power to the future working force* of the hive. Extend the brood nest and you not only require a large proportion of the stores to feed the young, but a larger number of the population is required to attend to the enlarged nursery instead of adding to the stores.

It should be distinctly understood that it is not always the larger population which gives the heaviest surplus, as it is possible for the hive of medium strength to send out a much larger gathering force. These are delicate points which require careful consideration but which are too often overlooked.

In this connection it may be mentioned that more often than not valuable queens of any prolific race are inserted at a time it is desirable an excess of brood should not be produced. A black queen, or any one that has bred heavily during the early part of the season is removed from a stock that is gathering abundantly and even crowding her out. The young queen is inserted and this being her first chance to enjoy her occupation, the stores rapidly give place to brood. The owner soon comes to the decision that the queen is too prolific and that her bees do nothing ; and yet the fault is simply his own. That the same bees will gather honey as well or better than his original stock, he can at once prove for himself by simply removing the brood and giving empty combs, when he will in a short space of time see these combs as heavy with honey as the others were with brood (*see page 44, on proper times for Queens to breed heavily.*) Well, the

First Honey Flow

is upon us ; weather steady, and temperature from 70° to 80° in the shade, with plenty of forage in all directions. Our sections are all ready on the hives, providing not less than 40 lbs. capacity with combs all drawn out ; or 20 lbs. to start with if only foundation is given, or with weaker colonies.

We are now in full working order and in looking around we find, here a hive and there another which require more surplus room, or the bees will be at work below the brood nest. Where any crates are completed remove them, inserting a fresh set in place of each. If foundation has to be used let that go next above the brood frames ; and combed sections if on hand are to be placed above those already on the hive. Great care must be taken to reduce the super-space towards the end of the season.

Remove Sections

during the working hours of the day, when a few puffs of smoke will generally send all the bees below. If this fails, remove the combs one at a time and brush the bees off with a feather, first giving the section a shake; but the operation must be rapidly carried out, because as soon as once frightened they will commence to tear open the beautifully capped cells, and it will therefore be seen that the sooner they are out the better.

Grading.

When brought in doors every comb must be looked over, while at the same time all propolis or other stains are to be scraped off, taking care not to injure the face of the combs. All the whitest and best finished are to be first selected and stored in crates piled one over the other, with ventilation right through the whole tier. The next in order are those which, while being well finished, are not of such good colour. These are to be piled up fully exposed to the light and air for a time, when the colour will be equal to the first with which they may then be classed. If placed in crates for bleaching, the latter must stand singly or on end, so that the light may penetrate. A piece of strainer cloth or wire netting must take the place of the usual lid meanwhile, that there may be a free circulation of air.

What will constitute the second grade will be all that are not nicely finished, though there must not be too many incomplete cells. Those that are a little discolored can be restored as before. Any that cannot come in as second-rate must have their contents extracted and the combs stored for future use; first making sure that no moisture remains about them by placing a number over any strong stock towards evening, when the bees will soon clean them.

The Store Room

should be perfectly dry, thoroughly ventilated, having a concrete floor, and all so carefully arranged that neither mice, bees, nor other

insects can gain admission. (For further particulars see Bee-houses, &c.)

Preparing for Market.

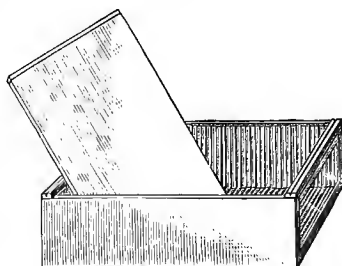
Crates can be made to hold anything from one to three dozen, the latter being mostly required. There should be glass on each side parallel with the face of the combs, not only to make the package more attractive, but as the greatest safeguard against rough handling. As an additional protection against friction, the sides and bottoms should be lined with patent corrugated paper, when there will be little fear of breakages.

Though more expensive, the crate may be placed on a false bottom with coiled springs, of a power necessary to resist the weight that may be placed above.

Sections should be enclosed in clean white paper, pasted securely where overlapping, when if any breakage does occur, the contents of the damaged one will not escape and spoil others.

The above should be done with each section, whether fancy boxes are used or not, but while the latter additional expense may do if retailed at home, it will certainly not pay at wholesale. I have obtained as much for sections without as others were getting with fancy boxes, in the same town ; one should therefore be very careful before adding this expense to his commodity.

Section holders introduced by Mr. Woodleigh have been used largely, and will no doubt be more appreciated in the future. They are made of tin, folding somewhat like the American section, and will be found very durable, as, if soiled, they can be readily cleaned. They can be had in several colours, and though expensive in the first instance, that is not a serious consideration, seeing they can be used many times without injury.



Comb Honey Crate, padded with corrugated paper.

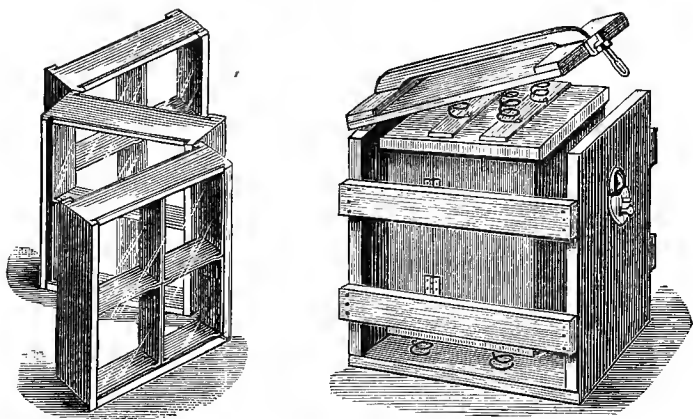
Selling Honey.

Where the apiarist retails his own honey; of course he will always have his own label on it ; something as neat and attractive as possible. It is surprising what a number of bee-keepers there are who will send from 100 to 500 lbs. of honey to a distant town at a very much lower rate than could be obtained at retail near home, if only a little perseverance were used. This shows a great want of business tact, in thus depriving themselves and injuring producers at large by reducing the value of their crop.

In securing some efficient tradesman to handle honey, where one has a large quantity, some difficulty will be experienced at times, as there are many who will not put it forward. If a grocer himself owns bees, *his* honey is very soon passed over the counter ; and why not that of others where the grocer is not following the pursuit? Perhaps the fault is with the price, but nevertheless being a new article the retailer must be induced to take a lively interest in it. Make it attractive by providing a good show case, and cards ; and let him have a consignment "on sale or return" to start with, and there is no doubt he will soon send for more. Do not attempt to send any without complete protection from flies, &c., as this is one of the most frequent objections made against having it in stock.

For Exhibition,

Combs must be visible on both sides, using for the purpose only those sections of the very best colour and finish. In some quarters it has been considered that the comb should not be sealed close to the wood all round, but this is a serious error, the idea being that the section can be more easily cut out ; but I have yet to find the retailer who does not prefer those for his window which are sealed perfectly all round the edges ; and when one of each may be placed on the scale, is there a doubt as to which the customer would select? Moreover, those that are filled close up to the wood will stand the risk of transit far better than they would otherwise.



Abbott's Exhibition Case and Crate.

Messrs. Abbott, of Southall, offer one of the best exhibition cases yet seen. It is in three sections which are hinged together, and each compartment holds four sections between glass on either side, so that the whole may be readily inspected. For transit, when folded together, the case is placed in a spring crate, and the entire arrangement is of great practical utility.





CHAPTER XVI.

QUEEN RAISING.

IT should be understood that when a colony is deprived of its queen the bees are soon aware of the loss, and forthwith special cells are constructed upon larvæ that may be from one to three or four days old, but very seldom are eggs selected in such a case of emergency. In due time a queen is hatched from one of such cells, and though she may have enjoyed the usual quantity of royal jelly, it frequently happens that the first to emerge from her cradle is one that is not well developed, as the oldest larvæ would naturally come soonest to maturity. Thus those which had been selected from the egg, or one or two days after hatching therefrom, and would have received only the royal food from the first day of their existence, and consequently are destined to be perfect in formation, are sacrificed to a dwarfed and ill-formed queen.

As will be seen, only one of the queens is reserved, though several may be raised. There are two points, therefore, of importance to the bee-keeper who wishes to obtain a number of queens. The colony that is to produce them must be made queenless; and then he is to guard against the destruction of the surplus queens.

The Plan often Recommended,

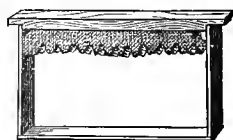
and that only recently in the *British Bee Journal*, of simply removing a queen from a colony in normal condition and then inducing the bees to start queen cells where desired by enlarging

the mouth of worker cells, is really more simple than practical. In the first place, one cell only is never large enough to form the base of a queen cell; two at least are thrown into one, but more often three; and where the bees have unlimited material at hand a queen cell will not be built upon one in fifty of such enlarged cells. I have had the proof of this assertion in my own apiary, and where Ligurians are concerned very often only two or three cells are started.

Again, why waste the time of the entire colony when a fourth of the bees can be made to raise finer queens, because with no other brood to attend to their whole energies are directed to the queen cells they are made to build.

My own Plan

is to remove the queen and all the brood combs with adhering bees from a crowded hive, and place them in a new situation, with the exception of those shaken from two combs into the old hive when with the flying bees a fair swarm will be obtained. Next, go to the hive containing the queen you desire to breed from and look up the comb of eggs, or such just hatching by preference, and in a warm room cut the comb asunder from end to end, horizontally at about one-third of its depth from the top bar. Now along each side of the lower edge of the septum make vertical incisions with the point of a penknife, cutting away the cell walls in the shape of the letter **V** inverted. Do not cut so close to the base as to displace the eggs, and let the incisions be made about $\frac{1}{4}$ -inch apart. Our cells will generally be built from these hollow spaces, and though not perfectly regular it is seldom that any two are joined together.



Comb prepared for Queen Cells.

The Reader may be tempted to put the whole comb in just as he takes it from the hive, or simply as sliced asunder, but only to find that he will not get one cell in five, and those not so regular as with the **V**-cuts. The remainder of the comb may be cut into strips and fastened into other frames in like manner, but

it is not desirable to put more than one prepared comb into one hive at a time. I have used frames with parallel bars and strips of comb on each, but find nothing more simple and practical than the one piece, which gives from ten to twenty cells at a time.

By the time the prepared comb is ready the broodless and queenless bees will have found out their loss, and being greatly excited are in the best condition possible for starting queen cells. Place a comb or two of stores at each side, and after two or three days add a comb of hatching brood to keep up a population of young bees.

H. Alley's Plan.

The oldest queen raiser in America, Mr. Alley, of Wenham, Mass., has had considerable success by first confining his bees in a dark room for twelve hours, considering that the eggs will sometimes be destroyed by bees when given at once to them. This is quite true, but I find I have better results by giving eggs just hatching without confining the bees, but waiting till their excitement shows they are fully aware of their loss. Bees do not feed eggs, and a day or two is wasted, whereas by supplying larvæ their feeding operations commence at once and more cells are consequently started. Mr. Alley places his strips of comb, as it were, on the side, with the upper part cut off nearly down to the base, where fastened to another comb, when the cells on the other side of the septum hang down perpendicularly, each other egg being removed. Thus it is impossible for two royal cells to be placed quite close together, but Mr. A. should withdraw his statement that they are built perfectly regular, and just where he desires. That bees do build many cells after confinement I am fully aware, but as the same author considers no more than twelve queens should be raised in one hive, I fail to see any advantage in that respect.

The Cell Nursery.

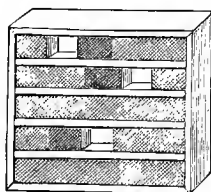
Where a large number of queens are required, as soon as any queen cells are capped, they are to be removed with adhering bees to another queenless hive retained for this express purpose.

Mark each frame with the date of setting the eggs, and allow eleven days before cutting out the cells, that they may remain in the correct temperature of the hive until the last, and yet be certain that none hatch to cause mischief.

Our cells, therefore, are not removed until the queens are almost at maturity, and now they are to be placed in the

Queen Nursery.

This may consist of a shallow frame composed of a number of compartments $1\frac{1}{2}$ inch wide with a wire loop in one side to hold the cell. Place this frame on top of the cell nursery hive with a piece of linen intervening ; the lower side of the frame is



Queen Nursery for top of Hive.

to be covered with a piece of strainer cloth, glued to the partition walls, and the top of each compartment is to be covered with a piece of wire cloth. For this purpose, the sides of the hive should project above the frames so that the heat may be retained, and the whole is to be covered first by a layer of felt, next a sheet of American oil cloth, and again one or more pieces of felt. The entire heat of the hive is thus reserved, and the temperature of the nursery will be about 90° . It should not descend below 85° nor rise above 95° , and must be carefully regulated by the size of the entrance, in accordance with the outside temperature. This plan will be found far preferable to those nurseries hanging in the hive like an ordinary frame, as the temperature is more certain, and one can see at a glance when a queen has hatched ; though neither of these plans will be of much use when cool weather comes on.

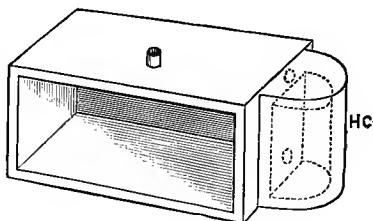
The Lamp Nursery

is frequently used and is invaluable for hatching queens. It consists of double walls and bottom of tin, with stays inside to keep the water from bulging out the sides; and the internal capacity should be large enough to take some half-dozen brood frames, with plenty of lateral space to spare. What might be added with benefit are small holes punched through near the upper inner margin of the tin wall to give moisture. The lid must be of wood covered with warm material, and if the whole is cased in wood, with the exception of an opening above the lamp, the temperature will be more even, and a very small flame will suffice to keep the chamber at about 90° , the space around being filled in the first place with water at about 100° . The frames are placed in as the cells near maturity, and the young queens are removed as fast as they gnaw their way out; several visits daily being required as they are liable to destroy each other and tear open the other cells as soon as their strength is gained. For the first few hours, however, they can do little harm.

Mr. Alley objects to the lamp nursery as being *unnatural*. Where is reason, if we allow such ill-founded statements to influence our actions? Are our processes of queen-raising natural? Is our entire management natural? No! only in so far that natural conditions do not interfere with greater profits. Let me ask those who use the hanging-frame nursery if they have observed the temperature surrounding a queen cell with the bees always packed closely around it, thus giving greater or at least more certain heat than is required for the rest of the hive? If so, they will be surprised to find how much lower is the temperature surrounding cells where no bees can cluster upon them, and where they do not even care to crowd upon the metal at each side of the little cages. All animal life is produced by heat, varying according as the nature of the creature may require, and for our purpose the lamp nursery supplies the correct and even temperature desired.

The illustration shows the metal portion of my own queen nursery, an apparatus I had made in the first instance as an incubator for chickens' eggs.

The rectangular portion shows the opening at the side, with a double casing on all other sides, with about 1 inch between the inner and outer walls. The whole of this compartment is enclosed by wood with



a closely-fitting door which closes the said open side. The inside is fitted with skeleton framework wherein slide several drawers, each covered on the underside with woven wire. The same arrangement will also take whole frames of comb, but I prefer to have the cells built that they may be cut out singly and so placed in the trays. A thermometer lies on the centre division of one of the drawers; while another is fixed in a vertical position under glass in the centre of the door; this glass being again covered by a close fitting shutter to avoid extremes; thus the internal temperature can be noted at a glance without exposing the cells. With my arrangement, however, the heat is always given from above, and even after examination of the interior there is not the same loss of heat as with the nurseries hitherto used where the whole top is opened, as such have no large body of heat just where most needed for the immediate restoration of the correct temperature.

