HANDY BOOK

OF BEES

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BEING

A PRACTICAL TREATISE ON THEIR
PROFITABLE MANAGEMENT

BY

A. PETTIGREW

SECOND EDITION, REVISED AND IMPROVED

WILLIAM BLACKWOOD AND SONS
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PREFACE.

SOME years ago, I was induced by my respected friend, Mr W. Thomson, then editor of 'The Gardener,' to contribute a series of articles on bees for that periodical. Mr Thomson heralded these articles with a few complimentary remarks. He then said: "We had practical proof of the extraordinary success resulting from Mr Pettigrew's system of bee-management when he was our foreman in the gardens at Wrotham Park, Middlesex, twenty-five years ago. We assure our readers who may peruse his letters, that though he may recommend what may clash violently with their present knowledge of the subject, he is, notwithstanding, a safe guide; and that where profit is the object, no writer that we have ever read can be compared to him. We predicate that his letters will be of far greater value to all interested than the cost of the journal for many years to come."

My father, James Pettigrew, was a labouring man, and perhaps the greatest bee-keeper that Scotland ever produced. He was so successful and enthusiastic in the management of his bees that he earned

and received the cognomen of "The Bee-man;" and by this name he was well known for thirty years in a wider circle than the parish of Carluke, Lanarkshire, in which he resided. The district of the parish in which he lived when he kept most hives, took then the name of "Honey Bank," which it still bears. While a common labouring man he saved a great deal of money from his bees; indeed it was reported in the Glasgow newspapers that he realised £100 profit from them, one season. His example and success have, twenty-five years after his death, not yet lost their influence on the successful bee-keepers of Carluke, who say, "The old bee-man taught us all we know." The bee-man saved money enough to purchase the Black Bull Inn of the village, and therein commence business as a publican and butcher. When his sons reached their teens, the management of his bees was left in great measure to them. It was then that the foundation of what I know of bees was laid; and though I left my native village thirty-five years ago, I am still known there as "the bee-man's son." As most readers of a book like to know a little of the author, I may be pardoned the egotism of saying, that at the age of eighteen I was apprenticed to the occupation of gardening at Carstairs House. In about four years afterwards I went to London to pursue my business. While an apprentice at Carstairs, and a journeyman in Middlesex, I kept bees in "hidden places" in the plantations and shrubberies; and while acting in the capacity of head gardener, managed the bees of my

employers. Now I have a small garden of my own, in which bees are kept for profit. Such is a brief outline of my history. The work before the reader, then, is a practical one, and written by a practical man. Indeed the book is simply an exposition of a system of management practised by my father for forty years; and profitably, for forty years since his day, by myself and others.

Dr. M'Kenzie, in a small book on bees, says he was induced to study the subject from the fact that one of his two labouring men, having found a swarm of bees in a hedge, and therewith commenced bee-keeping, was enabled to go without his wages till they were earned. Previously, both labourers got their wages in advance. The lift given to the one man by the possession of this fugitive swarm was so pleasing to the Doctor, that he commenced to read works on bees, and study their management both in this country and on the Continent. This little incident shows what a swarm or two of bees may do for a poor labourer. Indeed there are few things more profitable to cottagers living in the country or on the skirts of towns, than a few swarms of bees, or more easily managed. "Bees," says Cobbett, "are of great use in a house, on account of the honey, the wax, and the swarms they produce: they cost nothing to keep, and want nothing but a little care."

In bee-keeping I reckon the question of profit is of first importance. Stings do not seem half so painful to the man whose annual proceeds of bee-keeping amount to £10, or £20, or £50. It is my desire,

therefore, in this work to show how bees may be kept with both profit and pleasure. In addition to the profits of bees, there is a fund of interest and enjoyment derived from keeping them, uplifting in its nature and tendencies. One of the most pleasing sights on earth is that of a son of toil, after the labour of the day is done, taking a child in his hand, and going to see his pig, or cow, or bees in his garden. Who has not seen hundreds of working men charmed beyond description in attending to their bees or cows!

I hold that all employers of labour would do well to encourage their servants to spend their leisure hours in a profitable way.

A. PETTIGREW.

NOTE TO THE SECOND EDITION.

THE author gratefully acknowledges the many favourable notices of the first edition of this book by the press, and the kindly reception it met with from the bee-loving community.

More gratifying still are the statements and evidences of private letters to the author. Hundreds of apiarians, in all positions of society, are now masters of the art of bee-keeping, and are successfully practising the system of management unfolded in the pages of this work.

He trusts that this edition will be found as useful as the first, in giving its readers a firm grasp of the subject; and that it will encourage all who are seeking profit or honey from bee-keeping, to carry into practice most of its lessons.

A. PETTIGREW.

SALE, CHESHIRE,
8th February 1875.

CONTENTS.

PART FIRST.

THE NATURAL HISTORY OF BEES.

CHAPTER I.

CHAPTER II.

CHAPTER III.

CHAPTER IV.

CHAPTER V.

CHAPTER VI.

CHAPTER VII.

PART SECOND.

PRACTICAL MANAGEMENT.

CHAPTER XXVII.

CHAPTER XXVIII.

CHAPTER XXIX.

CHAPTER XXX.

CHAPTER XXXI.

CHAPTER XXXII.

CHAPTER XXXIII.

CHAPTER XXXIV.

THE CALENDAR.

THE

HANDY BOOK OF BEES.

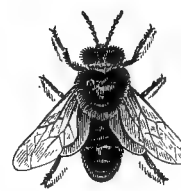
PART FIRST.

THE NATURAL HISTORY OF BEES.

In every healthy hive of bees there may be found, at certain seasons of the year, a queen or mother bee, males or drones, and working bees; honey and wax, bee-bread and propolis.

Queen.

Worker.



Drone.

CHAPTER I.

THE QUEEN BEE.

By looking at the representations of the different bees, the reader will see that a queen bee is less in size than a drone, and larger than a working bee. In shape she is

more like a worker than a drone, but more genteel and beautiful than either. Her abdomen or belly is comparatively long, and gradually tapers to a point—giving her an appearance quite distinguishable from all in the hive. She is really a queenly creature, modest and graceful in all her movements.

Being mother and monarch of the hive, her life is very precious. The loyalty of her people, and the activity of her body-guard, are remarkable. No human monarch was ever half so well attended to by his subjects as a queen bee is by hers. The life and prosperity of a hive depend on the presence of a queen—a queen moving and reigning in it—or in prospect—that is, in embryo; for when a queen dies, or goes with a colony or swarm, she leaves behind her some princesses in their cells—that is to say, in their infant state—or eggs which the bees hatch into queens. If a hive lose its queen, and is without expectation of getting another, all prosperity comes to an end—the contentment, loyalty, and industry of the bees depart from them: their stores of honey are often undefended by themselves, and stolen by the bees of prosperous hives.

The Age of Queens.

They live about four years. In this the worth of their lives to the community is seen. The working bees live but nine months, and the drones are not permitted either to live or die; they are destroyed. The climax of their history is not a pleasing one. But queens, generally speaking, live four years. Some die when they are three years old: very few die a natural death sooner.

Queens are fourteen days in being hatched—that is to say, perfect queens are produced on the fourteenth day after eggs have been put into royal cells. To a thoughtful bee-keeper the length of their days is not so great a

marvel as the shortness of time they are in their cradle-cells. Only fourteen days for the process of developing small eggs into princesses of the blood! A worker is twenty-one days in the cell, and a drone twenty-four days. Queens are perfected in ten days less time than drones. The mystery of this is beyond our depth; but the fact indicates the value of the presence of the queens in their hives. When a queen is accidentally killed, or dies unexpectedly, or is taken from a hive, as in artificial swarming, the bees have the power to make another. They take an egg meant for a worker from a common cell, where, if undisturbed, it would be developed into a worker in twenty-one days, and place it in a royal cell, and there convert it into a queen in fourteen days. In the royal cell the egg is developed into a bee—different in size and colour, perfect every way, and perfect in seven days' less time than it would otherwise have been if left in a common worker-cell. This is an exceedingly interesting point in bee-history, and a wise provision of nature. It is a fact established beyond dispute that bees have the power of rearing queens from common eggs. It may be asked how they accomplish this, and by what means. The power seems to be in a substance termed "royal jelly," which has a milky, gelatinous appearance. Whenever an egg is set in a royal cell, the bees place around it some of this milky-like substance, and soon after a little worm or grub may be seen floating on it, and by it this grub is fed. What this royal jelly is, we do not know—neither can we tell where it comes from. No writer, we think, has ventured to describe how or where it is manufactured or obtained. If an analytical chemist would ever like to examine this substance, we would gladly furnish him with a thimbleful of it at the swarming season—taking it, of course, from the cells in which it may be deposited.

Seven days after eggs have been deposited in royal

cells, lids are placed on them—which is technically termed "sealing them up." What takes place at the birth of queens will be explained when we come to the chapter on swarming.

Fertilisation of Queens.

This a very important affair—so important that a bee-keeper should know all he can about it; when and where it takes place, and what happens when it never takes place at all. Queens are mated or take the drone when they are very young—viz., from two to ten or twelve days old. If they are not mated before they are twelve days old, they are worthless for breeding purposes, and worthless for every purpose save that of keeping the bees together till they are worn out by labour or old age.

When we consider the importance of the fertilisation of queens, the number of drones in a hive is not to be wondered at, especially when we consider that copulation never takes place inside a hive. If the weather be unfavourable for ten days after the birth of a queen, she is not mated. Some five-and-twenty years ago we caused a hive to rear a queen in the month of September, after all its drones had been killed. This was done with a view to ascertain how many days she left her hive to find a companion. The mouth of the hive was shut, so that every bee going out had to pass through a narrow tube, projecting two or three inches, before it took wing. Though the way out was plain and easy, neither the queen nor bees ever found their way back through the tube. For nine days the queen came through the tube, though the weather was rather showery at the time, and was invariably found outside the hive about four o'clock P.M., either nestled up in a cluster of bees near the door, or trying to find an entrance into the hive. Once she came home and alighted on the flight-board in our pre-

sence at four o'clock when, the sky was heavily clouded and the atmosphere rather cold. Of course the queen and bees found outside the hive were admitted every afternoon. This simple experiment fully convinced me that the impulses of a young queen for a mate are very strong and urgent; and when she fails to find one, the fault is not hers.