Though shown at one end, the hollow heating cylinder *H C* is at the centre of the back. Under this is placed the lamp, which has a wick of such a size that it can not very well have a flame which would be able to overheat the chamber; the latter being about 18 inches by 12 inches by 9 inches. The boiler contains between the walls about six gallons of water, so that when the right temperature is once secured it does not vary one degree in twelve hours. The whole stands upon legs with a small table for the lamp to rest upon; this is trimmed once in twenty-four

hours, regularly every evening, so that there is no chance for the flame to drop during the night, when no attention is needed. Any cells expected to hatch may have the point passed into the tubular perforated cages, as used for inserting virgin queens, thus obviating the constant attention so often considered necessary by others.

A sponge or cloth saturated with water, or a shallow tray holding a small quantity, should be placed in the chamber to induce the necessary moisture. The outer casing of wood has a moveable lid, not very tight fitting; but between it and the boiler several folds of flannel are laid, thus permitting a gradual change of air to take place in the cell chamber without loss of heat. A tin plate is placed under the bottom to guard against fire, an opening, of course, corresponding with that in the hollow cylinder.

Though the time of hatching is delayed I find queens will come out with perfect wings under a temperature of 85° , but I prefer it regulated nearly as possible at 90° rather than 95° , so that in case of any accident there may be no danger resulting from either extreme. When properly managed, no intelligent apiarist will deny that the incubator or lamp nursery gives a more even temperature than can be obtained in the hive. That of the former is perfect, while the hive varies considerably, having its entrance always open to the outer air.

We have provided for the hatching of our queens, and must now prepare for their reception in

Nuclei.

These are small hives to hold from three to six frames, the latter being more serviceable for our purpose, as there is room to add fresh combs of brood when necessary.

It seldom happens that good nuclei can be made up from a stock which at the time has its queen, therefore my own plan is to make up a nucleus with the queen of the most suitable colony, being one very populous, having a number of combs with hatching brood in each. Place the queen with one frame of brood and bees, and enough more to cover two other combs, on a new

stand. On the third day thereafter make up nuclei in like manner from the same hive, leaving the younger brood in the original hive, as there will be plenty of bees to take care of the same. Bearing in mind that they have lost their queen and having already prepared for building queen cells, no farther excitement will take place, and not one-fourth the number of bees will return to the old hive, as when the nuclei are drawn from one with a queen presiding.

Insert the young queens the same evening by placing them in my

Virgin Queen Cage,

which is a small tube of finely perforated tin or zinc, about $\frac{1}{2}$ inch in diameter and 2 inches long; one end being stopped with the



Tubular Virgin-queen Cage.

same material, and after the queen is placed in, the open end is pressed into super foundation, when with a slight turn a piece is cut out which completely stops the opening. The cage is now carried to the nucleus and inserted between the upper part of two combs, wax end downwards. The young queen soon bites her way out, just as she has done from her natural cradle. The cage should be passed down so as to bruise the cappings of honey to ensure that she is well provided for, and as she will then partake of the same honey as the workers it is all in her favour. I have found this the most satisfactory method of any for giving virgin queens. The best time for inserting them being the evening; and when a laying queen is removed, the young one to follow must not be inserted until the second day after.

We shall probably have

Surplus Virgin Queens,

and where these cannot be accommodated by breaking up other stocks, one-frame nuclei must be on hand provided with thorough

ventilation, and in which are to be placed a comb of stores (both honey and pollen), with three or four hundred bees. These may be side combs from nuclei already established, and should contain no brood.

After the confined bees have been in an uproar for a short time, having already made provision for a small opening, allow the young queen to run in. Keep these in a dark room and use as needed in outside nuclei.

It has been observed that a young queen feeds upon pollen extensively until she has met the drone, from which time she is fed by the bees entirely upon digested food. Now just here I wish to show the

Folly of keeping Young Queens confined

in the frame nurseries for a number of days after hatching, as is done extensively, especially in several American queen-raising apiaries.

Without the nitrogenous food at this time, when their constitutions should be established, they are dragging out their existence upon sugar alone at the most important period of their growth. The editor of the *American Bee Journal* has repeatedly given his voice against the cheap queen traffic, and is it any wonder when they are produced wholesale with constitutions thus impaired?

The confined one-frame nucleus certainly takes up more space and time, but both are amply paid for by getting more substantial stock, while queens being able to feed naturally will get mated sooner than those with a weakened frame.

On p. 45 it will have been noticed that for

Supplying all Hives with Young Queens

yearly, and to compensate for the non-increase of stocks, one colony in ten is to be devoted to increase by nuclei. In this case the tenth hives are to be stimulated for brood rearing until the end of June, when there should be at least three chambers nearly full of brood in all stages. However, to be within limit we will say twenty combs of brood and a number of stored and partly-stored combs.

The whole tier should now be shifted to a new location, one storey at a time, and then give the swarm (made as before) the eggs for queen raising ; this time an upper storey of combs or foundation is to be added, besides filling up below as the much larger number of bees will probably store heavily. The moved stock will still have sufficient bees to care for the brood, the extent of which will now be immensely increased, as there are not enough gatherers left to crowd the queen out, though before shifting the hive the apiarist should have been able to give the queen plenty of room by alternating brood combs with foundation as the upper stories were added, and extracting if necessary.

On the ninth day after setting the eggs, make up a nucleus with the queen (of the moved lot), this time standing the same by the hive, to be returned after forming the nuclei in a manner similar to that before mentioned, standing a nucleus by each of the full hives working for honey, to be united to them in the autumn.

By waiting till the date named more than sufficient nuclei can be made up, while the original queen will have a full hive of bees to build up with again, and thus provide against loss, and have combs of eggs to spare for the nuclei.

Doolittle's Queen Cell Protector

will be found invaluable where a large number of cells are to be made use of. It is made of woven wire, rather larger than an average cell, and when one is inserted the point only is exposed, giving the queen just room to bite her way out ; the sides of the cell being protected from the attacks of the bees, as it is there that they generally begin to tear it open, if not approved of. The cage with the enclosed cell hangs down between two frames. just as I have always found it most convenient to give naked cells, and requires no other fixture. I consider this the best way to give them, if, as the originator states, the cells are inserted when not more than two days from hatching.

Nevertheless, for my own purposes I prefer to

Give Virgin Queens only,

and have quite given up the insertion of cells. A better selec-

tion can be made, while there is no loss of time by any accident such as an abortive cell or queens hatching in any way defective.

Eggs for Queen Raising

are more readily obtained from our select queens if the latter are in small colonies, having not more than four combs well crowded with bees, and protected at the sides with chaff dummies. When a comb of eggs is removed, at the same operation insert another, or a sheet of foundation if not too late in the season. Continue the process every two or three days if many queens are being raised, with a number of such hives to keep up the supply; and where it is likely that too much honey will be brought in to hinder the queen by the little lot getting strong, then carry the queen and two or three of the best combs of brood and accompanying bees to a new situation, thus providing her with attendants mostly too young to store a surplus. Use the remainder as a nucleus, or add to another hive.

Drones

are to be produced by stock which has shown good qualities and correct colour (if pure) for two generations back, as the colony producing them does not impart to our drones its own characteristics. For their good qualities we must look to the grand-parent, and the colony producing the drone which mated with her, if possible. Early drones are best secured by arranging drone comb at the centre of a well-provided stock the previous autumn. No useless drones should be produced as they consume considerable stores. A strong colony, well provided and made queenless in autumn before the slaughter is likely to commence, will save their drones till winter.





CHAPTER XVII.

HONEY AND INCREASE.

EXCEPT in the few districts where the season is protracted, increase is obtained at the expense of honey ; but in any case it is not desirable to take more than one swarm from the old stock ; and this division to give the best results must be made before the first honey-flow occurs, providing the colony can be made strong at that time. But as it is probable that some will not be, and also to allow for uniting in the autumn, it will be safe to reckon only upon 50 per cent. increase, as it is imperative that all be kept in good condition. In the table of estimates this has been placed at a much lower rate, so that there is little fear of the apiarist weakening his stock.

A division of stocks can also be made during an interval of dearth, if not too late in the season, but in any case a young queen should be on hand. The operation of

Dividing

will consist in removing from a strong colony one half of the brood combs containing mostly hatching brood, with the bees clustering thereon, as well as the queen ; placing these in a new location, with all the brood near the centre of the hive with empty combs or foundation on either side of the same. The brood combs remaining on the old stand are to be alternated with founda-

tion, as the larger number of bees will be here, and on the evening of the following day, unite with them the nucleus having a young queen, or insert the queen alone if the nucleus is again required.

Having their own queen, very few bees leave that portion placed in another situation, and possessing the older brood the hive will soon be crowded, when the outside sheets of foundation are to be inserted one or two at a time in the centre of the brood nest. The number of frames to be allowed for breeding will depend upon the approach or return of the honey-flow, and it may even be necessary to remove some of the least filled with brood, where comb-honey is to be worked for, crowding the bees on to 8 or 9 of the combs most densely packed with brood. I have practised

Contraction

both in summer and winter for more than ten years past, but with the institution of my non-swarming system it is found unnecessary either for summer or winter. When increasing however, it is the only way to make the most of the honey harvest, by thus curtailing the powers of the queen in less populous colonies. Treatment for either comb or extracted honey with divided stocks will be as before mentioned ; but where

Natural Increase

is allowed, the plan of proceeding will be somewhat different. Constant care and attention is needed where swarming is allowed, and if due precautions are not taken the prospects of a good harvest are ruined. In the first place we will consider my own method of

Swarming without Increase.

Where a swarm is not seen to issue, a glance around at the entrances of the hives only should show the bee-keeper from which it came. Hitherto all was life and activity, but look ! here is your hive with the entrance clear of bees, and but a few

returning, while hardly one is seen to issue ; it is the "calm after a storm." A closer inspection of the hive will reveal the true state of affairs, and now remove all the combs to another hive standing by the original with the entrance turned away from the same. Secure the swarm in a skep or any other convenient article, standing the same upon the ground with clear space for ventilation under, and shade above. As soon as most of the bees have entered or clustered about the skep, carry the same to their original location and shake them into the hive, having previously arranged six or seven frames with full sheets of foundation, or $\frac{1}{4}$ -inch strips of such ; and not more than two frames of brood near the centre, with dummies at either side.

The sections are to be replaced on the new swarm which will soon receive so many bees in addition from the removed combs that the remaining population will give up any idea of again swarming, and will destroy all but one queen. When the latter is mated and laying, the brood will be hatched, when the old queen left with the swarm is to be destroyed, and on the following evening unite the two lots with the young queen presiding. The united stock should not have more than ten or eleven frames in all, while the remainder of the broodless combs can be used for extracting purposes.

Where more than one young queen may be desired, break up the removed combs into the necessary number of nuclei with a queen cell to each on the eighth day after swarming, and re-unite as soon as the queens can be appropriated.

For obtaining one swarm from each stock, and in desiring to

Prevent After-swarms,

proceed in the same way, except that the removed combs and bees are to be placed at a distance from the old position, and no uniting takes place. This plan of obtaining one swarm and throwing the whole working force with the same, while making it a certainty that the other portion will cause no further trouble, was well known to, and practised by, most of the old masters. In

this case there is no time wasted in cutting out queen cells, an operation that cannot be tolerated in a modern apiary. Should there be any fear of the bees being strong enough to swarm again, a few more shaken off with the new swarm will settle that matter. As soon as the young queen, or one already on hand, has six or seven combs crowded with brood, supers may be placed on her hive also, at the same time giving two more empty combs or foundation near the centre. Upon removal of these there will probably be hardly an ounce of honey in the stock combs, when another empty comb or two must be inserted and feeding be followed up, so that the brood nest is gradually reduced and the combs stored for winter.





CHAPTER XVIII.

FEEDING AND FEEDERS.

WHEN and how to feed are questions of considerable importance to bee-keepers generally. In the apiary where bees and queens are raised for sale, feeding has often to be resorted to, as nothing is so exhaustive as the production of bees and queens on a large scale. Many colonies are reduced to such an extent, that the remaining bees are occupied entirely in brood rearing, forced on to the utmost by the master. Honey is quite a secondary object, bees *must* be had. Consequently honey cannot always be obtained even when the average colony is storing, and the forcing process must therefore be kept up by some substitute.

Dry Sugar Feeding.

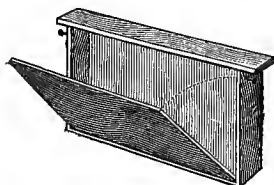
For spring feeding generally and for use with nuclei I have found nothing so stimulative as my plan of dry sugar feeding. The feeder consists of a hollow dummy with one side hinged on simple wire nails and held by the same above; or by staples turned at right angles to project over the margin below and a turned wire inserted at either corner at the top, which can be moved out of the way to allow of easily removing the side. The space between the sides should not be more than one inch, or comb will frequently be built therein.

Sugar known as Porto Rico, a soft, moist article, is used, being pressed in tightly, and the bees, entering above the moveable side, which does not reach the top bar by $\frac{1}{4}$ -inch, are soon busily engaged in reducing the food to syrup.

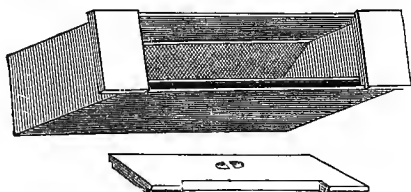
In spring it is necessary that the moisture of the hive be retained by placing American oilcloth next above the frames and plenty of warm material above that. All that is required is that the air does not become too dry, and then the sugar will attract moisture to itself. If so little covering is placed above the non-porous cloth that condensation takes place, the sugar is used up too rapidly and the queen crowded out; especially as the temperature is reduced enough that the brood nest cannot be extended.

The feeders are placed as an ordinary frame at the outside of the brood nest and the bees allowed only so many combs that they are crowded into them.

Another very serviceable frame feeder I have in use holds 9 or 10 lbs., and is 3 inches across inside. The bottom is simply a sheet of finely perforated tin placed in an arched form, so that the bees may cluster under and appropriate the sugar through the perforations.



Dry-feeding Dummy.



Champion Frame Syrup Feeder.

Syrup Feeders

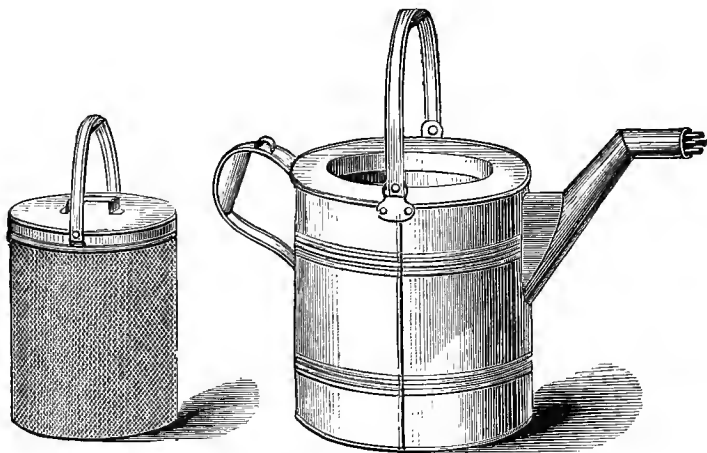
used in my own apiaries dispense with the tedious process of preparation by cooking as hitherto carried out.

If a stock happens to be very short of stores in spring, I find it best to give a feed of syrup to put the bees in good heart, and then follow with the dry sugar. In autumn, when surplus receptacles are removed, it is generally too early to finish off feeding all

at once, and it is well to give ten or fifteen pounds of syrup immediately and finish gradually with a ten-pound dry feeder. This is of course where all the honey has been placed above, but where any have considerable stores on hand but not enough to winter, the balance must be made up rapidly with syrup not later than the end of September.

Simmins' Syrup Frame Feeder

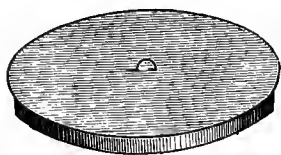
holds about twelve pounds ; is $4\frac{1}{2}$ inches wide, and otherwise of the "standard" frame dimensions. The joints are all tongued and well put together that no leakage may occur, though it is advisable to paint the whole inside to prevent saturation. There is a slot along the top on one side nearest the bees, by which they are allowed to enter a $\frac{3}{8}$ -inch passage between the outer and inner wall, where a good footing is obtained while taking up the



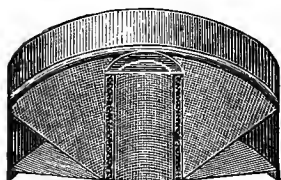
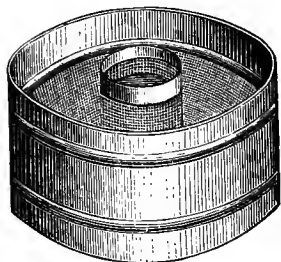
Self-acting Syrup Can, with internal arrangement shown outside.

syrup. The sugar is held clear of the bottom by a piece of perforated tin in an arched form, thus admitting of a free circulation under. No cooking therefore is necessary, as the usual quantity of sugar and water (a pound of sugar to half a pint of water)

soon amalgamate in the form of syrup. The proportions named happen to be correct for this system, as it will be found that a residue of sugar will be given where more than the pound is placed in the half pint of water. Another feeder for the top of the hive is the



Circular "Amateur,"



Circular "Amateur" Feeder.

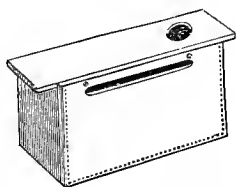
which I have arranged upon the same principle, as will be readily understood by the illustration. This holds about 7 or 8 lbs. at a time, and the inner funnel leading up to the syrup passage around the same is lined with wood, or a lamp-wick can be used leading down into the cluster in cool weather ; though if feeding is necessary at such times it is always more satisfactory if the syrup is warmed. Among

Bottle-feeders,

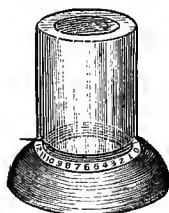
we have the "Raynor," arranged to give a graduated supply, with a projecting point attached to the perforated metal cap of the bottle, indicating by the figures to which it points on the stand the number of holes to which the bees have access. The underside of the excavated block is lined with warm material, though generally of the kind that is annoying to the bees, and which they soon tear away. If painted with wax it would be equally as warm, and more appreciated by the bees.

Messrs. Abbott have long had something similar, but more simple and less expensive ; but there is one great disadvantage with all bottle-feeders, in that they are subject to atmospheric

pressure, and with a sudden rise of temperature the expansion causes much waste of syrup. The syrup has usually been boiled when prepared for this class of feeder, but for my own use I have large cylinders on the self-acting feeder principle which reduce about 2 cwt. of loaf sugar at a time, the syrup being drawn off by a treacle valve at the bottom. The syrup-can illustrated will also be found suitable for smaller quantities.



Simplicity Feeder.



Raynor Feeder.

A very simple feeder is one adopted by myself some years since when using frames 16 inches by 10 inches. Good sound wood is selected, and plain boards fastened on each side of a frame of any desired width. Put the nails in rather close together and paint all joints with white lead before making up. The top bar is $\frac{3}{4}$ -inch thick with projections reduced to $\frac{3}{8}$ -inch. This is secured by four screws so that it can be removed for cleaning. The syrup is poured in at the circular hole, after turning back the quilt, and the bees go in by a slot on the side; no float is needed.

In many apiaries feeding is seldom resorted to, but there are times of dearth when valuable colonies would be utterly ruined, were it not for the timely assistance rendered by the owner—assistance that sooner or later is repaid a hundredfold.

Of course if feeding is absolutely necessary after the surplus receptacles have once been occupied, it must be simply from “hand to mouth,” that nothing be stored in supers; while it may even be desirable to remove such entirely, replacing them when better times put in an appearance.

Feeding without Feeders

is something that needs our attention before closing this chapter. Of the various methods offered for filling stock combs with syrup, to be placed in the centre of the brood nest for stimulation, or near the outside for storing, no plan can be so effective and simple as that employed by Mr. W. Raitt, of Scotland. He uses a common syringe, placing the comb in a drip pan, while driving the syrup into the cells. The filled combs are carried to the hives requiring them, while sometimes a chamber is filled up with them and placed bodily under the stock chamber which has to be stored.

A simple method of giving "dry sugar" is that of first placing a layer of strainer cloth upon the frames; the sugar above that, and pressed into a compact mass, with the usual quilting next that, nicely tucked up to keep all warm. Common paper will do in place of the straining cloth if two or three holes are first made through to give the bees a start.

It should be distinctly understood that

No Feeding whatever is to take place in Winter.

Candy is often recommended, but it is far better to unite to a well-stored stock in the autumn than to feed in any way during the months of repose. If a stock is found deficient in stores at the latter part of winter, then give combs of sealed food with as little disturbance as possible; placing such flat on top of the frames and covering up warm if the weather is very bad; or, failing sealed stores, make a thick paste of powdered loaf sugar and the smallest quantity possible of honey, just to bind it together. This also can be laid close on the frames; and in either case the bees will be brought along until a dose of warm syrup can be given rapidly.



CHAPTER XIX.

INTRODUCTION OF ALIEN QUEENS
TO STOCKS.

NEXT to Queen Raising one of the most interesting features in connection with modern Bee-keeping is that of inserting queens, that they may preside over another colony with which hitherto they have had no relation. At first sight, therefore, it would appear that the bees will not hesitate to destroy the stranger; under some conditions this is the case, and various ways have been devised to guard against this disposition of theirs. The different methods come under two distinct systems: the old called "Caging," and the new, known as "Direct Introduction."

Generally speaking, the caging process is carried out by placing the queen in a small perforated compartment, wherein she is confined between two combs among the bees for forty-eight hours, when the bee-keeper opens the hive carefully and allows the queen to run among her new subjects. If then attacked, she must be again confined, and tried after the lapse of another twelve hours.

Direct Introduction consists in so inserting the queen without confinement that the bees are either unaware of the new arrival, or are taken advantage of in such a manner that they do not attempt to molest her.

Of course it is understood that no other queen is to be in the hive at the time another is to be given, or the new one will

certainly be destroyed. The novice may experience some difficulty in

Finding the Queen

to be superseded, and he will certainly do better to leave his queens alone until he gains more experience, unless he is absolutely certain that any are actual failing. If he tries any new race, as yet he is hardly capable of forming a correct opinion of them, and the probability is that the natives will answer his purpose best for the first year or two at least.

In frame hives the fertile queen can generally be found without much trouble, as she is parading the brood combs, the hive being opened with as little disturbance as possible, and the frames gently lifted and examined one by one. If not to be seen there, look well around the edges of the combs, or she may be found on the floor, or at one corner among the bees. An unfertile or virgin queen is often most difficult to find, and at times even an expert bee-keeper would be tempted to say that no queen was there, were it not that the actions of the bees tend to show otherwise. A careful examination will generally reveal her presence; but failing to find her, when you think there should be one, give the bees a comb of unsealed brood, and if they build queen cells thereon it is certain that no queen is there; if otherwise, do not risk the life of a valuable queen until the other has been found. With fixed combs the only way is to "drive" the bees out and catch the queen as she ascends. If that cannot be done, then look well among the deserted combs and the bees clustering in the empty skep.

INTRODUCTION BY CAGING.

Procure a cage made of fine perforated zinc $1\frac{1}{2}$ inch in diameter, and 1 inch deep, having one end only closed with the same material. When the queen arrives place her in this cage while yet indoors, slip a thin card under and carry her to the hive. Without removing the frames other than to give plenty of room laterally, slide the cage carefully from the card on to uncapped

cells of honey, within the margin of the cluster, and press it down to the mid-rib of the comb with a cutting motion. The queen now has plenty of food, and if the perforations are fine enough the bees are unable to molest her. After forty-eight hours, give a puff or two of smoke, carefully examine the condition of the bees nearest the cage, and if simply passing their tongues through the perforations, the queen may be released without fear of the bees attacking her, but all the same watch their actions closely for a few moments. If all is well the bees will gather around her, but not thickly; those nearest will clean her with their tongues, while one or two may be seen feeding her. Under that condition the hive may be closed and left, but should they be found clustering tightly in large numbers about the cage, at once close the hive and wait another twelve hours; and in case a queen is attacked after being released (which is known by the bees forming into a knot about her and stinging each other in their endeavour to so do to the stranger, called "balling"), then confine her again, first dispersing the angry cluster by heavy smoking.

When inserting queens by caging, it is necessary to keep all queen cells destroyed, or the new-comer will seldom be received. She is present in the hive all the time the bees know they have the means of raising their own, and hence a dislike once begun is only fed into an angry flame simply by the continued irritation caused by the constant attempt to get at the stranger.

The queen will sometimes even herself be the first to attack the bees, and then, of course, there is no hope for her if not again confined. All these disturbances are brought about through the necessity of operating by daylight, but there are one or two other methods which do not necessitate so much manipulation. The "Raynor" cage, consisting of a narrow and long wire cage, can be passed down between two combs from the feed hole in quilt (if one), while with a wire rod connected with a small hinged plate at the bottom, the operator can, after the usual lapse of time, release the queen without opening the hive. I must here add what I know to be an improvement:—*Release the queen after darkness has set in;* on the night of the same day she is inserted.

Mr. Cheshire places a flat cage on (not cut into) the capped brood, where it is held by a spring passed over the top bar, when in the course of a few hours the bees cut away under the edge of the cage, and thus liberate the queen without further disturbance. For greater security let me advise something more definite : *Put the queen in towards evening, so that she may be liberated of a certainty during the quiet hours of the night.*

Though there are many methods of caging, I will call attention to only one more, which is deserving of some notice. Mr. G. M. Doolittle, an American bee-keeper, uses a flat cage having an area of 4 or 5 inches square ; this, with the queen in, is pressed down to the mid-rib of the comb just over hatching brood. Of course all the young bees hatching out pay homage to the only queen they know ; and the cells thus vacated are occupied by eggs laid by the confined queen. By this time there is not much doubt about the queen being accepted by the rest of the population, and she may be released. In this case it is evident that food must be present, therefore see that the cage also takes in an inch or more of sealed store. This point the inventor of the plan seems to have overlooked, and it should be borne in mind that in any case where food is given to a queen confined in the "Raynor," "Cheshire," or any other cage, *honey from the same hive should alone be supplied* ; and on no account may any of the bees which accompanied her be placed in the cage ; but it is advisable to give her an escort of some half-dozen young workers picked from the comb just after hatching, and taken from the hive in which the queen is to be caged. By these methods the most favourable time for inserting queens is during the months when they are breeding and storing ; but in autumn the bees are more inclined to resent intrusion.

DIRECT INTRODUCTION.

A term first applied by myself in the year 1881, will be found much more simple than the foregoing, in that it enables the bee-keeper to insert a queen without loss of time and by two of my own methods to any colony, at any time of the year, whatever be

the condition of the hive, whether it contains queen cells up to the point of hatching, brood in every stage of development, fertile workers, or no brood at all.

My "Comb Method,"

first brought to public notice by my pamphlet in 1881, consists in taking a queen from a nucleus, or otherwise, upon the comb she is parading among her own bees, and then inserting the whole into the desired hive, using a little smoke as in ordinary manipulation. Be careful to carry the comb in an *uncovered* box from nucleus to full colony, and before inserting the same, part the combs of the hive to give plenty of room and admit light. (*See also "Uniting."*)

The "Fasting Method,"

long since practised by myself, and mentioned in my pamphlet upon Direct Introduction, I have since improved by inserting the queen at night. The three things of importance to be observed are as follows:—(1) Keep the queen quite alone for not less than thirty minutes; (2) she is to be without food meanwhile; (3) and to be allowed to run down from the top of the frames after darkness has set in, by lamplight. It is also important that the same receptacle be not used twice over for holding the queen during the thirty minutes' probation without first being scalded or otherwise cleansed. Of course a metal cage is easily made clean, though there is no objection to the cheap "safety" match boxes so commonly in use, as there is nothing obnoxious about this kind. My own practice is to carry the queens in the vest pockets, in small tubular cages made of fine perforated zinc or tin, one end permanently closed, while the other end is pressed into a piece of foundation after the queen is in. When ready, remove the foundation and let the queen run into the hive. Caution:—Make no examination after inserting a queen, by either of the two foregoing plans, until 48 hours have expired.

The above meets all requirements, whether the colony has been long, or only a short time queenless; if it has brood or not,

or queen cells in any stage of development. It is also applicable to any season of the year.

Mr. Pond's Method.

Mr. J. E. Pond, jun., an American apiarist, gives his method as follows :—Remove the old queen about mid-day, and towards evening, or when the bees have ceased working for the day, let the new queen run into the entrance. He says it is important that the queen be inserted the same day. It would appear that the interval named gives the bees time to discover their loss, and thus provides them with another queen when they feel most inclined to accept one, just before making any serious attempt to raise one of their own.

Introduction by Chloroform,

Puffball, &c., are sometimes recommended, but I cannot advise such a course as to reduce the bees to a state of stupefaction, as it is not only injurious but totally unnecessary.

Covering Queens with Honey.

It is claimed by some that a queen is generally accepted if first covered with honey and then placed among the bees ; but the practice is one of doubtful utility ; in the first place, there is no restriction as to *what* honey, and if any desire to try the plan, I must say that no other honey should be used but what is then and there taken from the hive the queen is to be dropped into. An ordinary pocket knife can be used to scoop out a little honey from the capped cells ; or failing that, use the same syrup that is being fed to the bees. The body of the bee is studded with breathing tubes ; it is, therefore, evident that much mischief, if not permanent injury, is caused by all being clogged with honey, if only for a few minutes.

Running Queen and Bees in at the Entrance.

Another method, long since tried and discarded by myself, has sometimes been recommended. It is this :—Shake all the bees

from the combs on to a board in front of the hive, and as they draw back through the entrance let the new queen run in with them. There is considerable risk with this plan, even when all are sprayed with thin syrup, scented or not, but I mention it more as a caution to the novice, that he may not be led astray, more particularly as he would be liable to get the brood chilled before the bees regained their former position.

VARIOUS.

A plan which I have found very satisfactory, and which was first suggested to my mind by the fact that I had long made a practice of sending queens off with bees they had never seen until the moment of fastening down in the various receptacles they were to travel in, is as follows:—Make up a 3-frame nucleus in a small hive $14\frac{1}{2}$ inches by 11 inches inside (allowing $2\frac{1}{2}$ inch space under the “standard” frame); then confine the bees, with ample ventilation, and as soon as they are in an uproar, having found themselves to be queenless, let the new arrival run under one corner of the quilt, first driving the bees back with a little smoke. Keep them thus confined in a darkened room, and liberate on the evening of third day, standing the nucleus where it is to remain; and as soon as strong enough give a frame of hatching brood at intervals of seven days. Before inserting queen, she should, for greater security, be kept alone and without food for 30 minutes.

Mr. Doolittle (of America), also appears to have discovered that confined bees will readily accept a strange queen. His plan is to shake the bees into a box, well ventilated, and as soon as they are in distress at the loss of their queen, he allows the new one to run among them through a small opening, otherwise kept closed. In a day or two the bees are placed upon brood and store combs, where it is intended they shall remain.

Few bees will return to the old hive in either case, but there appears to be more labour than with my own plan, in that bees are twice shaken from the combs; first to place them in confinement, and next to provide the brood and other combs to start

them in a new situation. In my own case the bees have their own combs all the time, and when liberated the same have already been largely stocked with eggs by the new queen.

Colonies long Queenless.