Drones seldom leave their hives but in very fine weather. This fact accounts for the non-impregnation of queens during unfavourable weather. Very cold or stormy weather may, and often does, we daresay, prevent queens from leaving their hives on these errands. Failure is very uncommon in fine weather. About the time her majesty is expected to leave her hive, the drones come out in great force, and make a tremendous noise in front of the hive. By reason of their number their buzz becomes a roar, and may be heard at a considerable distance from the hive. Last year we happened to hear this well-known sound, and went to see her majesty come out of her hive and go away on her marriage-tour. The hive was no sooner reached than she was seen going into it. She had been abroad before the drones had come out. In about five minutes after her return she came out again, and took wing amid a noisy rabble of drones.

The statements of some authors about queens selecting their lovers in their hives, and then going away together to make their nuptial couches high up in the air, where no eye may follow, are mere poetical fancies. When a queen comes out of her hive for this purpose, she comes by herself: she has no favourites, and as readily accepts a mate from another hive or community as from her own. How far she will fly in search of a mate is not known. Drones fly great distances from home, and often impregnate queens which they happen to meet. Though there were a great many hives in our

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cells containing two or three eggs. On another examination some time after, the empty cells will be found all filled. And often, when bees are building combs, eggs are set on the foundations of cells—that is to say, as soon as the bottoms of the cells are formed, eggs are placed on them, and afterwards their sides are built up around the eggs.

Some one may ask how it is known that a queen bee lays 2000 eggs every day in the height of the season. Some hives contain more than 2000 square inches of combs each. Let us suppose that only one half of these combs is filled with brood, and the rest filled with honey and bee-bread: that is 1000 inches of comb for brood in each hive. One inch of comb has 50 worker-cells in it, 25 on each side. Very well, 1000 inches of comb contain 50,000 young bees, in all stages of development, from the egg up. These 50,000 young come from one queen in three weeks. Divide the 50,000 by 21, and it will be found that the average number laid per day for three weeks amounts to some hundreds beyond 2000 per day. We have not yet seen a hive large enough to overtask the laying powers of a queen bee.

The Sexes of Eggs.

On this question there appeared in the first edition of this work some very interesting and well-written letters from the pen of the late Mr Woodbury of Exeter, who held "that eggs of queen bees when laid are of two sexes, male and female, and that no after-treatment can alter either sex." We then were inclined to believe that all the eggs of queen bees in proper condition are of one kind only, and convertible into queens, drones, or workers. Mr Quinby, an able American writer on bees, held the same opinion, and argued thus: "If food and treatment

would create or produce organs of generation in the female, by making an egg destined to be a worker into a queen (a fact which all apiarians admit), why not food and treatment make a drone?" We suggested some experiments, with the hope that they would be fairly and widely tried. We tried them ourselves, and in every experiment the bees failed to hatch female eggs into drones, and drone eggs into females. Mr Woodbury, and all of his way of thinking on this question, are right, and we were wrong. As soon as we were satisfied on the question, we published our change of views in the columns of the 'Journal of Horticulture,' and there gave an account of the experiments which led to the change. A bit of drone-comb containing eggs was placed amongst some bees which had lost their queen, and were in a state of great commotion and lamentation for their loss, running hither and thither in search of her. The hive contained no eggs of its own, as the queen lost was a virgin one. As soon as the bees found the eggs, they commenced at once to erect royal cells around them, and became as calm and contented as possible. The eggs became maggots in the royal cells, and were covered with lids at the proper time. On the sixteenth day after the royal cells were formed, they were cut out for examination. Only one of the maggots had taken the insect form: all were dead. The bees made a great effort, but failed to produce queens. In various ways, and many times during the last few years, have we had proof that queen bees lay both male and female eggs, and that no treatment by the bees can alter the sex.

It has been stated by more than one writer that the ovaries of a queen are never impregnated, the matter of the male being stored in a distinct vesicle called the spermatheca, a portion of the contents of which is either withheld from, or communicated to, every egg as it passes through the oviduct—and this difference determines the

sex. If this is true, it appears to us all but impossible to account for the fact that impregnation makes a queen prolific, causing her to lay a hundredfold more eggs than a queen unimpregnated. If the fertilising matter of the male is simply lodged in a distinct vesicle, and does not affect the productive powers of the queen, but merely touches and femalises so many eggs in passing through the oviduct, how comes it to pass that unmated queens are nearly barren? We think that the explanation given as to the cause of some eggs being male and some female is not satisfactory, and that the mode of fecundation may be for ever veiled from the ken of mortals. Also, how the queen knows what kind of eggs she deposits—placing male eggs in drone-comb and female eggs in worker-comb.

The eggs of virgin or unmated queens are male in character.

CHAPTER II.

DRONES.

These are about the most idle and unfortunate creatures in existence. They are generally hatched in drone-combs, the cells of which are considerably larger than those of worker-combs. These large cells, built up together, are called drone-comb. The less of drone-comb there is in a hive, the better it is for breeding purposes; for though the bees can rear drones in worker-cells, they never rear workers in drone-cells. Drone-combs are generally situated on the extreme outsides of the worker-combs, but sometimes they are found near the centre of the hive. It is the position and number of drone-cells in a hive that determine the number of drones reared. If such cells are near

the centre, drones will put in an appearance long before the hive is ready for swarming; and if on the outside of the combs, the hive will be ready for swarming about the time drones are first hatched. Their appearance in a hive is therefore no safe guide as to its ripeness for swarming.

Drones are twenty-four days in being hatched from eggs—that is, they come to perfection in twenty-four days, being three days longer in their cells than workers, and ten days longer than queens.

But why so many idle fellows in a community remarkable for industry and activity? It is easier to ask this question than to answer it. They are produced for a purpose, and that is the impregnation of the queens. When the importance of this impregnation is considered, the apparent want of economy in the production of so many otherwise useless creatures will not be wondered at. The time given for this fertilisation is limited to ten or twelve days at most. When weather is cold or wet, drones do not leave their hives; and even when the weather is fair and favourable, they do not all leave their hives at the same time. As the reader is already aware that copulation takes place outdoors—it may be at some distance from the hive—he will more easily understand why so many drones are usually produced. Better to have a superabundance of 10,000 drones than the queen fail to meet one. The more drones—indeed, the more hives in a garden—when a queen becomes marriageable, the more likely is she to be seen and mated when she leaves on that errand.

Queens and drones, the produce of one mother, mate without the least deterioration of blood. In-and-in breeding amongst bees for generations and ages does not in the smallest degree produce bad results.

The great characteristic of a drone bee is his laziness. He will die of want rather than work. Drones have

never been known to do "a hand's turn." In recently hived swarms, before any honey is stored up, drones may be frequently seen stooping down to be fed by working bees! Drones wanting to be fed place their feeding-tubes alongside those of workers, and thus remain apparently motionless while the pumping process goes on.

But these idle gentlemen know the country geographically better than the working community. In fine weather they take longer excursions into the country for pleasure than working bees do for food. If a hive be removed in fine weather two miles, some few bees and a great many drones return to the old place. If removed three or four miles, a considerable number of drones return, but no workers.

Comparatively useless in their lives, drones come to a sorrowful end. What is termed the massacre of drones seems a strangely cruel process. Well might a great naturalist exclaim,—"The climax of drone-life is wonderful—a chapter of horrors, which clouds the harmony of an otherwise beautiful system of insect-life."

About fourteen days after the queen of a hive has been fertilised, or some days after she has begun to lay, the working bees begin to haul and maul the drones about. Day by day the bees become more anxious to worry the drones. Inside the hive the drones are driven from the honeycombs, and may be found in heaps on the board for days. Here they become weak from want of food; and when they leave the hive many of them have savage tormentors on their backs. Some fall off the flight-board so weak that they cannot fly; but must die at a distance, being unable to return.

During weather unfavourable for honey-gathering, drones and drone-brood are often destroyed. On the appearance or prospect of hard times the bees destroy these comparatively useless creatures and cast them out of

their hives. Whenever white drones are seen being cast out, the owner may be pretty certain that his bees are on the border-land of starvation. The lives of drones being always cut short, no one can say how long they would live if let alone.

CHAPTER III.

THE WORKING BEES.

The common working bees are twenty-one days in their cells, and live nine months. Probably nine-tenths of them die, from some cause or another, before they reach their allotted span; but at the end of nine months or thereabouts, after their birth, all perish. The working bees are considerably smaller than either queens or drones. They do all the work and drudgery of a hive, and do it with a willingness and activity that baffles and beggars description. They manufacture the wax, build the comb, gather honey by day, and store it away by night. It is hard to believe that they never sleep, though we have never seen one either sleepy or asleep, in winter or summer.

The working bees are female in character, and are produced from the same kind of eggs as queens. The queens are of course fully developed, and have their reproductive organs in a normal or perfect condition; whereas the working bees are undeveloped females, with reproductive organs imperfect. The treatment which the eggs receive in their cells determines whether the bees shall be born perfect or imperfect. This is one of the many interesting things in bee-history which is at present veiled in mystery. The same egg may be reared into a

queen in fourteen days, or into a working bee in twenty-one days. Whether the queen is developed and made perfect by special treatment in the cell, or whether the working bee is dwarfed and made imperfect by special treatment, is a question yet unanswered—and is, perhaps, beyond the powers of human investigation.

It is a fact established beyond all doubt that bees can procure a queen for themselves, provided they have larvæ not more than three days old in worker-cells. Royal cells and a particular kind of food only appear necessary for the conversion of common larvæ into queens.