When I am aware a colony has been queenless for any length of time, I generally take out one of the central combs and allow the queen to run among the bees ; if favourably received, replace the comb, but if, as it seldom happens, they reject her, then give them a frame of honey and brood, and insert the queen at night according to the "fasting" method.

Whatever non-caging method may be followed, it would be well to first follow the fasting method for greater security ; and in times of scarcity it is always better to have the feeding-bottle going when it is decided to insert a queen by any caging process.

All the foregoing plans have reference to fecundated queens, but with regard to the introduction of virgin queens, hitherto there has been great uncertainty, and the only satisfactory plans I have found are :—(1) By introducing to a confined nucleus as shown above for fertile queens ; (2) by the tubular cage before mentioned ; in this case pressing the open end into *thin* foundation after putting in the young queen. (*See also Queen Raising.*)

Queens Dying in Cage.

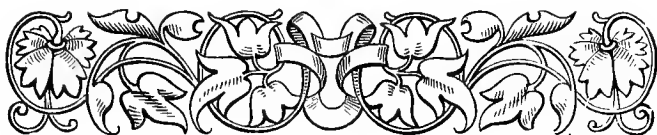
When inserting queens by the cage it sometimes happens that they are found dead. This results from one of two causes ; either want of food, or death by stinging or worrying, as the perforations are too large in almost all cages used. The former shows the danger of using such cages as do not press into the combs, should the bees be disinclined to feed the stranger ; while the latter evil can be remedied by using perforations no larger than an ordinary pin will pass.

Why Queens are Accepted or Rejected.

It appears to be little understood why some queens are readily accepted and others not. Generally it has been considered that the condition and temperament of the stock was the cause ; but I

have no hesitation in asserting that more often the cause is to be found in the queen herself. For instance, I very frequently take a laying queen from one hive in the middle of the day, and carrying her alone, insert her in another stock, without waiting to see if she is accepted, whatever be the condition of such colony, and I do not remember one being missing when the hive happened to be examined. The reason is apparent ; there you have a queen in the highest state of fecundity, and her condition is respected and immediately recognised by the bees. Take a queen that has been confined with a handful of bees for a few days, and the chances are she may or may not be accepted under like treatment ; while under the disturbance caused by caging the bees would be inclined to reject some of those first mentioned. The queen that has been confined for many days will be the most difficult to insert, as she will be to the bees little more than an unfertile queen, and they are prepared to reject her accordingly, unless proper precautions are taken, such as placing her upon a comb of hatching brood only, in a small hive with hot water tins to keep up the temperature to about 90 degs., or else the combined "fasting" and "confined nucleus" methods. When inserted by caging the queen will sometimes become so irritated that she herself attacks the bees ; and at other times the disturbance so frightens her that the bees follow and attack her ; and if a queen once begins to run, even though the bees were at first favourably disposed towards her, she is lost, as she thus makes herself appear to be chased, which is soon the case in reality.

Much more could be added ; but I think I have shown more than enough to convince the reader that the caging system is not to be compared with some plans of Direct Introduction, which provide that a queen may be inserted into any colony, whatever be its condition, and almost as it were, without the bees being aware of the advent of a new sovereign.



CHAPTER XX.

BUYING, PACKING, AND MOVING BEES.

IN an early chapter, much has already been explained as to the best time to buy bees. If possible they should be obtained in hives that are in general use, and can be adapted to modern management.

In most cases the seller packs the bees and delivers them to the rail, the buyer paying carriage ; but if he has the time and can make it convenient, the buyer will find it greatly to his advantage to see them packed and delivered to the railway company, especially where many hives are concerned.

Though some are more suited to the purpose than others, I have yet to see the hive, legs or no legs, that could not be turned "top-side-down" for travelling ; and all should be so sent as the combs then ride more securely, having their base resting upon the top bar of the inverted frame. Tapes may or may not be fastened round the frames to enclose the combs more securely ; but to dispense with this, where I can make my own selection, I use combs that are well fastened down the side bars of the frame.

Shade must be provided in hot weather, with more ventilation than at other times. Bees are lost more from want of ventilation in travelling than anything else, and due provision should be made according to the number of the occupants in whatever receptacle may be provided. If sacking can be arranged to give

shade and at the same time exclude light without interfering with the admission of air, bees will travel and stand confinement very much better than where they are continually striving to get out, and thus to a great extent impeding free circulation.

Packing Stocks.

Before inverting the hive, fasten a thin board along the whole length of the hive at the ends of the frames, overlapping these at least one inch. A piece of porous sacking is first to be placed above the frames and held in place by a few tacks till the slips of wood are fixed. With the left hand find where the frame ends come, and with a bradawl bore a hole through the thin board into each bar; then insert French nails *pressed* not quite home. Screws are to be used with this exception, as little hammering should be allowed for fear of injuring the comb attachments.

We have to provide for a free circulation of air under, after the hive is inverted; therefore on each upper side, parallel with the frames, thick strips of wood are to be screwed, so that these only will rest on the ground when turned over. The entrance may be closed with perforated zinc before or after, as is most convenient. The packing can take place several days before moving, if desired, leaving only the entrance to be closed on the eve of departure. In very hot weather for long journeys additional ventilation should be provided by holes bored at the sides and covered inside with perforated material, or an additional storey or half-storey can be given under the other before inversion.

By inverting the combs we not only place their weight upon, instead of depending from their base, but also provide that there is free circulation throughout the hive above them; whereas in the natural position the heated air ascending is unable to escape and tends still further to weaken the foundation of the combs.

When delivered on Rail,

or placed in vans, the combs should always travel in a line parallel with the road, so that with any incline, or sudden movement they are not thrown to one side. Where necessary to tier

up the hives, place boards between each set. Plenty of straw is needed to give them an easy motion, but on no account is it to be arranged so that the inverted hives rest directly upon it, though some must be packed between to prevent sliding, or jolting against each other. Place a good layer first upon the floor, spread it out evenly, and then lay boards down ; on these place the first set of hives ; then straw and boards again, thus always keeping a clear space under the sacking next the frames.

All covers and odd material must be packed separately, and where the stock hives are simple square boxes, with no projection whatever, the entire process will be more satisfactory and expeditious.

For Export,

additional care will be necessary, while a sponge must be provided at one side in a perforated box, with directions requesting that the same may be moistened occasionally ; or a zinc vessel may be supplied with a cotton wick held in a funnel reaching nearly to the bottom that the water cannot be spilled.

It may be necessary, according to the strength of the colony, to give an outer case, thoroughly ventilated to provide for excessive heat ; though when it is known that bees have to undergo a high temperature, a nucleus only will travel far better and give more satisfactory results than a full colony.

On receipt of the Bees,

they should be placed out where they are to stand permanently. The packing need not be removed for a day or so, but the entrances are to be opened as soon as the bees are a little quiet. Do not liberate each hive in rotation, but go from one spot to another as far distant as possible, and so let the first quiet down before a neighbouring hive is opened.

It is well not to examine the interior of the hives for two or three days, that the bees may have first noted their location ; but it will then be necessary to determine if any queens have been lost, which frequently is the case. Where any are gone it will be

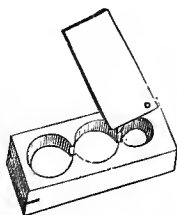
necessary to unite to others at once if this happens to be the first stock of the apiarist ; but when other colonies are on hand one may be able to insert another rather than unite.

Packing Queens.

An admixture of honey and sugar first mentioned in Rev. L. L. Langstroth's book as a substitute for honey in wintering, was afterwards used by Mr. I. R. Good, another American, in queen cages when transmitted by the post. However, perfection had yet to come ; the food was right, the candy was "good," but until the introduction of F. Benton's mailing cage, general success was not attained. Queens may now be sent by post just as safely as an ordinary letter, and Benton's cage has rendered the system absolutely perfect, though as yet through some short-sightedness, or prejudice on the part of the postal authorities, many foreign queens have been returned to the senders. Mr. Benton then overcame that difficulty by registering the packages, but now again someone at the General Post Office, more officious than wise, has seen fit to send back registered packages forwarded to myself. They now therefore are sent over by Parcel Post ; but by what process of reasoning they are allowed to pass in that manner, and not by letter post it is difficult to understand.

The Benton Cage

consists of three compartments ; one is ventilated for general accommodation, and particularly for advantage to the bees under high temperatures ; from this a small passage communicates with the central compartment, otherwise having no ventilation. The last has another small opening leading into the third space wherein is



Improved Benton
Cage.

The Food,

which is made by thoroughly incorporating with finely powdered loaf sugar just sufficient liquid honey to form a thick paste ; this

should be almost dry, and give no sign of "running" under any temperature.

It is best made up some time before actually required for use, so that any excess of moisture may descend, leaving the upper portion just right for the cages. When the compartment is filled a sheet of wax or a piece of parchment covers the opening, while a thin lid of wood fits over the whole, being secured with brads or tacks.

Inserting the Bees.

The lid is to be tacked on only at one corner, at the side of the food compartment. Hold the cage in the left hand with the thumb on the lid just above the ventilated chamber, and now pick from the combs about a dozen young bees with the right hand, inserting them one at a time while the thumb moves the lid back to receive each in its turn. The queen is to be put in last to make sure of no mistake, when the remainder of the tacks can be driven in.

If the weather is cold more bees must accompany the queen, and additional warmth may be given by outside packing, though this is seldom necessary with Benton's cage. Instead of the brad holes I have found a sawcut through the end more effective for ventilating in hot weather.

Packing Swarms.

A "rough-and-ready" way is to tie a piece of strainer cloth over the mouth of a skep in which the swarm may have been taken; but for long distances something more substantial is necessary, and a frame of honey will be required.

The box must be as light as is possible consistent with strength, and ventilation must be given on at least two opposite sides. I have had very good results with air space all round the top, the lid being raised and secured to the main body with perforated zinc.

Swarms should always be purchased by weight, and the buyer ought to insist upon receiving no other. There are 3,500 bees to

the pound, and four or five pounds would give a good working swarm. The plan of offering swarms containing so many thousand bees, when in reality not more than a third of the number make up the swarm forwarded, is becoming a thing of the past, and I do not suppose many would be caught in the trap now ; nevertheless swarms of no guaranteed weight are still advertised, and it is time bee-keepers set their faces against the practice.

Weighing Bees.

Where natural or other swarms are weighed after clustering inside the travelling box, they can be first secured and carried to the scales, and the weight marked upon the label. If they have to go a long journey, either place a feeding bottle over the zinc until starting, or see that a frame with sufficient sealed stores is securely fixed in before the swarm is hived ; the weight of such comb and the box to be noted, and presently deducted from the gross weight.

Where a definite quantity is ordered, the scales are to be carried to the hive by any convenient arrangement that provides correct balance ; take the weight of the package, and if the opening is not wide enough to admit a comb end-way, use a funnel lined with zinc. Now make sure of the queen and then shake from the combs the necessary quantity of bees, and insert the queen last of all ; close at once and pack for the journey.

They are to be first smoked in the usual way, and all the time they do not miss the queen, the bulk of the bees shot into the box will remain simply clustering on the sides. The operation should take place in early morning or towards evening as the bees are more restful, and they can be put up in less time as there are more at home. Give food if necessary as before.

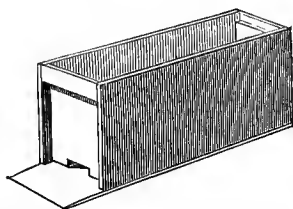
I consider the most satisfactory way and the more profitable to the purchaser when wishing to establish a stock of any new variety is to get them in

Three-frame Nuclei ;

but I do not mean such as are often sent out, and as some I have

myself received from abroad with not enough bees to cover one of the frames ; but such as can be built up with little trouble by the receiver.

To make up a fair nucleus of three frames, take from a strong hive all the bees from one comb, and one comb full of brood where young bees are rapidly coming forth, with all the bees thereon.



Nucleus Hive for three frames.

Place the brood comb at the centre of the small hive, the other bees having first been shaken in, and look up a comb partly stored to place on each side. Screw the lid down after inserting the queen ; place wire nails through into the frames at each end, and invert as for full stocks. Strong combs should be selected, and sufficient ventilation given without danger of chilling the brood.

The frame of hatching brood will presently give enough bees to cover three combs, so that with the other bees a queen gets a good start, though if the apiarist has them to spare, another comb of brood in like condition added every seven days will do wonders in building up to a full colony.





CHAPTER XXI.

HOUSE APIARIES, STORE ROOMS, &c.

IT would be a difficult matter to give hard and fast rules for putting up buildings to suit every bee-keeper. One may have premises that with little or no alteration suit his requirements. Another may have no room to put up convenient sheds, or the situation is such that any given plan could not be carried out.

I will therefore give ground plans of buildings, &c., that I have found to be convenient, and the reader may then make such modifications as may suit his own particular requirements, having the general idea in mind. At

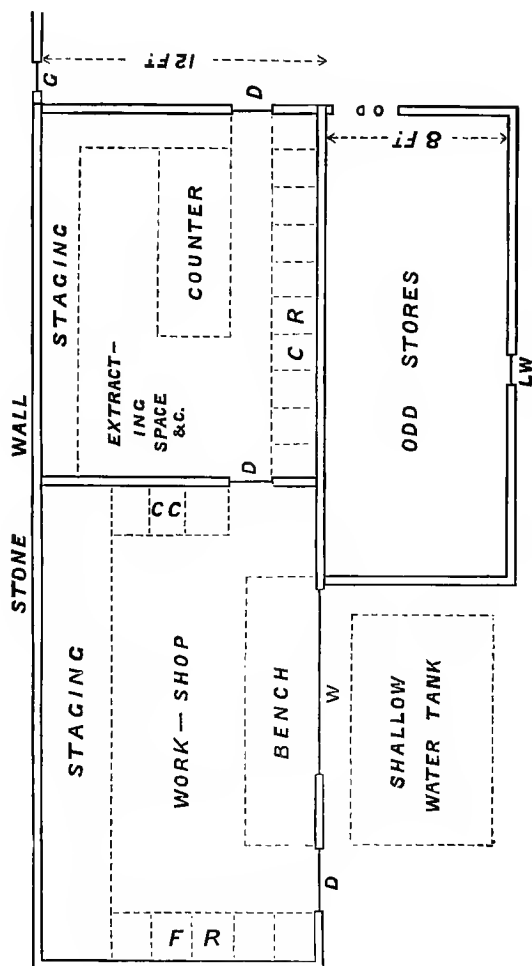
THE HOME APIARY,

the buildings are put up with 3-inch by 2-inch scantling as the framework, and $\frac{3}{4}$ -inch by 6-inch boards, matched and beaded. The roof leans to a stone wall at the back, and is there 10 feet from the ground. The front of the main shed is 6 feet from ground to roof; the outer store about 4 feet at the front.

The Workshop

is 20 feet by 12 feet, with communication to the apiary at **D**, passing a shallow water tank which is constantly supplied, and has cork dust floating on top for the bees to settle upon. This article, recommended by a correspondent in the *British Bee Journal*, is more satisfactory than anything I have tried for the purpose. Only the coarser material is used, after the fine dust is sifted from it.

The plan, to a great extent, explains itself; **F R** are frame-racks for hanging up frames as put together, or foundation when



Scale 1/8 inch to the foot.

inserted ready for use. **C C** are closed comb-cupboards, with ventilation through the hinged doors at both top and bottom by auger holes covered with perforated zinc.

The bench stands in front of

The Window,

the panes of which are in one piece, and *do not reach the bottom of the frame* by $\frac{1}{2}$ inch ; thus, when combs are first taken into the workroom any stray bees soon find their way out, as also at any time. To prevent them returning, perforated zinc is tacked outside along the bottom of the frame, and reaching 6 or 7 inches above the said opening, with a space of $\frac{3}{8}$ -ths of an inch between it and the glass. The above arrangement with fixed windows I prefer to any revolving sash, because a room may be left for days together, and the bee-keeper knows that not a bee will lose its life in the vain endeavour to escape, as with the other which needs constant attention to prevent much loss.