The development of queens from worker-eggs or grubs is a most marvellous transformation, and comprehends far more than the development of the reproductive organs in queens, or the repression of them in worker-bees. The transformation alters the anatomical structure and instinctive propensities. Queens are different in form, colour, and habit from, and live six times longer than, working bees. They have more slender trunks and more crooked stings than bees; they have no downy brushes at the joints of their limbs, or basket-shaped cavities on their legs for holding bee-bread. Queens in numerous particulars are very different from the working bees. In this transformation there is a world of wonders and mystery.

Bees, like the human family, possess five senses—viz., sight, feeling, taste, hearing, and smelling; and a very interesting and instructive chapter could be written in proof of their existence and acuteness. We must hasten to notice the industry, ingenuity, and courage of bees.

The Industry of Bees.

How few bee-keepers know the worth of their own servants—the value of their own stock! No writer can get near enough to touch the hem of the garment of the in-

dustry of honey-bees. Fancy a large and prosperous hive full of combs, bees, and brood ; fancy 20,000 little grubs in this hive requiring constant attention and proper food, and all receiving them in due season ; fancy the care and diligence of the bees in mixing and kneading this food before they give it to their young ; fancy 20,000 of these grubs daily requiring and receiving beautiful lids on their cells while they pass into the insect form and chrysalis state ; fancy 800 or 1000 square inches of this brood being built up every three weeks. Try these combs in the scales against a twenty-eight-pound weight and see which conquers. Stand and look at that hive of bees, and remember that all therein goes on with unerring exactness and without light : then think of the untiring energy and perseverance of the bees outside the hive—ranging fields and woods from morn till night, gathering up the sweets and the pollen of flowers, storing the one in sacks and the other in baskets, returning to their homes laden as a donkey with panniers, increasing their honey-stores in weight from 2 lb. to 6 lb. per day ; and after their honey has been twice swallowed and disgorged, and thus made into honey proper, they securely lock it up. Yes ; think of all these things being done, together with countless and nameless offices performed every hour, and methinks the reader will be dumb with amazement at the industry of these wonderful bees ! ! Bonny wee creatures ! your own fanning wings will drive from your hives scores of tons of the sweat of your labours ere the imagination of the poet or the pen of the historian can compass your industry !

Without any pretension to accuracy, and anxious to be within the circle of facts, we may state that the daily consumption and waste of a large and prosperous hive of bees in the summer-time, while honey is being gathered, is about 2 lb. To repair the waste of such a hive, upwards

of 2 lb. of materials have to be collected every day. Beyond this there is often, in favourable weather, a great accumulation of honey. We have known a hive gain 20 lb. weight in two days. This year, at Cairnie, in Aberdeenshire, Mr Shearer had a hive that gained 10 lb. in weight in one day.

The Ingenuity of Bees.

To mention half the instances of ingenuity seen in a large apiary would fill a book. In the building of combs and formation of cells, design is strikingly evident. Honeycomb-cells are made to dip to the bottom. If a piece of guide is put in wrong side up, the bees adapt it as a commencement, but reverse the dip of the cells, so that they slant in the best direction for holding honey. The stays and props so frequently given to weak places and loose combs display great ingenuity.

When a swarm is put into an empty hive which it can only half fill, the bees, on commencing work, find that the way to the door by the sides of the hive is round about; and to shorten the way, they let down two or three beautiful *bee-ropes*, on which to descend and ascend. These ropes are made by one bee suspending itself to another, each bee coming lower down till the board is reached.

In spring months bees are anxious to hatch as many young bees as possible, and therefore spread themselves out as widely as they can. Sometimes the weather suddenly becomes cold, causing the bees to have some fears about their brood being chilled. In order to protect the brood some bees gather themselves into a cluster in the doorway, and thus prevent the cold from going into the hive; or, as our more accurate friends would say, to keep the heat in. Often is the door so closely wedged up—so

nicely corked—that there is just room enough left for one bee to pass in and out. On the return of warm weather the protecting sandbag is removed.

The story of the dead snail in a bee-hive is worth mentioning. Snails are very fond of honey, and often take lodgings for months inside a hive. They eat both honey and wax. Bees attack and drive from their hive every enemy but snails and worms. These they will not touch. It happened that a snail died in one, and was more unpleasant to the bees after death than before; but they could not cast it out. Their ingenuity was set to work, resulting in a coffin of wax being built around the snail.

The ingenuity of bees is manifest when they are at work on a windy day. In calm weather they fly pretty straight on their journeys to and from the fields; but when wind is high, they seek the shelter of houses, banks, and fences. Often have we seen them flying at great speed along open drains and ditches, and in this way escaping the violence of the wind. And when it becomes necessary for them to leave their sheltered course, they rise like a rocket, and dive again into the most sheltered way.

The Courage of Bees.

Cowardice is not an element of their nature; they fear no foe, and shrink from no danger. A bee cannot be cowed or dispirited by knock-down blows from the hand of man. If not stunned to inability, it will rise courageously to attack after being knocked down ten or a dozen times. Bees are furnished with weapons of defence; and they know how to use them. We say defence, for that is the proper word; for when they attack anybody or anything, it is owing to some molestation either received or

anticipated. The bees of hives placed near a peopled thoroughfare, or in a garden in which men, women, and children are often moving about, become as quiet and peaceable as cocks and hens. They become really domesticated, and will not annoy anybody if they are not first annoyed. Human breath and sweat are very offensive to bees, and hence it is not wise to move amongst them while in a state of perspiration.

But what about vicious bees and their courageous attacks? All bees born away from the haunts of human beings—that is to say, in a lonely place—are very apt to attack people going near their hives. Away from their own hives they do not attack anybody; but on seeing strangers (men or cattle) approach their hives, they anticipate molestation, and are not slow to use their stings. Often have we proven that bees once domesticated never become vicious. Bees that are quiet and peaceable in autumn are quiet and peaceable in spring, though they may not have seen anybody near their hives all winter. But bees that are born in lonely places, and there fly about, will fearlessly attack both men and beasts that go too near their habitations.

How to Tame and Domesticate Vicious Bees.

Though this properly belongs to the practical part of our book, we may be permitted to say here, that the way to cure vicious bees is to make them acquainted with the sight and form of human beings. A scarecrow or two (what the Scotch folk call "potato bogles"), placed in front of their hives, soon make them all right. The scarecrows can be shifted from one position to another a few times. Some years ago I bought a hive in the country, and placed it amongst some others at home. The bees would not let me go near their hive. A bogle was placed in front of it, and to me it was interesting to watch the

attack; one or two of the savage creatures were seen eyeing the face of the scarecrow, looking for a tender spot on which to dart. In a few days they became as quiet as the rest.

Have Bees a Language?

To be sure they have. Who has not seen a flock of rooks or crows feeding quietly in a green or ploughed field rise on wing as a black cloud on hearing the watch-word sounded by a single bird, which had seen apparent or possible danger near? So bees have a language well understood by themselves; and, we might venture to say, pretty well known by bee-masters of extensive experience.

There is the hum of contentment and the hum of trouble—the hum of peace and the hum of defence—the hum of plenty and the buzz of starvation—the hum of joy and the roar of grief—the cry of pain and the music of their dance—the buzz of the heavy-laden and the scream of suffocation. The cry of pain from a bee at the door of a hive affects the whole community.

Where is the bee-keeper who is not acquainted with the sound of bees *bent on mischief?* They have not stung him, but he knows they mean it. Often we have let the bees of a weak hive have the honey of some combs half empty. When no bees have been at work outside, a morsel of comb has been taken to the door of the weak hive; and as soon as four or six bees have begun to feed on it, they have been carried to stores or combs to be emptied. As soon as these few bees have got home with their booty, the whole hive seemed to be made aware that more might be had, and hundreds of bees belonging to this hive were soon busily carrying it home, before the rest of the hives have known that honey could be had. Bees have a language.

CHAPTER IV.

LIGURIAN OR ITALIAN BEES.

As our object in writing this book is to guide inexperienced bee-keepers in a safe and profitable course, we may be expected to say a few words about Ligurian bees, which were introduced into this country some few years ago.

The principle of novelty is implanted in the human mind, and the weakest part of an Englishman is his gullibility. A new style of dress, a Cochin-China fowl, a Ligurian bee, if well puffed up and advertised, will command lots of customers. People are bewitched by novelties.

But do you mean to say that the Ligurian sort of bees, which is so much praised, and sold at such high prices, is not better than the common English sort? Better for what? Do they fly faster? No. Do they carry heavier loads? No. Do they lay more eggs? It has not been proven or tested to our knowledge. Do their eggs become perfect bees sooner? No. Are they not earlier astir in the morning? No. Do they work later at night? No. Do they gather more honey? No. Are they not better in any sense? No; neither in Great Britain nor America has their boasted superiority been established. Still, amongst bee-fanciers they are fashionable. There is a gratification arising from the possession of what we like, and to many the cost of the gratification is of no importance. The satisfaction derived from the possession of a swarm of Ligurian bees to many gentlemen is an ample return for the money paid for them. But to those who are more

anxious for profit than for novelty we would say, wait till they are certain that the Ligurian bees are better than the common sort, ere you pay an extravagant price for them. We have no words strong enough to express our admiration of the old English bees; and if a public contest between them and Ligurian bees could be instituted, we should confidently stand by the old sort. We like to speak well of the good roads and sound bridges that have borne us along for fifty years.

CHAPTER V.

THE GOVERNMENT OF A HIVE.

The queen bee is monarch of the hive; and every hive of bees must have a queen reigning or in prospect—that is to say, in embryo. The monarchy of a bee-hive is a very limited one, for the presence of the queen amongst the bees is all the authority she wields, but is enough to secure the greatest order, contentment, and activity. Deprive a hive of its queen, and we presently find the bees thrown into a state of chaos and commotion, tumultuous to a degree. Let her be restored to them, and there is presently a great calm, and evident tokens of joy and satisfaction.

The workers are the governors or rulers over both queen and drones. The harmony of a hive is so great and unique that it is but seldom necessary for the bees to exercise their powers of mastership. When queens become old and enfeebled, *their* governors resolve to have younger ones. Royal cells are prepared, eggs are set in them, and

then comes the dethronement of the old ones. Frequently the old queens are cast out alive. We have known one such crawl back into the hive four or five times. It was a sad end to a useful life. But the bees mercifully abstained from hurting her. The welfare of the community demanded her removal, and a worthy successor in her place. Hence they cast her out, and reared another. If they had let her die a natural death, it might have taken place when there were no eggs in the hive, and thus have doomed the whole colony to extinction.

In times of threatened poverty and starvation, a queen may lay many eggs; but the bees often wisely remove them, rather than consume the little food left for themselves in rearing brood. Frequently half-hatched brood is torn out of the cells and cast out of the hives by the workers. Commands are often given *not to swarm*, after arrangements have been made for swarming. When we come to explain swarming, it will be seen that it is by the will and authority of the working bees that it does or does not happen—weather not interfering.

CHAPTER VI.

SWARMING.

It is our intention to explain this more fully when we come to the practical part of this work. Though it is one of the most interesting parts of bee-history, swarming and all its adjuncts are very difficult to explain, or put in a tangible form. The building of drone-combs, and the formation of royal cells, long before they are needed, indi-

cate that swarming is a law amongst bees—it is an instinct of their being, and tends to their preservation.

In spring months, hives, generally speaking, have not much honey in them. The combs afford plenty of scope for hatching brood; and young bees are born much faster than they die. Hives soon become very full. Sometimes clusters of bees, like bunches of grapes, hang outside. They are ready to swarm. Preparations are made for the important event. The bees well know, long before it comes to pass, that the queen (call her the old or mother queen) goes with the first swarm from every hive. What about a successor to the throne? When the swarm shall have gone, there will be no queen, no fresh-laid eggs. These wonderful creatures know all this, and therefore never fail to set eggs in royal cells, and thus have young queens on the way when the first swarm is sent off. Generally the eggs for young queens are set about four days before swarming takes place. Inclement weather may prevent the swarm leaving at the usual time; and therefore the young queens may be nearly ripe, and ready to leave their cells, ere the old queen with the swarm leaves the hive. Sometimes these young queens are torn out of their cells, by reason of wet or cold weather; and when this takes place, swarming is postponed for a week or two. The weather may become favourable, and a second time preparations be made for swarming. As the time draws near, scouts are sent to find a place for the swarm to go to. Like a queen wasp in spring, seeking a place to build her nest, these scouts may be seen going from bush to bush, and along the hedgerows in the neighbourhood of their hives. When the spot is fixed on, there is, in some way or other, a consultation about it in the hive, for messengers may be seen going straight to and from the place some short time before the swarm

leaves. It may, and sometimes does happen, that two places are selected, half the swarm going to the one, and the rest to the other place.

But let us return to the hive, and there we shall find something to excite our admiration. Thirty or forty thousand bees are about to leave the place of their birth, and comforts of home, never to return. Home-sickness is unknown to emigrant bees, provided they have a queen amongst them. The signal for departure will soon be given, but not before these thousands of bees have well filled their bags with honey. Which *great bee* gives the signal to go will never be told, but unquestionably a signal is given, for in a moment the swarm begins to gush pell-mell, like a flowing stream, out of the hive. What an exodus! What an interesting sight! Talk about the Pilgrim Fathers (and all honour to them) leaving their native land for the shores of America! Look at these courageous bees in the act of swarming, rushing forth to make the air ring with their cheers, rising into the atmosphere, and there roaring at the fullest pitch of joy and gladness. The swarming of bees is like a wedding, in this particular, that it seems to inspire all spectators with a felt interest and enthusiasm in the scene. Brave colonists! go and prosper, and multiply exceedingly!

Let us look into the mother hive. Why so quiet now? No crowding, no suffocation, scarcely a sound is heard. More than half the bees are gone; still there are enough left to rear and hatch the brood. Comparatively few hands can be spared now to gather honey; but great numbers are born daily — brood becomes population, There is no queen to lay eggs. In a short time many cells will be empty, and an ample population, all but free from the duties of nursing, ready and willing to fill them

with honey. In this transition state, while the brood is passing into insect forms and living bees, there is considerable loss of weight. But what about second swarms? Well, we had intended to look into the hive after the swarm had departed. On turning it up we find three, four, or five royal cells have little maggots in them, floating or lying in a white substance like milk. This milky substance is royal jelly: where the bees get it no one knows. These little maggots grow uncommonly fast, and become beautiful princesses in ten days. If there is ever anything like a regency in a bee-hive it is now, for their is no queen reigning, no queen born—still, all goes on well.

By-and-by there are strange sounds made in that hive. They come from a royal cell. One of the princesses has come to maturity, and intimates her intention to claim the queendom of the hive. She calls "Off, off, off," which sounds like the barking of a dog at a distance. These sounds she repeats several times; and, being unanswered, she leaves her cell, and becomes the rightful sovereign of the hive. She now commences to speak in another tongue altogether—uttering sounds more sharp and shrill. She calls, "Peep, peep, peep," or rather, "Pa-ay, pa-ay, pa-ay," eight or ten times. The other young princesses come to maturity, and commence to bark "Off, off, off," in their cells. This barking provokes the reigning queen very much. With murderous intent she runs up and down the hive to find these barking queens. Again and again, every few minutes, is she heard calling "Pa-ay, pa-ay," sometimes in one part of the hive and sometimes in another. And the responses, "Off, off, off," come regularly from the cells of her rival sisters. This calling of the queens is termed "piping." What is it for? Who can tell? It goes on for three days and three nights. The

reigning queen during this time is seeking an opportunity of killing her rivals, but the working bees ward off her attempts to get at her sisters; and they too are securely watched and kept in their cells. If the weather be favourable on the fourth day after the piping began, a second swarm will issue from the hive, taking with it the queen which called "Peep, peep." Now one of the princesses kept in confinement for three days is permitted to take the place of her sister. She in her turn calls "Pa-ay, pa-ay;" and if the responsive bark of "Off, off" be continued, a third swarm may be expected on the following day, or, at latest, the day after that. Third and fourth swarms have been known to issue from a hive in one day. Third and fourth swarms are not very common; for the bees of most hives find that two swarms in a fortnight are enough to send off—and sometimes they cannot afford to do that. To prevent second swarms leaving, the bees adopt signal measures. As soon as the first princess is born, and commences to "pipe," they *hush* her into silence at once. Before she gets one "pa-ay" half uttered, the bees prevent her from going on with it. In stopping her, they make a sound like the word "hush" spoken by the human voice. The supernumerary princesses are killed and cast out of the hive.

It has been already said that the usual time of piping for second swarms is three days and nights; but it ought to be stated that when the weather prevents swarming, and the bees are bent on swarming, the piping will be continued for some days longer. I have known it continued for seven days; and during those seven days not one of the princesses ever closed an eye in sleep. The piping of the queens, and their deadly hatred of one another, are two of the interesting and striking features of bee-history. Two old queens or two young ones—it matters not whether

they be mother and offspring, or sisters of the blood, or strangers every way—will, on meeting, rush savagely at each other, and fight with greater fury than bull-dogs.

In every contest between two queens it is death or victory. In some such contests both die. I have known two engaged in this deadly and violent struggle roll out of the door of the hive, over the flight-board, and fight it out on the ground. In this battle one was killed and the other wounded. Once we saw two young queens meet on the flight-board of a hive while a second swarm was issuing from it. They ran and embraced each other in furious combat; but, as we wished to obtain the second swarm, we tore the combatants asunder and threw them up in the air. Both went with the swarm. Next morning one was found dead in front of the hive into which the swarm was put.

CHAPTER VII.

HONEY.

This substance is found in the flowers of certain plants in almost every country. Doubtless it is odoriferous; and hence the honey-bee, whose smelling powers are wonderfully keen, can easily find it. The bee is furnished with a proboscis of some length, wherewith it can reach most of the nectaries of flowers in which honey is found. It has been said that at the point of the proboscis there is a brush of exquisite softness, which is used for collecting honey, and thus enabling the bee to fill its own bag.

The honey as it is collected in the flower and carried to the hive is not honey proper. The nectar of flowers is a thin sweet juice which may be properly called crude honey. This is collected by bees into the hives, and there converted into honey proper. During the day, the bees collect as much of this crude honey as they can, and place it in open cells till night, when they re-swallow it, thus making it into real honey. In this process it becomes thicker and sweeter. Before it is swallowed a second time, it readily runs out of cells whenever the hive is turned up or held a little to one side; but after having been put twice through *the stills* of bees, it is not easily disturbed in the cells. Besides, the taste and quality of the honey are greatly improved by the change effected on being re-swallowed. Doubtless much water is eliminated during the process.

Crude honey being thin and watery, will not keep: like badly-preserved fruit, it soon becomes mouldy and sour; but after it has been made into honey proper, it will keep good for two or three years, if not for a longer period of time.

The honey of one kind of plant is different in some small degree from the honey of other kinds of plants—different in substance, colour, and taste. For instance, the honey collected from the flowers of gooseberry and sycamore trees is of a sea-green colour, the flavour of which cannot well be surpassed for excellence. It has been often said by others that the honey from wild thyme is richer than any other honey. We have never lived where this plant grows abundantly, and have not tasted honey from it. The honey collected from the flowers of white or Dutch clover is clearer—more like spring-water—than any honey gathered from other flowers known in England. It pleases the eye better than honey of a higher

colour. The flavour of clover-honey is good and pungent, but not so rich and pleasing to the palate as that of sycamore and gooseberry.

Honey gathered from heather-blossoms is considerably darker in colour than any other pure honey gathered in Great Britain and Ireland. It has a much stronger flavour too—peculiarly *grousey*. This heather-honey, though to appearance of greater substance and consistence, is considerably lighter in weight, taking bulk for bulk. The clear sort goes to the bottom of the jar, and swims the heather-honey when both go together.