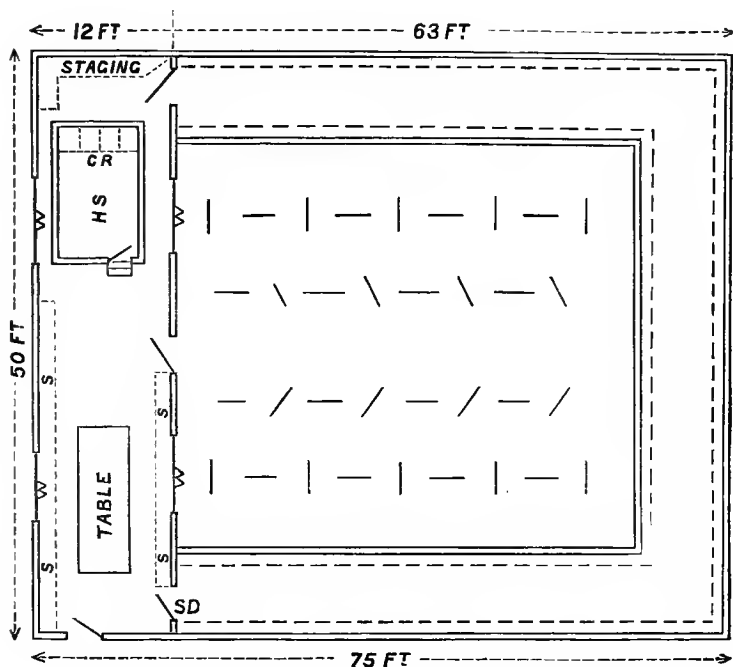
From the workshop we pass into the

Honey Room,

where by the passage from end to end the recess is occupied by frame-racks which will accommodate several thousand frames, empty combs, or those stored brought in from the apiary for extracting. At the other side of the passage we see the counter ; with staging on two sides near that, where crates of both bottled and comb-honey can be stored.

The open space gives room for extracting, arranged with or without a stage to assist in drawing from the extractor, as the apiarist may desire. Passing the other door, D, we again look upon a portion of the apiary, with the gateway G leading out of the premises. O D is an open doorway to the store for odd materials, timber, &c. The latter may be placed overhead in the workshop for greater convenience. L W is a latticed window, giving all the light required besides the open doorway. The honey room is lighted by a window in the roof, having no arrangement for clearing out bees as this is done in the workrooms before our honey is taken in, and every care is taken to keep out any intruder, while at the same time a thorough change of air is provided.

The floor of the honey room must be concreted, but the other is not of so much importance. It is sometimes recommended that a paraffin stove be kept burning in the honey store, but with the skylight sufficiently large, the heat of the sun will be quite enough to complete the ripening process, taking care that it does not shine directly upon the honey.



Scale 1/16-inch to the foot.

W Windows. **S** Shelves or Staging. **H S** Honey Safe, Extracting Room, and Comb Store. **C R** Comb Racks. — Position of Hives.

THE COVERED APIARY

occupies a space 75 feet by 50 feet, and is compactly built, with the entrances arranged so that no two are alike within several yards. The base of all the walls is a plank, 6 inches by 3 inches, under which is laid a single row of 3-inch bricks as with the

building first mentioned. All the framework is of 3-inch by 2-inch scantling and matched boards as before, which were put on when dry. The ground plan is as here shown. The only door communicating with the outside leads first into a closed room, 50 feet by 12 feet. Just beyond the centre we have the honey safe and extracting room, which stands 2 feet clear of the ground with woven wire on two sides opposite the windows. Steps lead to the door which is carefully fitted, and no bees are able to get in.

The long room has two other windows, and all have the glass arranged that no bees are ever found dead inside, as before mentioned. Stray bees are here disposed of before the honey goes into the safe. Between the latter and the outer door stands a table, 12 feet by 3 feet, for general manipulations. On either side with intervening passages are shelves for storing crates, and other materials.

The closed shed has a span roof, 10 feet high at the centre, dropping to 8 feet at the sides, and upon turning to the right after entering by the outer door, we pass a side door, S D, communicating with the sheds which form the other three sides of a courtyard. These sheds have only a lean-to roof, 8 feet high at the outside, and 3 feet 6 inches on the inside next the yard. The low sides are open, while the outside is all boarded, with openings 2 inches by 6 inches, left in front of each hive for the bees to work through.

We pass right round between a double row of hives until at the opposite door we again enter the long room. Hives are also arranged in the yard, which is reached by another door at about the centre of the wall on that side of the closed room. The latter is well ventilated by openings allowed above the four doors.

The Hives under Cover

are each on a separate stand, and such floorboards are made to provide a recess of 2 inches under the hive, not only to allow all refuse matter to fall clear of the combs and secure free admission of air during winter, but also as an advantage in summer, as it were meeting my non-swarmling plan half-way.

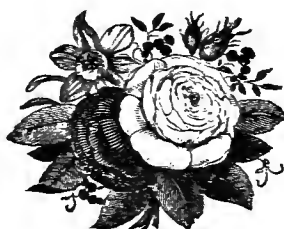
The advantages

that can be claimed for a covered apiary are as follows. The bees as well as the master have shade during the heat of the day at the season most attention is required. Shelter is afforded from wind and rain, so that any necessary work is carried on without hindrance ; and lastly the entire arrangement provides for a great saving of time in that all is compactly arranged in the smallest convenient space.

Provision is made for 150 colonies, and all round the 8-foot wall nuclei can be placed in narrow hives close to the same about 4 feet from the ground, resting on the central rail of the framework.

Bee-houses so-called,

but being merely cupboards, with two or more rows of hives, leaving neither room for tiering nor ordinary manipulations, are not worthy a place in the modern apiary ; moreover no arrangement in larger houses can be in any sense convenient where an attempt is made to arrange an upper and lower row of standard hives.





CHAPTER XXII.

THE PRODUCTION OF WAX;
AND NON-USE OF FOUNDATION.

THE more one studies the matter the more is he convinced that wax should be a profitable product of the apiary. We have been told over and over again that the bees consume 20 lbs. of honey while producing 1 lb. of wax therefrom. Upon the face of it the idea is merely theoretical, as in the first place it is ridiculous to presume that an article costing, if we say only 5s. (20 lbs. honey at 3d.) could be sold for 1s. 6d. Supply and demand regulate prices, and, as a matter of fact, wax is comparatively scarce; therefore it is time the question of cost is set at rest once and for all. In making

A Test by Experiment,

there are several important factors to be considered; the bees must have access to both water and pollen, but no brood must be at the time produced. The experiment should be carried out where the bees need not be confined to the hive, and yet they must gather no other food than that supplied to them for the purpose. The test should be carried out under a high temperature, and a fair swarm used for the occasion.

I have been able to provide all the above conditions, except as to temperature, and the result is that I find about $6\frac{1}{2}$ lbs. of honey give a pound of wax.

Aids to Production.

The apiarist who has all the colonies and all the combs he requires is the one who will make the production of wax profitable. He will have a great deal from cappings in extracting, and many an odd piece, all of which should be placed in some convenient receptacle till enough is obtained to run down. There are the queen cells even; shavings from combs when reduced to brood thickness in spring; also the scrapings from the tops of frames, not including the propolis.

Then, again, new worker combs can be produced in spring between the others containing brood, while feeding dry sugar, at a great saving over foundation; the apiarist then being able to run down his more irregular combs, or those that are getting too old; or, as is sometimes the case, the wax being perished, such would only be torn down by the bees, as they do not appreciate combs that have been out of use for a whole season, and if possible all should be passed through the hive every year to keep them in good order.

During the season that bees are storing heavily I have reason to believe that the secretion of wax is continually going on, and if the scales cannot be utilised they are allowed to drop and be carried out as so much refuse. Now the space allowed below the brood chamber provides that full employment shall ever be given should it happen from any cause that the supers are not removed in due time and the bees there kept busy. Thus we have another step towards the production of wax. When one desires

To Produce Wax in Quantity,

a colony must be run for extracted honey, and at suitable intervals alternate the combs of brood or stores with starters only in the frames. Between the stored combs these would be built rather thin, but the sealed combs are to be removed and the honey extracted as soon as the new ones are built to about two-thirds of the frame capacity; other empty frames take their place, and so on in rotation. This process cannot be carried out to any extent

between brood combs, except as described for spring work or when a young queen presides over the colony, otherwise some drone comb will be built ; and the production of useless drones shows a great defect in management.

Another plan, by which a large number of colonies can be kept and much wax produced at little expense of labour, is to place several chambers fitted up with starters under the brood nest early in May. The bees will gradually work down, and the production of brood will be regulated in accordance with the amount of income, and no trouble with swarming will be experienced.

Where Swarms have been Hived upon Starters,

I have avoided the building of drone combs by placing the frames rather less than $1\frac{3}{8}$ -inch from centre to centre. This point appears to have been overlooked by many in America who have followed Doolittle, who for a long time stood almost alone in his endeavour to show that foundation was used in many cases at a loss.

W. Z. Hutchinson took up Doolittle's idea and has been the cause of the plan becoming more generally used ; but not only does the complaint come that much drone comb is built, but also that

Pollen is Stored in the Sections.

The latter trouble also I learned to avoid when hiving swarms upon full sheets of foundation in my endeavour to get the best work started in the sections. Just as I hived swarms upon foundation, I now put them upon starters, with the addition of two combs of brood ; one with uncapped larvæ, and the other having brood hatching. Thus the bees have room to store the pollen carried the first day or two, without spoiling the partly finished sections when they happen to be removed from the old stock to the swarm ; and what is of equal importance, there is just sufficient brood to make up for wear and tear before a general hatching would otherwise take place. Moreover the queen is kept below without the useless and expensive addition of the excluder zinc. Mr. Hutchinson is obliged to use where starters only are given under the sections.

My plan is not to throw the bees entirely into the sections as soon as they are hived, but simply to prevent the production of an excess of brood in the height of the season, and with the two combs of brood so arranged the colony is worth wintering after the season is over ; whereas in the other case several have to be united to get a fair stock. But, I am told, the bees will not work in the sections with so much room below ! Have I not already shown that full stocks will do so with plenty of room under or in front of the stock combs ? And if your bees will not go into the supers, when they are strong enough and honey is to be had, do not wait for their pleasure, but *put them in* by either of two ways.

To make the Bees go into the Sections,

first secure the queen and cage her above the sections for a few hours, and when you go to the hive you will find the super crowded ; remove her quietly and let her go in by the entrance. Another plan I have found successful is to place the crate on a sheet of paper on the ground, raised on one side that the bees may draw under, when many of the bees are to be shaken off the frames close to the same when they will cluster in the sections. They may be thrown on top without lifting the crate, and though some will of course return when the super is replaced, our object is accomplished.

This is best done towards evening, and when desirable to add other swarms within a few days, these can be hived in upper crates without their queen.

All the above has reference to the profitable production of wax, and I shall be excused for bringing these particulars of management in here, more particularly as the whole question has received but little attention from bee-keepers generally.

When Foundation may be used to advantage.

Now I do not consider that foundation is always used in the stock chamber at a loss ; in fact it can be adopted at considerable profit when "time" is the object.

A bee-keeper has to increase his stock of both bees and combs, and then considerable time will be gained by taking advantage of

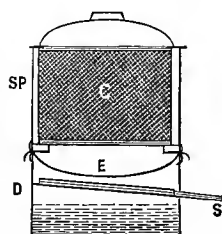
foundation; though it should be borne in mind that increase is obtained at the expense of honey.

When the honey season arrives we have to be prepared with plenty of storage room, and therefore nothing less than full sheets of foundation can be tolerated in our sections, while if already drawn out in preparation for the harvest, the results will be far better. If suitable foundation with a thin base is used there will be no difference to be distinguished between such combs and those built from starters only, while the appearance of the surface when capped will be much better than that of those so often finished off with drone cells.

While the profitable production of wax will be carried out by those who have completed their stock, much will depend upon locality, as well as the culture of bees most suited to the purpose.

Wax Extractors.

Solar wax extractors are frequently used, with a large surface of glass, on a frame; all being air-tight enclosing a perforated vessel to take the wax and a pan under, but these are not so satisfactory as those worked by steam. A cross section of a suitable wax refiner is shown in two sections. A piece of fine flannel **E** must be stretched across, under the perforated comb holder **C**, thus thoroughly refining at the first operation. The wax running on to the false bottom **D** passes out by the spout **S** into any convenient receptacle. When it is required to work from a steam boiler, the steam pipe **SP** can enter where shown, and no water will be required below, as when placed over a stove. The wax will be of still finer quality if the vessel it runs into contains warm water.



Sectional View of Wax Extractor.

Cost of Producing Wax.

An experiment was conducted in a large flight room, 50 feet by 10 feet. A swarm of nearly 3 lbs. weight was made up and

given frames, with a line of wax as a starter to each. I determined to avoid the complication that would arise if brood were produced, but at the same time it was necessary to have a fertile queen presiding, or the bees would not work to the best advantage. The new combs were therefore removed every three days, and though occasionally eggs were to be seen, no food was consumed in their production other than that fed to the queen. The removed combs were placed behind the division board, and were emptied of their contents by the bees, to be again used in filling fresh frames.

Thus without extracting, the combs were taken away perfectly dry, with the exception of the three last; and to make sure of wasting none of this remaining honey the combs containing it were run down in a vessel with no added water. The bees had access to both pollen and water while building, and from 6 lbs. of honey fed to them they gave $6\frac{1}{4}$ ozs. of clear wax, with a balance of 15 ozs. of honey left over. If I say an even pound left I shall be nearer the mark, as the bees had the means of loading themselves much more heavily than when the swarm was made, as they were then forced to consume what they had before commencing to build. Five pounds therefore giving that quantity of wax, it would be supposed that it takes $12\frac{1}{2}$ lbs. of honey to give a pound. But our experiment is not yet completed; the bees had to live during the twenty days taken to carry it out. Being in a confined area during autumn when the weather was far from being as warm as could be desired, the expense of production would be very much more than when new combs are built in the height of the season. The bees did not get on so fast, especially as the best combs were removed in time to prevent the production of brood and towards the last the supply of honey became very limited.

To Get at the Cost of Living,

after removing the last of the combs and balance of the honey, the bees were given just 1 lb. of honey in a feeder arranged so that they would not get it fast enough to go on building. After the fourth day there were 6 ozs. left; but here is a little difficulty: they could not require 10 ozs. in that time, and on removing the

feeder with balance of honey, and giving four empty combs they put about 2 ozs. into the cells. This would still leave 8 ozs. consumed, or 2 ozs. per day while in active flight. Then for the twenty days we have 40 ozs. consumed to preserve life, which deducted from the 5 lbs. leaves 2 lbs. 8 ozs. actually used in producing the $6\frac{1}{4}$ ozs. of wax; thus, to produce 1 lb. of wax $6\frac{3}{4}$ lbs. of honey would be consumed.

When the cost of living was carried out the bees were reduced about one-third, so that 2 ozs. per day should be within the mark. In the height of the season with everything favourable it is only reasonable to say that the cost of production is really much less, and probably not more than 5 lbs. of honey are consumed in actually producing one pound of wax.

Comparative Cost.

In the course of the experiment I found that about eight standard frames (14 inches by $8\frac{1}{2}$ inches) of new comb will give one pound of refined wax. It is surprising what a large amount of refuse is found after melting the most beautifully white combs, so that the actual weight of wax obtained is much less than that of the original combs. *Observe this*: one pound of wax, costing the producer less than 1s. 6d., fills eight frames. To do this with foundation $1\frac{1}{3}$ lb. of that article is required, costing in hard cash at the least 2s. 6d. for the base only; to this the bees add considerable of their own production before the combs can be completed; making the total cost much over 3s. Facts are stubborn things, and cannot be ignored.





CHAPTER XXIII.

MANAGEMENT FOR HEATHER
HONEY.

HITHERTO no work has given special treatment for the production of heather honey ; and yet it is a subject of the first importance to hundreds of bee-keepers, nearly all of whom wish for some better method than they now possess for making the most of this late harvest.

Late in the season bees must be close to, or in the midst of the crop they are to gather from, and in the case of heather large quantities of honey can be, and often are secured, but in nearly every case the stock combs receive, and are totally blocked up with what the apiarist desires to get stored in the sections.

Heather honey being so thick, it is quite impossible to extract it unless removed as fast as gathered, and this is not desirable. It is natural for bees to crowd the stock combs late in the season as many find to their cost ; but why is it so ? It is not that the nights are cooler, as frequently the temperature at night is much higher in August than during May, when bees work well in the supers. It is not even that the bees are aware that the season is drawing to a close, as many consider ; but if we would go to the very starting point of the trouble, we shall find that

The whole question centres upon the Queen,

as every bee-keeper may prove for himself, and as he will admit as he follows my statements.

Now, what is the condition of the colony which goes first into the supers in early summer? Have I not already shown that the hive must be full of bees, and have every comb *literally crammed* with brood, when the honey *must* go into the sections? Well, go and do likewise for your heather crop! Imagine that you have another year, a new season coming in, instead of a late season in the same year; and then you will have your honey where you want it.

But, you say the bees will *not* breed to any extent late in the year. True, the same queen that you have used all the summer will be of no use to you in this emergency, and just here is the point. You are then to

Use a Young Queen,

and the best way to have one in readiness for every hive is to follow my plan of using every tenth colony for nuclei as already shown. Your first harvest closes towards the latter part of July, and as soon as the supers can be removed, dethrone the old queen and unite the stock and nucleus. You now have a stronger colony and a young queen who will take good care that her domains are not crowded with honey. *Her* first season is just coming and the bees will act accordingly.

This is a special case and special treatment is required, as the honey nearly always comes in so freely that by the old method, the already exhausted queens are soon crowded out and by the time the harvest is over, the workers are worn out; whereas with the young queen we have a good stock left, with bees still hatching to make up for the tremendous loss of life. More honey is accumulated because the population is larger and does not decrease as only too frequently has been the case.

Of course only worked-out combs are to be used in the sections, including those not completed from the first harvest, after being cleared by the extractor.

At the termination of the earlier harvest if any stores are left in the stock combs, the same should be extracted, and in

Uniting with the Nucleus,

only those combs most crowded with brood should be used. The odd combs of brood can be given to one or more lots left at home. Some reader may say that his hives *are* crowded when his bees go to the moors. They may be, but like the queen such bees are already exhausted by their previous labours, and new blood is required throughout if one wishes to make the most of this last important harvest.

If necessary feed "from hand to mouth" after uniting, until time for the heather, but on no account feed heavily, as advised recently by a correspondent in the *British Bee Journal*, who hoped thereby to fill up the space the old queen could not occupy, and so expecting that the heather honey would all go above, and that when the bees came home they would require no more feeding. True indeed, for there would be no bees to require it. How utterly inconsistent, to add wear and tear, when the whole energy of our workers should be reserved for the storage of honey! And how very injudicious to crowd the queen out at the very time we require one that will still further extend the brood nest in preparation for the good time near at hand.

When Moving to the Heather,

everything should be got ready and loaded on the vans overnight, and if not desirable to travel during the night the journey ought not to be delayed later than 3.0 a.m. Upon reaching their destination the hives should be treated as before shown after a journey.

The Supers should Travel separated

from the hives, and be arranged in position on the next day after the bees have been liberated. Each stock should have an extra chamber for better ventilation, and all openings for the admission of air must be shaded, so that there may be as little excitement as possible to exhaust the bees.

My "Tenth" Method

of providing a young queen for *every* hive *yearly*; uniting at the right time; *i.e.*, before feeding up where there is no late harvest, or just before a late gathering is expected, will also prove invaluable in many places in the States of America and other places where the gathering of stores so late as September, and sometimes in October, leaves the bees totally unfit to stand the rigours of winter, through the queen that has been used all the season failing to keep up the necessary supply of young bees.

The young queens are not to be raised before July, while in some instances it may be desirable to have them come on in August when the last flow is extra late.

After uniting, the capacity of ten or eleven standard frames only should be allowed at this date, and no empty chamber will be required under or in front of the same, as no swarms will issue with the young queens.

Another Plan.

Where one will not take the trouble to raise young queens for the purpose, and desires to make use of the heather honey stored in the stock combs, such must be removed one or two at a time and placed in another chamber below the brood nest after having the cappings sliced off, when the stores will be carried above provided the sections are filled, not with foundation, but combs already drawn out. In long hives such removed combs should be placed behind the division board.





CHAPTER XXIV.

DRIVEN BEES.

WHERE these can be secured in Autumn, the general rules laid down for management of ordinary stock will of course apply in their case.

There are, however, a few minor matters that require attention, especially by those who have had no practice in this undertaking. Where the surrounding cottagers are willing to part with their bees instead of killing them, the general way is for the bar-framist to have them for his trouble, but on no occasion should he give more than 1s. for each lot, or they may turn out a dear bargain.

How to Carry the Bees.

By using lightly-made straw skeps, the bee-keeper can carry eight or nine around his shoulder, slung on a broad strap. Thus by uniting as they are taken, two and three lots into one, I have been able to carry home the bees from a large number of cottagers' skeps, over a distance of four or five miles, where no trap could go. When a conveyance can be taken, suitable well-ventilated boxes can be used to greater advantage.

As soon as the bees are driven from their combs, secure them at once by tying a porous cloth over the mouth of the skep; and when two or three are to be placed together, let them be united as soon as driven, first securing the queens not wanted that a young one may preside. If there is any use for other surplus young

queens, place such in Benton cages with a dozen or more workers each.

The Novice

should always begin by driving a skep or two of his own at home, and never attempt to practise first on the property of others, not only for the sake of his neighbour, but for his own and that of bee-keeping generally. After some experience in driving, then Mr. Lyon's "Bumping" process can be followed to advantage in many cases, though driving will often be more satisfactory, as being less inductive to robbing, there being no broken honey to excite the bees.

Mr. Lyon advises that all hives not being operated upon are to have their entrances closed with a bunch of grass inserted lightly, that ventilation may not be impeded. Where an outhouse can be utilized however, there is no need for this operation.

Attention has already been called to

Foul Brood,

and the bee-keeper should be on the watch for this when he may be taking bees. Where found the bees will be perfectly useless, as it would have developed during the spring, and the remaining occupants of the hive will not pay for their carriage home. Tell the owner of the condition of his bees and get him to smother them the same evening by the old plan, both for his own sake and the benefit of his neighbours. The whole skep must be burned; and do not fail to impress him with the importance of leaving none of the honey in any way exposed.

When to Hive the Bees.

One is so often told that it is necessary to place the bees in their new hive the same evening they are brought home, that I think it necessary to show how robbing need not occur, even if combs wet from extracting are given to them in at the middle of a warm day. It is considered that when put in during the

evening all the bees congregate to the hive, but they would not in the daytime, besides being liable to get robbed out.

The fact is, with cool evenings often experienced in autumn, many bees are lost by not being able to note their location ; whereas in the middle of the day they gradually settle down to the one spot like a new swarm and not one is lost, while the bee-keeper is able to find his extra queens and is in no trouble about darkness coming upon him before he has half finished.

Place the Frame-hives in Position,

quite empty, and shoot in the bees, taking care that only one queen is left to preside over the two, three, or more lots united. Now get your stored combs, or those fresh from the extractor, and arrange them in position ; put on the quilt and cover all securely, leaving the entrance several inches wide. As the stores are inserted just before closing no robber bees are on hand ; but where empty combs or foundation have to be inserted, feed carefully until the hive is well stored.

Taking average lots, the number to put together to make a fair stock should be as follows, according to the manner in which their house may be furnished—with stored combs, two swarms ; with empty combs, three ; foundation, four.

Uniting to other Stocks.

A wasteful plan, which results only in loss of bees and time, is that of adding driven bees to weak colonies at home. Without considering that fighting is almost certain to cause the death of thousands in the hands of many bee-keepers, but too frequently these bees only die out before winter is half over, leaving the stock worse off than before.

To be in any way satisfactory the driven bees must first be made to develop a fair-sized brood nest in another hive on the spare combs of such lot ; when plenty of young bees are hatching *then* unite to your weak lot, saving the queen most to be desired. Feed and prepare for winter as hitherto shown.



CHAPTER XXV.

HONEY, AND SOME OF ITS USES.

BEE-KEEPERS generally are prone to consider that honey is good for everything ; but our ideas must be somewhat moderated before we can hope to teach others to appreciate its real advantages. That it is a wonderful gift of nature no one will deny ; and that it stands almost alone as a pure natural sweet, perfect in itself, we are all aware. There are very many who have the impression that bees *make* honey ; but this is far from being the case. Flowers *secrete* nectar under the chemical action of the atmosphere upon the juices of the plant, and this process is continued daily until the bee while *gathering* such production is the means of mixing the pollen of different flowers, and thus being fertilised and the plant made capable of reproduction by seeding, the object of the sweet attraction is accomplished ; the flower fades, and the nectaries are dried up.

Medicinal Qualities.

Honey requires no digestion, but enters immediately into the system ; it is productive of heat, and by its regular use, the entire organism is benefited in a high degree, as it not only stimulates the appetite and aids digestion, but is at the same time better than any medicine for regulating the system.

Persons inclined to be costive, especially children, will find honey restore them to a perfectly normal condition ; while the continued use of purging medicines on the other hand causes

a distressing reaction, because each dose impairs the delicate membrane of the stomach ; whereas the only rational course to pursue is to endeavour to restore the injured or relaxed parts.

Consumptives have received great benefit from the constant use of honey. Instances are on record where persons have been quite cured by it ; while others past all hope of recovery have enjoyed many years of life they had ceased to hope for or expect.

In that honey aids digestion, it of course gives healthy action to the liver, purifies the blood, and improves the general health.

A very distressing malady which will seldom yield to allopathic treatment is that known as "gravel." Honey taken daily will soon effect a cure, and I am quite sure those tortured with this complaint will not fail to avail themselves of such a simple remedy.

For colds, coughs, and sore throats, I suppose there is hardly a household but has had some experience with the use of honey either alone, or mixed with vinegar, lemon juice, or even butter, in case the palate does not appreciate the pure article alone.

Honey as Food.

Though the sweetest of all sweets, honey is not suitable for cooking purposes in such a general manner as sugar, requiring a much larger quantity to sweeten many articles of food, as well as being more costly. There are many things however which are much improved by the addition of honey, such as fruit pies or puddings, cakes, &c. ; while a basin of bread and milk is made very palatable when sweetened with it.

The following are among many excellent recipes given in Mr. T. G. Newman's "*Honey as Food and Medicine*" :—

"Extracted honey is superior in every way for preserving fruit. Add one-third as much honey as fruit, boiling until the taste of the honey has evaporated.

"Those engaged in harvesting and other occupations tending to create thirst, will find the following preparation a very palatable and healthful drink in hot weather :—Take 12 gallons of water,

20 lbs. of honey, and the white of 6 eggs. Boil one hour; then add cinnamon, ginger, cloves, mace, and a little rosemary. When cold add a spoonful of yeast from the brewery. Stir well, and in twenty-four hours it will be ready for use.

“For cooking green fruit use only extracted honey, which being the only liquid, holds the fruit firm and gives a very rich flavour. Sweeten or season with spices to suit the taste, and cook slowly until done. Serve dried fruit the same, only adding enough water to swell the fruit.

“To make Ginger Honey Cake, take $1\frac{3}{4}$ lbs. of honey, $\frac{1}{4}$ lb. of butter, $1\frac{1}{2}$ lbs. of flour, 1 ounce of ginger, $\frac{1}{2}$ ounce ground allspice, 1 teaspoonful of carbonate of soda, quarter of a pint of sour milk, cream if you choose, 3 eggs; put the flour into a basin with the ginger and allspice; mix these together, warm the butter and add it with the honey to the other ingredients; stir well; make the milk just warm and dissolve the soda in it, and make the whole into a nice smooth paste with the eggs which should be previously well whisked. Pour the mixture into a buttered tin; bake it from three quarters to one hour; take the white of 1 egg and beat it up with a little sweet milk, then brush the same over the top with a feather to give it a glossy appearance.

“Honey Sponge Cake is nice eaten warm, and consists of two-thirds of a breakfast cup of sour cream, 3 of flour, an even teaspoonful of soda, 1 cup of butter, 3 eggs, $1\frac{1}{4}$ lbs. of honey, 1 tablespoonful of cinnamon, $\frac{1}{2}$ ditto of allspice, and a little extract of lemon; mix the spices with the flour; put the soda in the milk and stir well, that all the ingredients may thoroughly mix: beat the cake well for another five minutes; put it in a buttered tin—bake from one-half to three-quarters-of-an-hour.

“Butter Honey Cake is pronounced by all to be excellent. One pint of flour, 1 tablespoonful of butter, 1 teaspoonful of soda, 2 ditto of cream of tartar, and honey sufficient to make a thick batter. Spread out an inch thick, and bake in a hot oven.

“To make Mead, not inferior to the best foreign wines, put 3 lbs. of the finest honey to two gallons of water, two lemon peels to each gallon; boil it half-an-hour, and skim well. Put in the

peel while boiling. Work this mixture with yeast, and then put it in a vessel to stand five or six months, when bottle for use. If desired to keep it for several years, add four pounds of honey to a gallon of water.

"A cheap Honey Tea Cake is made with one teacup of extracted honey, half ditto of thick sour cream, 2 eggs, half teacup of butter, two of flour, scant half teaspoon of soda, one ditto of cream of tartar; flavour to taste.

METHEGLIN.—"Mix honey and water strong enough to carry an egg; let it stand three or four weeks in a warm place to ferment; then drain through a cloth, and add spices to suit the taste.

"Honey Vinegar is obtained as follows: Heat 30 gallons of rain-water and put it into a barrel; add two quarts of whisky, three pounds of honey, three-pennyworth of citric acid, and a little mother of vinegar. Fasten up the barrel, place it in the cellar, and in a short time it will contain vinegar unsurpassed for purity and excellence of taste."

Mr. Allan Pringle gives a substitute for tea and coffee:—Take three quarts of good, clean, wheat bran; and bake in the oven till it becomes quite brown. Then add one quart of liquid honey and stir thoroughly; put it back in the oven to bake still more, stirring it frequently until it gets dry, granulated and very brown. Draw it the same as coffee and use with milk and honey, or milk and sugar to suit taste.

Honey-Lemonade.—Make it in the usual way, using honey instead of sugar; nothing can be used as a summer beverage that is more grateful and refreshing. Try it. Many thousands of pounds of honey may be used in this way, and all the users be benefited.—*British Bee Journal*.

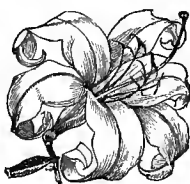
General Uses.

Besides the foregoing, honey is used in preparations for preserving leather; in ointments for various purposes, such as for chapped hands; sores, &c.; and is very largely used by chemists in

their many preparations. For printers' rollers it takes the place of sugar, doing better work, and making a more durable article.

The reader will thus see that honey is not simply an article of luxury, nor of ordinary diet ; and instead of bee-keepers complaining that there is little demand for their produce, let each endeavour to find some new use for it ; and thus make an opening for the consumption of honey by the ton, where otherwise it would never have been thought of.