CHAPTER VIII.

HONEY-DEW.

This material is found on the upper surface of the leaves of some trees, has a shining appearance, and is sticky to the touch. Many ignorant people think that it falls from the skies during the night. It is simply the product of an insect (aphis) found frequently on the under sides of the leaves of some kinds of trees. This insect is most plentiful in times of prevalent east winds; and it is well known that flowers yield very little honey indeed when winds come from either east or north. In these times of scarcity bees work on these shining leaves, and thus collect honey-dew. It is dark in colour—disagreeable both to the eye and the palate; and is a great nuisance to bee-keepers whose aim is profit. It is a great pity that bees touch it at all.

Oaks, sycamores, limes, and beeches are the trees most

liable to be attacked by the aphis which yields honey-dew. A small quantity of it mixed with pure honey discolours the whole, and makes it quite unsaleable. It never candies or crystallises like good honey. Though bees gather and eat it in times of scarcity, it is improper food even for them.

CHAPTER IX.

WAX.

Wax is not gathered like pollen or propolis. The bees have to *manufacture* it at very great cost, both to themselves and their owners. As milk is manufactured in the body of the cow, so wax is manufactured in the bodies of bees. It is both a secretion and excretion of bees. In collecting honey, bees carry it in their bags; and when they wish to make wax and build combs, some of the honey goes into their intestinal canals, passes into the juices of their bodies, and scales of wax ooze from, or are excreted on the under sides of, their bellies. Wax, then, is a homespun article, wholly made by the bees themselves. Dr Liebig, in the appendix to his great work on 'Animal Chemistry,' says that "bees have to consume 20 lb. of honey to make 1 lb. of wax, and 1 oz. of comb holds 1 lb. of honey." We do not vouch for the accuracy of Liebig's calculations or experiments; but they are stated merely to show that wax costs the bee-keeper a great deal more than he gets for it in the market. But we are not quite sure that 20 lb. of honey are consumed in the manufacture of 16 oz. of wax. A swarm was put into an empty hive. This swarm, hive, and board would

weigh about 17 lb. In seven days it weighed 45 lb., and was filled with combs. These combs, pure and simple, would weigh about 2 lb. If 40 lb. of honey were consumed in their production, the gathering of this swarm was enormous. Liebig's experiments were honestly made, and the results honestly recorded: but no close observer of comb-building in bee-hives will admit that they are, or ever can be, conclusive in their character; because the experiments were made with about 10 oz. of bees—a mere handful. Both the weather and the warmth of a hive have a great influence in comb-building.

Dr Liebig says that it takes thirty-eight hours to convert honey into wax—that is to say, that the laminæ, or thin plates of wax, do not appear on the bellies of bees till thirty-eight hours after the honey has been taken into their intestines. This surely is not correct; for bees that are driven into a hive at six o'clock of a summer evening often commence to build combs before six o'clock next morning. And if no combs be formed or visible then, there may be seen the laminæ or flakes of wax lying on the board beneath the swarm. The making or secreting of wax is voluntary on the part of the bees; and this is one of the secrets of bee-history that can never be fathomed, and must remain veiled for ever from the ken of mortals. Bees do not secrete wax when their hives are filled with combs; but remove the bees into an empty one, and in less than twelve hours they build one or two pieces of comb.

As honey from one kind of plant differs in taste from that of another kind of plant, so wax differs in colour if different kinds of honey are used in its manufacture.

Wax is made from treacle or syrup as well as from honey; but the combs made from these are more brittle than those made from honey.

In the covers or lids of brood-cells there will be no-

ticed this fact, that they are always like the cells they cover: the cells of dark combs get lids of the same colour, and white combs have white lids. Doubtless part of the old combs are used in the manufacture of lids; but why it is so used, or why bees will have lids and combs of the same colour, has ever appeared a very remarkable thing.

In Professor Liebig's remarks on wax, there is another statement which is not absolutely correct. He says combs are never built in a hive unless the bees have the presence or prospect of a queen. Now we have seen a second swarm that lost its queen a day or two after being hived, half fill its hive with combs, chiefly of the drone kind.

The question of wax-making and comb-building is a very important and interesting one in the history of a bee-hive, and at present, little is with certainty known about it. In comb-building, bees are wonderfully frugal in the use of wax. We guess that not more than 2 lb. of it are used in the construction of 80,000 cells. It is a very inflammable substance, containing, as it does, more than 80 per cent of carbon.

CHAPTER X.

BEE-BREAD.

This is the pollen of flowers. Bees can with great ease gather it, and carry it home in pellets sticking on their hind-legs. Of course the colour of pollen is different in different kinds of flowers. Anciently it was considered crude wax, and even now some novices think it is made

into wax. It is used principally for feeding maggots in their cells, and hence it is termed "bee-bread."

If it were used in comb-building, swarms put into empty hives would gather much of it; but we find that all such swarms do not gather any pollen for some days, or till some combs are built to contain it. In most hives it is stored in their centres where the young are hatched; and often there is stored far too much of it. Though some seasons are remarkable for the abundance of bee-bread stored up, and though some hives have more than others, it is never in Great Britain a scarce article in hives of bees. The hive that has fewest cells filled, or half filled with it, is generally the most prosperous—all other things being equal. Bees do not eat it, and will die of starvation with a superabundance of it in their combs.

CHAPTER XI.

PROPOLIS AND WATER.

Propolis is a kind of cement used in hives to fill up all holes and cracks, and prevent unnecessary ventilation. It is a substance not absolutely necessary to the well-being of a hive; but, doubtless, the bees derive benefit from using it, otherwise they would not collect it. It is a sort of resin or gum, sometimes called bee-glue, and is collected from the buds of poplar and other trees. It is a harder substance than either wax or bee-bread.

Water is largely used in the height of the breeding season. It is used with bee-bread in feeding young bees. It is collected in dewy mornings, and after showers, from

blades of grass and the leaves of plants. In the absence of showers and dew, bees resort to brooks, rivers, and water-tubs for it, often preferring the impure water from manure-heaps. The sight of bees seeking and sipping water, is a proof that breeding is going on in their hives. During inclement weather, when not a particle of honey can be obtained, bees often venture out for water.

PART SECOND.

PRACTICAL MANAGEMENT.

We now come to the practical part of our work; and our aim is to make the reader understand everything necessary to the successful and profitable management of bees. This book is not written for the benefit of the advanced students of bee-history and apiculture, but to instruct the most ignorant to manage bees intelligently and well. It is Cobbett who says that all books should be written for the benefit of those who are ignorant of the subject of which they treat. The reader is requested to remember, that our stating certain facts and opinions will not make him, or anybody else, an intelligent bee-master, unless his mind be fully convinced and held captive by the reasonableness of such statements. All is to be weighed in the balance of his own reason, and whatever is found light and wanting should be cast aside. By the formation of correct and comprehensive ideas in apiculture, the reader will be able to guide his own industry, and rise to a position superior to those who follow and imitate others. Let all remember that those who follow are always behind.

CHAPTER XII.

THE APIARY OR BEE-GARDEN.

It is not which garden, but which place in the garden, shall the bees occupy? Every bee-keeper consults his own convenience in the choice of a spot on which to place his bee-hives. Near the door, or in front of a window, from which the swarms can be seen, is generally preferred by cottagers; for they have not much time to lose in watching for swarms leaving their hives. So far as honey-gathering goes, one corner of the garden will answer as well as another. It does not matter much, if anything at all, whether the hives look east or west, north or south. Hives placed in the centre of a wood or small forest, where the rays of the sun never reach them, thrive as well as those placed outside to bask in his smiles all day long.

A sheltered corner, with an open front, and at some distance from ponds or sheets of water, is perhaps the best possible in any neighbourhood for bees. If hives are placed in an exposed and bleak situation, or near sheets of water, high winds do some harm to their bees. Bees with heavy loads are fatigued when they return to their hives, and therefore it is desirable to let them enter as safely and speedily as possible. If driven to the ground by the violence of the wind, they sustain a rueful shock, and have to rest a considerable time before they can rise, perhaps to be driven down a second time. Still, practically and experimentally considered, the advantages of sheltered places are of small importance. If the pasture of the neighbourhood be good, bees will do well wheresoever placed. On the housetop and bleak hillside,

underneath the hedgerow and in an open field, we have found them to thrive exceedingly. We have seen them placed amid lofty houses, where they were compelled to rise to their tops in short spiral turns, and drop down about as perpendicularly as a bucket in a well, and yet in this position collect from 4 lb. to 6 lb. per hive every fine day. Bees have wits enough to make the most of every position. A warm sheltered place is, however, recommended for the home of bees.

How far should hives be off the ground, and how far asunder?

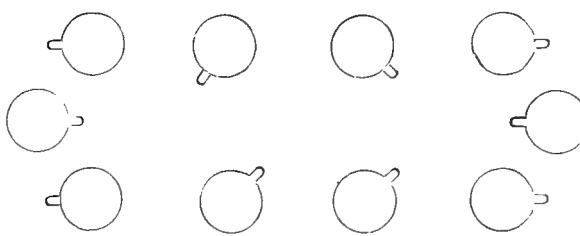
We think 8 inches above the ground is quite enough, and most of our hives are never more than 6 inches above the level of the ground. Is the health of the bees not affected when placed so near the earth? Bees are as healthy when placed 2 inches above the ground as when placed 20 inches. If hives are raised 2 and 3 feet, the bees, when heavily burdened, often miss the flight-board on their return from the fields, and thus come unexpectedly to the ground; and, by reason of the sudden and severe shake, do not rise for some time—and some are chilled to death ere they gain nerve and resolution enough to make another attempt. If an elevated position has any advantages at all, we have failed to learn what they are.

Three posts, about 15 inches long, driven half their length into the ground, answer well for a stand for one hive. These posts are driven into the ground about 15 inches apart, and the front one a little lower than the two behind, so as to make the water run off the flight-board, and not into the hive. Three round stones or river bullets, half buried in the soil, answer as well as the posts. Some bee-keepers are of opinion that bee-hives are like corn-stalks—if not placed high above the ground, vermin will go in and eat their treasures. A very little schooling will teach bee-keepers how to keep mice out of

their hives, without hoisting them aloft on ugly single posts.

Hives should be placed as far asunder as convenience permits. When we come to the chapter on artificial swarming, it will be seen that 6 feet distance between stock-hives is little enough. Many reasons could be given in favour of some distance being left between hive and hive.

But where many hives are kept, would you place them all over the garden? No, if economy of space and compactness of appearance are objects aimed at. Besides, it is possible to place a great number of hives within small compass, and be free from all danger of mistaken visits, or molestation of any kind, from the bees belonging to each. Many of our hives are removed, in spring, to cottage and market gardens in the country. We pay rent for a small space, and make it answer well. The following representation will show the reader how ten hives can be safely placed on a spot not much larger than a dining-room table.



Here every hive is separate from the rest, and so placed that there can be no mistakes made by the bees as to their own hives; but there is not room between them to hold a swarm from each hive without risk.

As there is a peculiar smell in each hive of bees, which

appears to be the bond of union in the community of it, —bees knowing each other by smell—the intelligent bee-master will keep his hives as far asunder as he conveniently can, or sufficiently far to prevent the peculiarity from being lost. Close proximity may destroy it.

BEE-HOUSES are very expensive and inconvenient. All bee-masters of experience consider them a hindrance to good management, and objectionable in many senses. We have nothing to say in their favour, save that they help to protect hives from the severity of winter storms. To say more about bee-houses in a work on the profitable management of bees would be a work of supererogation.

CHAPTER XIII.

THE PASTURAGE OF BEES.

It is believed that a twenty-acre field of grass, well sprinkled with the flowers of white clover, yields to bees every fine day at least 100 lb. of honey, and strongly scents the air as well; and that twenty acres of heather in flower yield 200 lb. of honey per day. If this calculation is correct (and we think it is), who will venture to estimate and give the sum total of all the counties of Great Britain and Ireland? We remember being startled at the statement of a citizen of Manchester, in a paper which he read before the British Association for the Advancement of Science, when that Association met in that city some years ago. I forget the title of the paper, but the subject of it was the poisonous exhalations of the town. The number of tons of carbonic acid gas constantly passing off into the atmosphere was named—a

number great enough to quicken the attention of all sanitary reformers, and the movements of the Corporation of Manchester. But who can accurately weigh or number the millions upon millions of pounds of honey that pass away (ungathered) into the atmosphere? Who can estimate the millions of pounds' worth of honey thus wasted on the "desert air"?

But is it not possible to overstock a given locality or parish with bees? Yes; though we have never known one overstocked. We have seen from fifty to one hundred hives standing in one garden, the stronger of which gathered from 2 lb. to 5 lb. each per day in fine weather.

But are all localities equally good for bees? No; there is a great difference. Some are very much more honeyed than others; and some are rich at one period of the season and poor at another.

It is perhaps beyond the powers of the most observant and best-informed mind in the realm to name every plant in this country that yields honey. The number of such plants is very great; but as there are some of greater value to bees than others, we will now mention those which we consider the best for bees.

Crocuses in early spring receive great attention from bees. Much pollen and some honey are collected from their flowers.

In some places there are certain kinds of *willow* (*salix*), which bear yellow flowers in spring, much visited by bees.

The border *hyacinths* of our gardens—the same sort that are forced to decorate and scent our conservatories—furnish bees with many a sweet mouthful.

Single wallflowers—grown largely in some localities for cut-flowers and seed—are excellent for bees.

The flowers of *gooseberry* and *plum* trees are super-excellent, yielding honey of the finest quality in great abundance.

Apple, *pear*, and *currant* trees are of great value to bees, furnishing them with rich and large stores of honey.

Almond, *cherry*, *peach*, and *apricot* are also honey-yielding plants.

Field-mustard (*Sinapis arvensis*), which is a weed, superabounding in some districts, frequently covering our corn-fields with its yellow flowers, is an invaluable thing for bees. In Yorkshire and Derbyshire this plant is called *ketlock*, in Lanarkshire it is called *skelloch*, and in Wigtownshire it is termed *ranches*. Here, in Lancashire and Cheshire, it is called the *yellow flower*. It continues a long time in flower, and the honey gathered from it is clear, and soon crystallises. The flowers of *turnip*, *cabbage*, and all the *brassica* tribe, like those of field-mustard, are exceedingly tempting to bees.

The flowers of *field-beans* are about as rich in honey as they can be. There is some mystery as to the means employed to extract it from bean-flowers, which are tubular in shape, and of considerable thickness and depth. The honey, of course, lies at the bottom of these—deeper than the length of a bee's proboscis. The tubes are pierced or tapped near their bottoms, and through the holes thus made the bees extract much rich treasure. It has been said that bees are unable to pierce the tubes of the flowers, and that the holes are made by humble-bees, which have greater powers. No one can watch humble or earth bees at work in a field of beans, and remain in doubt they do some work in this way. They push their trunks through the petals of the flowers with a view to reach their honey; but the question is, Can bees make holes for themselves? We have never seen a honey-bee make a hole through the petals of a bean-flower; but, from the scarcity of humble-bees in some neighbourhoods where the flowers of many acres of beans are found well

pierced, we believe that the "jemmies" of our own friends are used for breaking through the thick walls of bean-flowers.

Maple, sycamore (or *plane*), and *lime* trees are of great value to the bee-farmer. Maples are not so abundant in this country as sycamores and limes. Honey is not distilled (does not drop) from the flowers of the sycamore, but it literally lies on them, and is clammy and sticky to the touch of human hands. It continues a long time in flower, coming into flower before apple-blossoms disappear, and lasting till white clover is in bloom.

The strong scent of lime-trees in flower, and the music of bees busy at work on them, indicate that an abundance is collected from them in the month of July.

Wimberry, raspberry, and *brambleberry* deserve honourable mention as honey-producing plants.

Borage, mignonette, heliotrope, buckwheat, birds'-foot trefoil (*Lotus corniculatus*), *gorse, broom*, and wild *thyme*, are all honey-plants, and useful in their day.

White or Dutch clover is the *queen* of honey-plants. It is widely cultivated in this country, and continues to flower a long time. In Scotland the farmers use more clover-seed in laying down land in grass than the farmers of England; hence the clover-fields are, generally speaking, better there than here. The use of bone-dust and lime as manure has a great influence in the production of clover.

Pastures eaten bare by cattle are, of course, not so good for honey as those less severely eaten. Sheep are fonder of clover than cattle, and are more able to nibble off its young heads; hence sheep-pasture is inferior in a honey point of view to cow-pasture.

Clover is perhaps more uncertain in its yield of honey than most other plants, inasmuch as it is more easily affected by cold nights. Some years ago, a stock-hive from

which one swarm only was obtained, was weighed every morning during the hot weather of July. On the 17th and 18th it gained 12 lb. in weight, next two days only 4 lb., and on the following day it gained 4 lb. The difference of the weight of honey gathered was attributed to the variation of night temperature, for one day was as hot as the other.

Heather-blossoms, during the months of August and September, yield a harvest of honey prodigiously and marvellously large. This is so well known, that in Scotland and some parts of the Continent, there may be seen cartloads of bee-hives going to grouse-land. Bee-masters find that there is an ample return for the trouble and expense of taking bees to the moors, even though the distance be thirty or forty miles.

On no spot of Scotland can it be said that heather is not within easy distance of it, so that all Scottish bee-keepers can avail themselves of the honey that is so abundantly produced by its pinky-purplish blooms. To me it appears wonderful that in England we have heather enough for all the bees in the world. In Yorkshire there are magnificent seas of it. On the hills of Derbyshire and Cheshire, within twenty miles of Manchester, we find miles of heather excellent for bees. In both Staffordshire and Warwickshire, heather in abundance may be found. In the south, we find large tracts of heather in Devon, Surrey, Hampshire, and Sussex. In Ireland, Wales, and the northern counties of England, it is as abounding as it is in Scotland.

All plants grown on warm well-drained soils yield more honey than those grown on cold heavy land. Even in the case of heather this is true. In ordinary seasons heathery hills yield more honey than heathery swamps. And the good sense of every bee-master will tell him that hilly exposed pastures and districts are better in showery

seasons for honey than flat and sheltered ones. We have known hives placed in hilly districts increase in weight in such seasons; whereas those standing in low sheltered places could scarcely keep themselves, the flowers there being hardly ever dry.

How far will Bees go for Honey?

This question we cannot answer with accuracy. Our experience in this matter goes dead against the wonderful stories that are told in some books. We read of bees flying four, seven, and twelve miles for food! Our bees will perish and die for want of food within three miles of good pasture. Our bees here never find the hundreds of acres of heather which cover Carrington Moss within three miles of them. In fine sunshiny weather bees go farther from home than they do in dark cloudy weather. But even in the best and brightest of weather in June and July, very few, if any, find their way home to their old stand if removed three miles off. Moreover, the return of some bees does not prove that they travel three miles in search of food. It proves that some of them go a little more than one mile and a half from home, and finding themselves on known pastures within one mile and a half of the old place, they return thither, forgetting, as it were, where they *last* came from. I am therefore of opinion that very few bees go more than two miles for food.

It is very desirable to have bees near the pasture on which they work. Short journeys are not only a saving of labour to bees, but also a protection of their lives. When compelled to fly far for honey they are often caught by showers and destroyed. In warm genial weather, with a superabundance of honey in flowers, bees *will* have it. They go beyond the bounds of safety for it. Gentle showers do not stop outdoor labourers. Black clouds

often send them hurriedly home; but they are frequently caught, and die on the altar of their industry. Hives containing 8 lb. and 10 lb. of bees have lost two-thirds of their ranks by sudden showers in warm honey weather. Bees driven to the earth by showers do not die at once. If the following day be warm and fair, the rays of the sun sometimes reanimate these storm-beaten creatures, and enable them to return to their hives.