A large firm of biscuit makers were induced to start a new biscuit, sweetened with honey, and thereupon required two tons of the bees' product weekly. Though we may not often find an opening for it to this extent, there are many ways in which honey is, and can be disposed of, other than for table use.





NOTES BY THE WAY.

Dear Reader, to enable you the better to succeed, set up a standard of perfection that you wish to attain in your management. Never mind if it appears almost impossible to gain that end; if you will only keep the desired object in view, and work earnestly, depend upon it you will be almost certain to reach your goal.

The reader will have little idea of the great difficulty experienced in obtaining a good photo of the bees on a comb, even with the most approved apparatus. Many negatives were taken, and a number of visits made by the photographer before anything like a respectable picture could be obtained. We hope to try again and have something better for future copies.

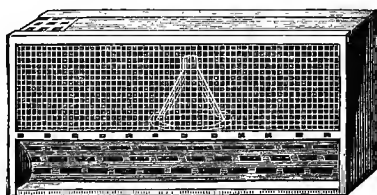
The first photo in the book also required the exercise of a great deal of patience before all the babies could be induced to remain still; and then, perhaps, the position of the entire number would not be just right. Though the mother may appear a little worried with such a tribe, we have selected the best general arrangement, and to those to whom we are thus introduced our very best wishes are offered for their prosperity.

The process of contraction has long been practised by beekeepers, but it was left for Mr. J. E. Pond, jun., of America, to reduce the plan to a system. He shows that stock combs may be

crammed with brood to the almost total exclusion of honey if the frames be spaced only $\frac{1}{4}$ inch apart when sections are put on, the latter receiving the entire crop. With no honey and no drones below, the bees are less inclined to swarm.

The above advantages are claimed for inversion of the stock combs, but that craze has already seen its day, and soon little more will be heard of it, as the same results can be secured without inverting at all.

A very practical aid in controlling swarms is Mr. H. Alley's swarm trap, or what is incorrectly called a "non-swarming attachment." It does not prevent the issue of a swarm, but when one does come out the queen cannot, or generally does not, pass the perforated zinc; and finding her passage impeded she rises through a funnel tapering to a small opening at the point; which once passed is not again found, as the light attracts her to the perforations at the top and front. The instrument is placed close up to the entrance, but does not impede the passage of the worker bees, though all drones are secured. The swarm comes home again, while in the interval the apiarist, if on hand, has secured the queen, to be returned after giving more room and removing queen cells; or she may be otherwise utilized with her swarm, leaving one queen cell for the old stock.



Robbing was almost omitted as a point of little importance, as it is quite a rare occurrence in my own apiaries; but I am aware that many novices are troubled somewhat in this direction; but this difficulty is nearly always brought about by carelessness. A

weak lot may stand for months and never be touched, but only break open the same hive during the day when many bees are on the alert, seeking what they may devour, and the fate of that hive is soon sealed. No syrup or honey should be spilled or left about in any shape or form, especially in autumn, or the desire for plunder once started the uninitiated will find he has a job on his hands. Open hives only in the evening and early morning in Autumn, discontinuing operations as soon as other bees begin to follow. See that entrances are reduced according to the strength of the colony, and take care that there are no back ways such as cracks or badly-fitting roof.

Having provided for prevention, we must now consider the best means of curing the robbing mania. A very sensible plan sometimes recommended is to exchange places with the hives; thus the robbers come on the stand where they had been robbing and are quite bewildered. Another way is to unite the two. Carbolic acid placed in the front of the hive being robbed will at once stop the marauders; so will dripping sheets, or the watering can; but at the same time the entrance of the besieged hive is to be reduced so that only two bees can pass at a time. After all there is nothing like prevention, as is evidenced by the fact that I can work all day long in my queen-raising apiary without a single case of robbing; and why? Judicious planting! friends, enables me to keep right along without the usual disagreeable trouble in autumn.

Those who wish to have a variety of plants for bees, or to experiment as to those best suited for their own convenience or surroundings, will be interested in Mr. Dobbie's little work, "Bee Pasturage."

It has been considered that practical bee-keeping owes much to science, and that scientific bee-keeping owes little to practice. What is science but ascertained knowledge, gained by the con-

tinued practice of ages? the good being consolidated, while the chaff has been expelled. Correct practice alone constitutes and establishes true science.

The British Bee-keepers' Guide Book, by Thos. W. Cowan, Esq., is a practical work which I have often had the pleasure of recommending to beginners during several years past. It has passed through several editions, and being also printed in the French language it has an additional value.—J. Huckle, King's Langley, Herts.

Queen bees with the necessary attendants have been refused by the General Post Office as letters from abroad, and have been returned when registered. Strange as it may seem they are passed by "Parcel Post," though the boxes are much less secure. I have had no difficulty in exporting when registered, nor when sending to any part of Great Britain. Nevertheless, in case of any accident it is unwise to make application, as the authorities will not be responsible.

The British Bee Journal should be read by every bee-keeper, and is especially valuable to beginners, as queries are answered without charge, helping them over many a difficulty in their novice days.—J. Huckle, King's Langley.

By a careful experiment I have found there are 3,500 worker bees to the pound. Queens will live from three to four years; drones, three months; workers during summer, six weeks, and through the quiet months of winter six months.

Robbing again. Here is another cure. By autumn your hives have been deprived of most of their stores; you hardly dare open a hive at any time. Well, feed *all* at the same time, giving the

full dose required in the course of two or three days. Not the slightest inclination to rob then exists.

A queen may be mated when six days old in exceptionally fine weather ; and will commence to lay on the third day after ; but more generally they are much older before mating ; though if not laying at twenty days after hatching a queen is seldom of any use.

Cyprian and Syrian queens are much smaller than those of either the Carniolan or native kinds. The drones also are smaller, consequently I find where only males of the larger races are flying, the Cyprian or Syrian queens are often long in finding a mate.

I have had small queens accept the drone, but to no purpose, and while those of the above races are naturally smaller than the others, every precaution must be taken to raise only well-developed queens.

The Bee-keepers' Record, published in Liverpool, and edited by two well-known veterans, Mr. W. Raitt, of Blairgowrie, and Mr. W. B. Carr, of Higher Bebington, is a sprightly little journal full of valuable and interesting information. Costing only 2s. 6d. per annum, no bee-keeper can afford to be without it.—Gibbs & Co., 49, Moorfields, Liverpool.

Langstroth on the Honey Bee, is a work full of interest as illustrating the rise of the present system of movable combs. The author gives much valuable information upon many of the plans used to the present day.—Geo. Neighbour & Sons, 149, Regent Street.

Whatever requires doing about the apiary should be done at once. If left for another day, an important matter is liable to be

forgotten when many other things require attention, and considerable loss ensues. Where any need cannot be attended to immediately some note or sign must be made, but the apiarist should not make a note of every little detail that requires his attention, or such a course will only tend to weaken the intellect.

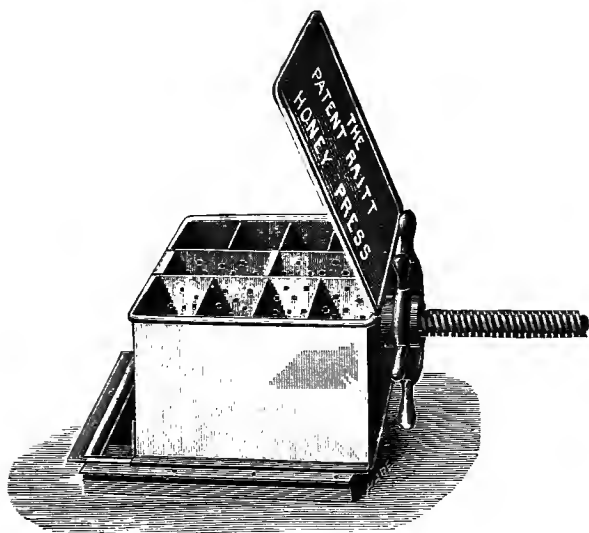
I make very few notes except in queen-raising, and in passing through my apiaries, friends have often been surprised I could give the entire history of each hive we came to. Long-continued practice makes all simple, and being day after day among a large number of colonies, their study becomes part of one's nature.

Fertile workers are not often troublesome except in the queen-raising apiary. When they persist in laying in nuclei, do not attempt to give virgin queens, but at once supply a good fertile queen on a comb of brood, with accompanying bees; this also being the very best and simplest cure where they are found in stocks of greater strength. The worker deposits eggs in a very irregular manner, sometimes a dozen or more in one cell.

Where eggs of fertile workers are placed in worker cells, many of the larvæ die before reaching maturity, otherwise the cappings are much raised above the surface, as with normal drones; and those that do hatch appear equally as perfect as the latter, though, of course, dwarfed in appearance.

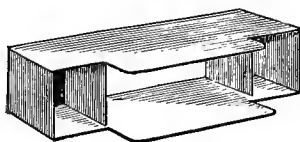
The wholesale prices for honey have now settled where business can be carried on upon a large scale, and if producers will only conform to these rates, we shall hear no more about being unable to sell. Bottled and canned honey, and that in bulk will, no doubt, fall lower; but comb-honey will remain firm at present quotations.

A most exhaustive treatise upon the anatomy and physiology of the hive bee, as well as its practical management is being brought towards completion, and will prove to be the most extensive work of the kind yet published. Part I., treating of the natural history, is already finished, and has received well-deserved commendation. The author, Mr. F. Cheshire, is a well-known scientist who has spent many years of his life in studying both the scientific and practical departments of bee-culture.—London: L. Upcott Gill, 170, Strand.



There has been some talk lately about Honey Pressers, for clearing combs more thoroughly of honey, and as a better means of separating heather honey from comb. The accompanying illustration explains itself; the central chamber receiving the combs to be pressed and the honey running out at either side to be strained below. The advantages to be derived from such a process are questionable, as it is impossible to give pressure in any manner without imparting the pollen flavour to honey. The apparatus is made by Mr. Meadows, of Syston.

Metal ends have already been referred to ; there is only one kind however that permits of gauging at two different spaces— $1\frac{1}{2}$ -inch and $1\frac{1}{4}$ -inch—and that is the one here illustrated ; the invention of Mr. W. B. Carr, of Higher Bebington, Cheshire.



While it is impossible for one to make a success of bee-keeping, if he has another "business" on hand which requires constant and regular attention ; there are, of course, a number of light occupations that can be adopted to fill up one's spare time. If bee-keeping is the secondary consideration, then the bees must often be neglected at the most critical time, and loss consequently results. One may keep poultry to advantage, especially where certain crops are grown for the bees as elsewhere shown. A large apiary will keep the owner busy during the winter months preparing for the following season ; but there are long evenings in winter, and other times when the want of some suitable work will be felt. Each must consider what is best suited to himself ; what he can obtain ; or what course of study may ultimately be of advantage to him. Something must be taken in hand that can be picked up at any opportunity, and that can be laid down the moment the bees require attention. One may be at work during the usual hours of the day, but that is no reason why he should spend the remainder in idleness and frivolity. Not for a moment do I intend that a holiday should never be taken ; but a bee-keeper especially, though his work is often laborious, has a holiday every day ; for is he not always in the open air, gaining health and strength, as well as having constant pleasure in studying the wonderful works of nature ?

Fertilization of Queen Bees in confinement ! The greatest wish of enthusiastic bee-keepers is apparently as far from being

accomplished as ever. I have given this subject much study and have made more extensive experiments than perhaps any other apiarist; but so far it appears that nothing of practical utility is to be gained where a succession of queens is required on a scale sufficiently large to enable one to offer them for sale. I had no difficulty some years since in getting bees to fly freely in a greenhouse, 20 feet by 8 feet, with the glass covered on the inside with wire screens. The space was too limited for the object in view, and I then put up a canvas-covered flight room about 30 feet by 8 feet, and another still larger—50 feet by 10 feet; but so far my success has been too limited to speak hopefully of the project. That it is to be done I am quite aware, but on a scale all too expensive for one to hope for full repayment; as the number of nuclei that can be placed in even a large confined space must be very limited. The drones, workers, and queens fly freely, and the latter very seldom miss their own hive, providing they have never flown anywhere but indoors.

Two years since I turned my attention to fertilization by hand. Mr. Cheshire's very minute explanation and illustration of the drone organs led me to believe that the whole thing could now be accomplished. I was soon to learn that the trouble was not in the drone, but that the whole difficulty lay with the queen. Her organs had not been so faithfully described, and no writer as yet appeared to know in what manner the union takes place naturally. Finding some trouble in inducing the queens to allow the common cavity to be opened at the extremity of the body, I constructed a very delicate instrument wherein I placed the queen head downwards, so that she was fixed for any length of time without injury and at the same time could get plenty of air. On two opposite sides I arranged very fine and weak springs, so formed that the body of the queen could be held open sufficiently that one could plainly see (1) the termination of the alimentary canal, (2) the termination of the oviduct—the vulva, and (3) between these the sting, which itself lies between (4) the

palpi, the latter appearing to be mainly useful in conducting the egg from the oviduct to its position at the base of the cell.

Having all plainly before my eyes I then felt convinced that the fore-part of the drone organ actually penetrated the common oviduct; and such ultimately proved to be the case; as I have carefully examined a queen upon returning from a successful wedding flight, the portion of the drone organ retained being so securely locked into the common oviduct that the parts could only have been separated at the expense of the queen's life. In this case my object was to discover how soon the spermatozoa passed into the spermatheca, as the latter, being already filled with a transparent liquid, it was evident that one could not give place to the other immediately. In the case of the queen mentioned the spermatheca was only partially occupied by the spermatozoa within fifteen minutes after her return. Others dissected within five or six hours have shown the spermatheca filled, while the drone organ is then emptied, and reduced to a thin thread, while it is removed from the vulva and oviduct without strain.

Here, then, we have the most important part of the natural act laid bare. However, there remains much to be done yet in obtaining suitable tubular instruments for passing the spermatozoa forward. I have had them made in various forms, with fine perforated points, but while I can claim partial successes, on the whole it would appear that the action is so far unnatural that many queens cannot be forced to accept the spermatozoa. It transpires that two Americans, Messrs. McLain and Baldwin, have been experimenting in the same direction, but the latter does not appear to have been so careful as the other in his investigation, and makes extravagant assertions that are open to doubt. It would appear, however, that both have fallen into the error of calling the common opening the vulva, as neither seem to know

the position of the latter, judging from the manner in which they insert the drone sperm.

Many writers have fallen into the error of supposing that young queens often commence by laying a number of drone as well as worker eggs. In nuclei it is frequently to be noticed that many cells contain drone larvæ, but a little more careful observation will always show that this is the result of fertile workers, which often continue to deposit eggs after the young queen is in full work. I have even had these pests start laying side by side with a queen after she had been at work long enough to hatch her first batch of brood. The queen was a Carniolan crossed with black drone; the fertile worker was from a Ligurian queen crossed by Cyprian drone, the resulting drones being very yellow. The yellow bees had been united to the stock to strengthen it, and without this proof it might have been considered that the queen had produced the drones.

While I have had ample evidence to show that bees are able to retard the development of both eggs and larvæ by withholding food, where a colony has been queenless for more than ten days, the presence of uncapped larvæ, whether in queen cell cups or ordinary cells, may be put down to the action of fertile workers.

Many bee-keepers appear to understand that my non-swarmling plan can be carried out in a single ten or eleven-frame hive, allowing only two or three frames at the front with starters. I would never attempt such a pretence as this, and could not myself work with so little space. I must have longer hives and six or seven empty frames in front of the brood nest; or, in the case of ten-frame hives, another chamber having only starters, must be placed under the brood nest, as distinctly pointed out in my *Non-Swarmling* pamphlet, and now illustrated in the chapter on that subject.

Small packages for honey are not wanted either by the retailer or his customer. In these days of lower prices the tendency is towards using larger rather than smaller weights. Good jam is sold in 2 lb. jars at from 10d. to 1s. each at retail. We have to, and shall compete with that at no distant date. A few years since jams were about double the present value, but at the reduced rate, half-a-dozen pounds are consumed where only one was used when costing much more. The same will be found true of extracted honey, and the sooner bee-keepers are brought to accept this fact, the sooner will the production of honey be acknowledged as a national industry.

Bees winter best with plenty of room below the frames. Many of my own stocks have been wintered with the lower body under the stock chamber, as used for prevention of swarming, with very satisfactory results.

Chickens will be found very serviceable in the apiary, as they destroy a large number of insects. Earwigs especially, and sometimes ants swarm about the hives, but though they do no harm they are a great nuisance. Chickens turned down as soon as they can take care of themselves, can soon be taught to look in the right place for the pests, and will be on hand when the hives are opened.

With a quarter of an acre of borage, the seed from a number of sunflowers, and a good grass run, in all rather more than an acre, I have had about a dozen fowls come along fit for the table, with no other feeding, except a little corn for a week or ten days before killing.

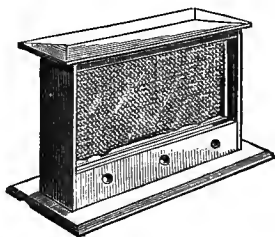
None of the birds have been actually stung, though sometimes attacked. At first they simply pick off the bee ; but finding their

enemy returns to the charge, they soon learn how to settle it, and then invariably give the bee a second grip before it can leave the ground.

While borage, melilot clover, and other plants may not be suitable for cattle, my own experience goes far to show that chickens can be brought up at little expense where they have admission to a large area of such plants, which throw suitable seed. Borage especially is very valuable, giving a constant supply for several months. Old birds must not have the run of the plants or they will pick off the bloom and cause waste by treading down the plants before they get a good growth.

Sunflowers cannot be considered suitable for bees, judging by half-an-acre grown as a test near one hundred colonies, when with fine weather the flowers were almost entirely neglected. Nothing else of importance was in reach of the bees at the time. The same area of melilot clover, in the same place, the following year, simply roared with bees.

The best show card I have been able to find for the retailer is an Observatory Hive, placed in the shop window. A single comb with bees and queen has proved to be a very great attraction, introducing new customers in quite an unlooked-for manner.



We know how distressing it is to see the usual observatory hives at bee exhibitions, with the insufficient ventilation and numbers of dead bees, resulting from overcrowding, but we want our bees to remain confined quite three weeks in good order, as it would be out of the question changing them every few days. I

have had them in good condition for more than four weeks ; and three weeks confinement in the window with daily exposure with few stains to be seen.

The single-comb observatory is made as illustrated with a 3-inch space below the comb and three 1-inch holes both sides, covered on the inside with perforated zinc for thorough ventilation ; while at the same time such darkened recess hides any refuse or dead bees that may drop from above. A comb should be selected not too light nor too dark, about half full of stores ; not more than enough bees to cover one side of the comb ; having no brood, but a nice yellow queen. If the bees are mostly young very few will die, as the window will be shaded from the sun, and before they are ready to be exchanged young bees are hatching out from the small patch of brood generally started. A suitable darkened crate with convenient handle must be provided for transit. As no brood is inserted in the first instance, this kind of advertising can be carried on in all but the coldest weather.

For exposition at Bee Shows the same arrangement would be found much more convenient than most of those used, and with fewer bees the observatory would be presentable for a much longer period.

The exhibition of bees for the purpose of obtaining prizes is but a farce, to say the least. The working qualities of the bees cannot be considered, and I will show how easily the judges may be deceived as to colour and markings. Whenever friends have asked my opinion about the preparation of bees for competition I have recommended the following course ; and the result has justified my advice.

Whatever kind you intend to exhibit, see that they are all young bees placed in your observatory, and on a newly built comb of brood, the framework to be painted a pale green in contrast to the light-coloured comb. The young bees are secured by making up a nucleus a few days before they are required, with plenty of hatching brood; most of the old workers returning to the original stand. It will readily be seen therefore that bees from inferior stock may thus gain the prize in competition with others not so prepared, though the latter may on the whole possess the better qualities.

The man who enters a large bee-farm for a term in the hope of gaining an insight into the practical management of the same, must not think all the necessary information is to be picked up simply by looking around and paying occasional visits to the apiary. On the contrary, he must make up his mind to go there to work just as any other apprentice or assistant. The daily routine must be gone through in every particular, and though some manipulations may be repeated constantly, it will be only by such close study and application that he will make himself master of the entire practical management.

At my queen-raising apiary the hives face all points of the compass, and though this has sometimes been objected to by visitors, it is well to note the opinion of the oldest queen-rearer of America. ~ Mr. H. Alley says :—"Should my nuclei be arranged in rows, as some people think they should, not one queen in a dozen would enter the right hive on her return after a flight. Therefore my hives look as though they might have been shot into the yard from the mouth of a big gun. Well, we never lose a queen by her mistaking the hive, though it would seem to a stranger that not one bee in the yard could find its home as the ground is so completely (?) covered by small hives."

Many inquire how they are to know when honey is coming in. Examination of the hive will, of course, show every vacant cell being more or less occupied with the thin newly gathered nectar. The bees, too, come in with distended bodies, falling heavily upon the flight board. Sometimes the aroma of the incoming stores is distinctly noticeable, more particularly at evening when many bees are ventilating at the entrance, and a perfect roar is heard throughout the apiary. Apart from this, the advanced apiarist has an instinctive feeling that honey is, or is not being gathered. The state of the atmosphere and his knowledge of surrounding crops, tell him at once what to expect. The temperature may range anywhere from 70° to 90° in the shade, but if it continue too hot and dry for more than ten or fourteen days, the amount of honey brought in will decrease daily, unless there happen to be a succession of heavy ground crops coming along, when the earth being shaded, moisture is still retained. A shower once in a while is beneficial, but frequent rainfalls destroy all chance of a good honey flow, as such induce also a low temperature. Even with fair weather it sometimes happens that the temperature rules too low for the secretion of nectar; but usually if none is stored during a fine season, it implies either that the district is poor in honey plants, or else that there are too many colonies in one place.

The question of over-stocking is one that has received considerable attention, though nothing satisfactory has been arrived at in regard to this matter. It may safely be said, however, that in any fairly good district 100 colonies will each put out as much surplus as one only. But with a large number, however, there are greater risks, and the whole cannot receive the same attention individually that would be given to a few. It will generally be found that it is not the district which is at fault, but rather that our stocks are not always ready when the first or only glut of the season occurs. Honey is seldom secreted so abundantly as when everything is bursting into new life, but it so happens

at that early date it is often difficult to get the bees strong enough to do much more than provide for the expanding brood nest. When bees can be so wintered that they will come out stronger in spring than when they settled down for winter, we shall hear little more about "over-stocking." That this desideratum will shortly be an accomplished fact I am fully persuaded, and I hope on a future occasion to give evidence to that effect.

For use with my uncapping saws, the comb is held in a simple manner by a frame secured to the upper part of the uncapping can, and the cappings are rapidly removed. The saws are as fine as is consistent with strength, that as little adhesive surface as possible may be allowed to "drag" on the combs. Being held in a frame, the blades are tightened by screws that they may not bend. Both sides are uncapped at one operation.



We are frequently told that drones are useful in keeping the brood warm; but why raise drones, if not required for breeding, when in the same space of comb a larger number of workers could be produced, who would add to the prosperity of the hive instead of being useless consumers? The statement is contradicted on the face of it, for why is it the drones are present only when additional heat can be dispensed with. As a simple matter of fact, they have but one use, and that is the fertilization of the young queens.

At the same time that my first uncapping machine was being developed another was constructed in Italy; both have since been supplanted by an improvement introduced by Mr. J. M. Hooker; though this again will be superseded by fine parallel saws, which I have arranged to remove both sides of a comb at one operation.

When using separators for producing comb honey the sections must be 2 inches wide ; but these are rapidly giving place to sections $1\frac{3}{4}$ -inch in width, to be worked without dividers. These I have recommended for a number of years past, and as I use none thicker I have no difficulty in getting good straight combs, but a few simple rules should be observed in working. The hive is to stand perfectly level, while the sections are to be filled with foundation or combs fixed exactly in the centre, so that nothing will shift the same from the original position. It is better to remove the entire set at a time, but where any are taken out singly all partly-finished sections should be kept together, inserting foundation, if used, at the ends of the row.

Where any article is recommended in this work the name and address of the manufacturer is also given, that the reader may not be told of a good thing and then be left in the dark as to how he may obtain it. I mind not if this proceeding is put down as advertising ; I call it simply a case of mutual interest.

There are two important points in reference to feeding that were first brought forward by Mr. Abbott, late editor of the *British Bee Journal*, and which require careful consideration. That veteran always insisted that to stimulate bees to extend the brood nest when desired they must have a gentle *continuous* supply. Again, when it is necessary to supply food for winter it should be given during the month of August, because the bees are then better able to store and seal it. Now while we may not all quite agree with the latter statement, there is much of truth behind it. Where there is no late harvest I do not see how one can improve upon such advice ; certainly it is not advisable to extract from the brood chamber later than that month, and the substituted food can hardly be given too soon, if we wish the bees to settle down quietly before cool weather comes on. Moreover, if the food be supplied immediately after the harvest, the remaining

strength of the old workers will be utilized in storing it, and so they perform a beneficial act to the colony before expiring, as it is desirable they should do.

Many complain that the more prolific varieties use up all the autumn stores in brood rearing, and the same bee-keepers will tell us that if fed up in August, their bees will want feeding again by October. But at this time, stores must not be given slowly; all a colony requires should be supplied in one dose in the course of two or three days. Give nothing more, when breeding soon ceases and the bees invariably quiet down.

This work is published in limp cloth cover, 3s. 9d., post free. A special edition is also offered at 7s. 6d., post free, including stout cover and photos of the author's domestic hive; his home apiary; another covered apiary, occupying a space 75 feet by 50 feet; and another photo. of queen and workers on a comb.

Dear Reader, whatever the side issues may be, I need hardly say that bees are cultivated for the production of honey. We have then to consider which plan of procedure will give the largest surplus with the least amount of time and capital invested. Your stock also is to be held in the highest state of excellence *generally* year after year. The desideratum to be followed is that mentioned as the "Tenth Method," which, worked together with the non-swarming system, will be found the very foundation-stone of success.

We have seen that a young queen must be used if we wish to obtain the best results in honey; but the reader may be surprised to know that for the production of bees, two and even three young queens can be worn out during the season, in a hive run for increase only.

It has sometimes been stated that by depriving a colony of its queen during a honey flow, a much larger harvest will be secured. Quite true ; if a heavy flow is on ; but what is to compensate for the wear and tear during the six weeks, more or less, when no young bees are coming forward to take the place of those worn out ? There is no compensation, and when a queen is given, these old bees will not raise enough young ones to go through the winter. The additional surplus, therefore does not pay for the total loss of stock.

To be in the highest degree profitable, year after year, a colony must *always* be in possession of a good queen. Hitherto it has been considered that a queen is at her best during her second season ; but in the future, the apiarist who wishes to compete with the times will give his stock a young queen *every year*. Such young queen is not to be inserted either in the spring or usual swarming time ; but by observing the "Tenth Method" it will be seen that the whole matter is reduced to a system.

Systematic management is the corner-stone of successful bee-keeping. Plans and methods may be well in themselves, but unless carried out at the right time with due regard to what has preceded or may follow a certain manipulation, they are like broken links in a chain ; bringing only disaster where success should have been attained.

I have found bees working two and three miles away from home in good weather, but when there has been nothing nearer little or no surplus would be stored. In the best of weather stores accumulate slowly, and at great expense of life if the bees have to go more than one mile ; but with a sea of bloom within half-a-mile or less, honey almost pours into the hive ; hence the necessity of planting large crops to come on in succession near the apiary — the only course that will give a certain income year after year.

The old straw skep is still clung to by many ; but considering that frame hives can be bought at little more expense in the first place, and at much less outlay in the long run, it is but false economy to continue to use the former. Those who think that the straw is better have no excuse as Messrs. Neighbour, of Regent Street, offer a very excellent frame hive of wood and straw combined at a very reasonable rate.



To be of any value, experiments must be tested and proven by actual dissection of the spermatheca after artificial fertilization. A queen may appear to be prolific in the first instance, but if the spermatheca is not *filled* with spermatozoa, such queen is of no value in the market, as her term of usefulness will be of short duration. In this connection I have been greatly assisted by my esteemed friend, Mr. F. R. Cheshire, to whom I have submitted most of the queens I have operated upon. A decisive answer was at once the result ; and if artificial fertilization is ever to become generally practicable, it will certainly not be till after eminent scientists have been able by dissection to give confidence to the public mind. With the naked eye one can readily tell if the spermatheca is occupied only by clear fluid, or the yellowish and much thicker matter received from the drone ; but to decide whether entirely, or only partially, filled with spermatozoa more experience is needed, and the microscope cannot be dispensed with.

In the mouths of several witnesses, the truth shall be established ; but if any others desire to experiment in this direction, it should be remembered that temperature is a very important item ; and to keep the surrounding air up to about 90° and moist at the same time, my apparatus is arranged over a heated cylinder, itself standing on a small table with lamp under. It consists of a hollow chamber with water all round, between two walls $\frac{3}{4}$ -in. apart. An inner chamber, open at the top, has water at the bottom to induce the necessary moisture, and herein is fixed the apparatus with the working parts projecting above. After operating, the queen is placed below, so as not to be exposed to a low temperature, for an hour or more. The cage holding her rests on a projecting ledge. The drones, also, are first secured and placed in a suitable cage near to the heated boiler. The spermatozoa does not appear in sufficient quantity in drones under 10 days old, and if the operator desires to explode the drone organs, rather than obtain the matter by dissection, he will find the warmth of very great benefit, as nearly every drone will then be found suitable.

While I am not an advocate of double-walled hives in winter, nor such arrangement even for summer, yet where *shade* is provided by an independent outer case during hot weather, very great progress is made by the bees.

Mr. Cheshire has repeatedly pointed out that queens should be reared artificially instead of using those raised under the swarming impulse, if we wish to diminish the inclination to swarm. But I go a step farther and breed from queens that have not swarmed, and whose parent and grand-parent also had neither of them swarmed. Thus only can a non-swarming race be secured ; and in this manner I have raised Carniolans, so that the excessive swarming frequently attributed to them has been quite unknown in my own apiaries.

The illustration on p. 112 does not show exactly the manner of making the V-cuts for starting queen cells. The cuts are not made right through the comb as shown by the engraver, but are on either side of the mid-rib, and scooped out only so near to the same that the eggs or larvæ are not destroyed. There is no need to remove any of the larvæ, as all but one are destroyed by the bees, as there is only room for the base of one cell. Though cells may be built on exactly opposite sides of the mid-rib, such are quite distinct, and may be parted without injuring either. Such an arrangement, however, can be avoided by making the V-cuts of one side alternate with those of the other.

Dear Reader, as a parting sentence, allow me to remind you that bee-keeping cannot be carried on extensively by every one. Success is not to be attained except by diligent study and hard work. The earnest and enthusiastic worker will find the pursuit give a reliable income if he will strive to keep only young queens bred from stock showing persistent good qualities; while additional security is offered where planting can be carried out in a systematic manner. I trust that herein you have found that I do not merely give you the usual and well-nigh worn-out advice, "Keep your stocks strong"; but instead of then leaving you to find out for yourself how it is to be done, I have placed before you the means that will enable you to attain the desired end.

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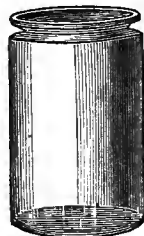
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