CHAPTER XIV.

HIVES.

As we have now come to the most important chapter of the book, it is hoped that all readers seeking profit from bee-keeping will try to go through it in the light of common-sense. Bees ever have been, and ever will be, profitable to their owners, when well managed. Many bee-keepers in England are fifty years behind the day, and have yet to learn the first principles of profitable management. Agriculture has made great advancement during the last half-century—so has horticulture; and they are not going to stand still now. But apiculture, alas! has made but poor progress. What hinders it? When the astronomer discovered and reported the fact that the planet Uranus loitered in one part of his orbit, it was an act of common-sense on the part of another man to push his telescope towards that part in order to find out the hindering cause. He was thus successful in discovering another immense planet (Neptune) lying far behind, the attractive influence of which is so great as to impede and hinder Uranus in his course round the sun. Now there

is something which hinders many bee-keepers from making as much honey, or money, as they ought. More than twenty-five years ago we told them that all the books that were ever written, and all that we could possibly say, would never put them on the highroad to the successful and profitable management of bees unless they kept large hives.

We are well aware that it is a difficult matter to remove prejudices of long standing. When water cuts its own channel it runs along it, year after year. To a large extent bee-keeping has done the same. We are glad to see and know that a great alteration is now taking place. The adoption of large hives by many bee-keepers has enabled them to double their profits, and given a great impulse to bee-keeping in their neighbourhoods and counties. The use of such hives by one or two bee-masters of intelligence and ability in every county would, in process of time, revolutionise apiculture throughout England.

Having far more confidence in the power of facts and figures than in that of logic and argumentation for convincing men that large hives, well managed, are incomparably better than small ones, we have of late recorded the results of bee-keeping in our native village, where hives are of considerable dimensions. These records have already stimulated the attention of many apiarians throughout the country, and their pluck and energy are now in full play. If the weight of Carluke swarms rise up to 100 lb., 130 lb., and 150 lb. each, according to the season, why should not swarms elsewhere rise to the same weight? In 1864, the weights of an old hive and its two swarms, belonging to Mr Robert Reid, Carluke, were published in the 'Hamilton Advertiser' of that year :—

"Old stock, or mother, was	92 lb.	weight.
First swarm from it,	160 ,,	,,
Second swarm,	76 ,,	,,
Altogether,	328 lb.	weight."

In the year 1865, the first swarms at Carluke weighed about 90 lb. each while on the clover; but after being taken to the moors many of them lost weight, owing to the weather being unfavourable for gathering honey.

The heaviest swarm of 1866 at Carluke was 148 lb.

The account of the success of 1868 came to us in a letter from our friend Mr Reid, part of which we shall here quote :—

"CARLUKE, 25*th Sept.* 1865.

"MY DEAR FRIEND,—We brought our bees home from the moors the week before last; the weather being fine, we thought they would be gaining weight, but were wrong. Henshilwood got his home about ten days before us. During that time ours lost each 8 lb. and 10 lb. in weight. Our heaviest swarm was 112 lb.—another about 6 lb. lighter. Our best second swarm was 75 lb.

"Robert Scouler had three first swarms, which were about 120 lb. each. His best was 130 lb.

"John Jack had two stocks in spring, which did better than most. One first swarm weighed 161 lb., another 104 lb., and a second swarm 68 lb. I have not heard of the weights of the old ones, but he took 230 lb. of honey from the produce of his two stocks.

"Samuel Dempster had two also in spring. His first swarms weighed respectively 110 lb. and 148 lb. Henshilwood had one 168 lb., and my brother one 130 lb.

"*P.S.*—Scouler had two seconds, one of which weighed 80 lb. and the other 90 lb.—Yours truly,

"ROBERT REID."

Mr Reid's letter containing some of the results of 1869 has already appeared in print, in connection with our own balance-sheet, which appears annually :—

"CARLUKE, *5th Oct.* 1869.

"MY DEAR OLD FRIEND,—I beg to be excused for not replying to your note sooner, but I waited till I got my bees home from the moors, and the honey taken from them. I jarred it all up yesterday, and find that out of ten hives we have taken upwards of 400 lb. of honey. The heaviest hive was 120½ lb., two or three of them about 90 lb. each, the rest from 60 lb. to 70 lb. each. We had three boxes of honeycomb, which realised 27s.; and one second swarm, 80 lb. weight, was sold for £2, 2s. The above is the produce of six stock-hives; so you see the bees have done well with us this season.—Yours truly, R. R."

In 1869, the heaviest swarm in the parish was 128 lb. And an old widowed aunt of the author got 250 lb. of honey from four stocks.

These facts and figures are quoted with the view of stimulating the attention of bee-keepers generally. We are of opinion that agricultural and horticultural exhibitions do more to advance the sciences of farming and gardening than the teaching of books and periodicals; and we fancy that example, even in bee-keeping, is better than precept. When we resolved to write a book on bees for publication, we sent the following three questions to bee-keepers in many counties: 1. What is the general size of hives used in your county? 2. What time does swarming commence? 3. In good seasons what weight are first swarms at harvest-time?

Our correspondent near Norwich, in Norfolk, says: "The hives here are rather smaller than usual; the middle

of May is a good time for early swarms; and at the end of the season a good stock may weigh only one stone. This may surprise you, but some are not half that weight."

From Yorkshire, a gentleman at Hull answered the questions as follows: "The size of hives used hereabouts contain 1300 cubic inches, and swarm about the first week in June. As to the general weight, that depends on the management of them. The most I have ever taken from a swarm was 32 lb."

From Wycombe, in Buckinghamshire, we learn that "the first week in June is the time of general swarming; the size of the hives about 12 inches deep and 12 wide; and the weight of swarms at the end of the season depends on the summer. If not much rain to stop their work, a good swarm *ought* to weigh 30 lb."

Our informant in Cornwall, near Launceston, says: "In favourable and pleasant spots, bees begin to rise from the 16th to the 20th of May; but the time of general swarming is the first and second week of June. The size of hives in use is, I think, about 14 inches diameter and 11 inches deep. The average weight in good seasons is about 28 lb., hive and combs together; the heaviest I have ever known was 35 lb. Taking one year with another, the average produce of a hive is about one gallon of honey. In the parts of Devonshire which I have visited, bees appeared to be treated much as we treat ours, the hives being a little less, if anything."

In Lincolnshire, swarming generally takes place from the 10th to the 20th of June; hives 12 inches diameter and 8 or 9 inches deep; and the weight of good swarms ranges from 30 lb. to 45 lb.

"We think," says our Devonshire correspondent, "25 lb. to 30 lb. a good weight for swarms in common hives; I have known some 50 lb., but this is rare. I do not

think your figures could be approached in this county with hives of any size."

We happen to think differently of Devonshire, and believe that if large hives were introduced and properly managed in that splendid county, the honey harvests would be enormous. Instead of swarms being rarely 50 lb. each, they would often be 100 lb., and sometimes 150 lb. each.

Let us now go to Northumberland, where we are told "that the time of general swarming is the month of June, but some early swarms are obtained about the 18th of May. The general size of the hive here is 15 inches in diameter and 12 inches deep; and the best hives at the end of an average season contain from 25 lb. to 35 lb. of honey." Northumberland is a long way in advance of any other county south of the Tweed that has responded to our questions.

Ayrshire, Perthshire, Wigtownshire, and Mid-Lothian, are about on a par with Northumberland. No answers to our questions came from Ireland and Wales.

"Now, come back to the parish of Carluke, and tell us if you think that the great success of the bee-keepers there is owing altogether to the use of large hives." No, not altogether. A great measure of their success comes from good management. But good management, without large hives, will not end in great results—large hives being the basis or foundation of success, and good management the superstructure. They go hand in hand, though they stand in the relation of parent and child; and whenever the intelligent bee-keepers of this country adopt and use large hives, they will be utterly astounded at their former blindness in this matter.

A queen bee lays about 2000 eggs every day in the height of the season. She lays as many in a small hive as she does in a large one: but in a small one there are

not empty cells for 500 eggs a-day ; and therefore 1500 eggs are destroyed in some way daily. The bees must either eat them or cast them out. Now, suppose the bees were allowed to set and hatch all these eggs, how much more numerous the population would be, how much more honey would be collected, and how much larger the swarms sent off would be too !

On former occasions, when we have been trying to make bee-keepers *think*, we asked them to consider the folly of a farmer's wife expecting large eggs from bantam hens. And we ventured to predict that if Shetland ponies only were used by farmers, agriculture would speedily collapse—nay, it never would have advanced to its present state, commanding the energies of our best men. Without the muscle and strength of the fine horses of the Suffolk, Clydesdale, and other breeds, what would agriculture have been ? Would it be worth the attention of men of skill and energy ? So it is, and so it will be, with bees kept in small hives. They are hardly worth the attention they require ; and the profits from them will never call out that enthusiastic energy and latent power which, put in play, make the most of everything. Of course, apiculture is a thing of trifling importance to agriculture ; but we hold that the general adoption of large hives would bring about a reform and revolution in bee-management, that would confer large and lasting blessings on the rural populations of this and other countries.

But let us return once more to the hives that weighed from 100 lb. up to 168 lb. Why, it would take three ordinary English hives, if not more, to hold as much honey as was in one of these hives—it would take three or more of them to hold bees enough to gather as much in the same space of time.

It is not necessary to say half so much in favour of large hives to minds unwarped and unprejudiced ; but as

almost all writers on bees, ancient and modern, have recommended for use hives unprofitably small, we have the hard and painful task to perform of nullifying, in some degree, the influence of their opinions, ere we can successfully recommend the general adoption of hives *profitably* large.

The Materials of Hives.

Straw hives, well sewed with split canes or bramble-briers, are incomparably better for bees than any other kind of hive yet introduced. Nothing better is needed, and we believe nothing better will ever be found out. On the score of cheapness and neatness, lightness and convenience, suitability and surpassing worth, we advise all bee-keepers seeking large returns in honey to use nothing but straw hives as domiciles for bees.

Hives made of wood, at certain seasons of the year condense the moisture arising from the bees, and this condensed moisture rots the combs. The walls of a wooden hive are often like the walls of a very damp or new-plastered house. The outside combs, and sometimes the inside combs too, perish before the wet walls of wooden hives. They perish in this sense, that their nature or adhesive power goes like mortar in walls, and becomes as rotten as burnt paper. All such combs are worse than useless in hives; for bees cannot use them for either honey or brood, or even as the foundations for fresh combs. They have to be taken down and new ones put in their places. There is in this work of the bees a waste of both time and honey.

But how can you account for the use of boxes as bee-hives in this country at all? Well, the great bulk of straw hives of English make are exceedingly small and ill made; they are unsightly, and comparatively not worth one shilling a dozen. Many bee-keepers, finding

them unsatisfactory, have invented hives of wood. Of course, everybody loves his own offspring, and likes to see it bear a good name, and be recognised in society. Every invention is a grand affair! Both architect and builder join hands in holding forth an article decidedly superior to all that has gone before! And what was begun in honest effort ends in full-fledged quackery. And hundreds, ignorant of bee-science, are induced to purchase these costly hives, which, in their own turn, are found so unsatisfactory, that purchasers think they will never be duped again. Another invention turns up in the shape of a costly hive—to be managed on the "depriving" or humane system! Many, again, are bewitched by the very name of the last invention, and spend their money for hives which the writer would not accept as a gift.

It appears from Mr Quinby's book on bees, that in America the new inventions in bee-hives are more numerous than they are here, and are well patented and patronised. After showing the worthlessness of many patent hives, Mr Quinby says, "that in Europe the same ingenuity is displayed in twisting and torturing the bee, to adapt her unnatural tenements, invented not because the bee needs them, but because this is a means available for a little change. Patent men have found the people generally ignorant of apiarian science. Let us hope that their days of prosperity are about numbered."

Mr Quinby, who is one of the largest bee-keepers in the world, and president of the American Apiarian Society, knows well that common hives are the best, and that straw is better than wood as material for hives. At page 300 of his book he says, "I shall greatly err in my judgment if straw, as a material for hives, does not regain its former position in public favour." "We have," Mr Quinby says, "faithfully supported a host of speculators on our business for a long time, often not caring

one straw about our success after pocketing the fee of successful humbuggery."

In making these quotations and statements, we know that the prejudices of some of our readers, and the selfishness of others, will be offended. We are sorry for this, but we cannot help it.

It is well known that in fine seasons for honey, there are considerable profits derived from the produce of small hives; but we wish the reader to know that in such favourable seasons the produce and profits from large hives, well managed, are incomparably larger. The writer's father once realised £20 profit from two hives in one season, and £9, 12s. from another, held jointly by him and James Brown of the same place. The profits came from the honey gathered by the bees, not from swarms sold at an exorbitant price, a practice common in our day.

Since the first edition of this work was published, we have received some hundreds of letters from the mansions of the rich and the cottages of the poor, intimating how well its lessons have been learned, and the great success and satisfaction that have been realised from putting them into practice. In the township in which we live (we might venture to say the county), swarms were never known to rise beyond 40 lb. each till our teaching and example were followed. The best swarms last year (1874, which was not a very good one) rose to 100 lb. each—quite equal to those of Carluke last year.

The adoption of large hives by many of the bee-keepers of Aberdeenshire and Banffshire put them last year in the van of the advancing hosts. In a private letter which lies before us, it is stated that the first swarms obtained last year about the 1st of July rose to great weights. One belonging to Mr Gordon rose to 164 lb. Swarms belonging to other bee-keepers rose to 128 lb., 126 lb.,

120 lb., 109 lb., 104 lb. Mr George Campbell got four swarms from one hive; their united weight (including the mother hive, which was 93 lb.) was 373 lb. The profit from this hive must have been very great.

The question of sizes and shapes we now come to consider. Three sizes have been recommended: the first, 20 inches wide by 12 inches deep, inside measure; the second, 18 inches by 12 inches deep; and the third size, 16 inches wide by 12 inches.

The first size contains about 3000 cubic inches; the second size, about 2700 cubic inches; and the third size, about 2000 cubic inches. We say *about*, for hives are sometimes made convex or round in the crown; and when this is done, the cube measure will be lessened somewhat. It is not expected that bee-keepers will be guided to the adoption of hives corresponding exactly with the sizes given above, but it is hoped that they will adopt and use hives after their own models, equal in dimensions to the second and third sizes. We use two sizes only in our own apiary—viz., the 16 and 18 inch hives—because three sizes necessitate a like number of boards and ekes, and our aim is to manage bees with the least possible expense and trouble. But in future our 16 and 18 inch hives will be made 14 inches deep—that is, nearly one-sixth larger than they are at present. In fine seasons these hives will need to be enlarged by ekes or supers. Enlarging hives by ekes is mentioned now with a view to let the reader see the wisdom of fixing on certain sizes for his hives—at least the width of his hives—so that enlargement may be easy when necessary

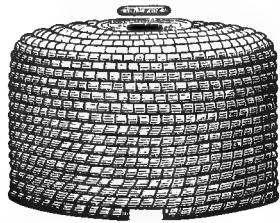
A hive 20 × 12, well filled, weighs 100 lb.; one 18 × 12, 80 lb.; and the 16-inch hive weighs about 50 lb. These figures are meant to give the reader an approximate idea—not an accurate one—of the contents of the hives recommended. In the months of May and June, the hives would

be at the swarming-point before they reached the weights here mentioned; and in the autumn of favourable seasons they would probably go from 14 lb. to 20 lb. beyond these weights without the bees ever thinking of swarming. How much honey can they gather per day? That greatly depends on the state of the atmosphere, the number of empty cells in them, and the quantity of brood that requires attention. Soft warm winds from the south and west fill the nectaries of flowers with honey, whereas winds from the east and north seem to stanch the flow of honey completely. But on good pasture, and with favourable weather, healthy 16-inch hives will gather from 2 lb. to 4 lb. of honey per day, and the larger sizes from 4 lb. to 7 lb. The hive that gained 20 lb. weight in two days was placed in the midst of good pasture, when it was 39 lb. weight. It rapidly rose in weight to 109 lb. The traffic of bees going out and in of this hive was graphically described as resembling the steam of a tea-kettle going two yards from its mouth before vanishing amongst thin air. From 3 lb. to 5 lb. of honey gathered is a fair day's work for a good hive.

But why use the smaller sizes at all when we see that the larger size does more work of every kind? We are glad this question has been mooted, for it gives us the opportunity of saying that hives of two or three sizes are of great advantage to a bee-master who acts on a principle, sound and natural, and with his eye constantly open to his own interests. All seasons are not alike favourable, and all swarms are not equally large, and some are early and some are late in leaving the mother hives. The larger sizes are used for large and early swarms; the smaller sizes for small or later swarms.

The shape of hives may be rather conical at the top, or flat-crowned. It is a matter of taste and convenience this. Some bee-masters like one sort and some the other; and

some skep or hive makers can build hives each after his own pattern only. We have been accustomed to the use of hives rather flat in their crowns, and we prefer them to those with conical crowns.



Here is a straw hive 18 inches by 12. Its sides are nearly perpendicular; its crown rather flat. It has an opening 4 inches wide in the crown for a super, and a lid to cover that opening when supers are not required. The 16-inch hives are made after the same fashion—all with holes in their crowns for supers of honeycomb. A well-made 18-inch hive weighs about 6 lb., and a 16-inch one about 5 lb. when empty.

When an 18-inch hive receives an eke—say, 4 inches deep—it will measure 18 × 16, and contain nearly 4000 cubic inches of space. Now, tell us if a hive of such dimensions, well filled with combs, will overtask the laying powers of the queen bee? No; we have seen larger hives as full of brood as the smallest hive in the country.

Before we leave the question of sizes, let us ask our readers not to be too hasty in introducing the large sizes into their apiaries. Begin with 16-inch hives; and swarms from these will fill the larger sizes.

The Bar-frame Hive.

Amongst amateurs and bee-fanciers this hive is rather popular at present. Apiarians of this class do not keep bees for profit, and they purchase every novelty. Traders in bee-hives are constantly offering to the public hives of this sort, containing the latest improvements. Though we think the bar-frame hive is very unsuitable for a bee-farmer, or for filling the markets of Great Britain with honey, we shall here describe, for the sake of those who prefer the hive, what we consider are its best and worst qualities.

It is termed "the bar-frame hive" because loose or movable bar-frames are hung up inside of it. The bees are tempted often to build their combs in the frames; and when they do this in a regular manner, the bar-frames are filled with combs, and can be removed from the hive separately. In artificial swarming with this kind of hive, half of the bees and half of the combs are put into another bar-frame hive. There are many ways of artificial swarming, but none more unnatural than this. In the autumn, when these hives are filled with brood and honey, some of the combs containing most honey are taken and the others left. If the swarming system of management (which is very much the best) be adopted, the combs containing most brood in both hives can be fixed in one, thus making it a good stock for keeping; the rest is taken for honey. "The American slinger" was invented to sling or cast out honey from bar-combs without destroying them. It was introduced into this country recently, and has been but partially tested. It can sling out flower-honey from combs, but is quite unable to cast heather-honey from them. The action and merits of "the slinger" will be considered when we come to the chapter on honey-taking.

The advantages of the bar-frame hive are found in the fact that the combs, when accurately worked into the frames, are movable. The disadvantages are manifold: 1. Loose bars in hives of bees are both unnatural and obstructive. Bees are better architects than their masters, and better house-furnishers. Bar-frames are, in the nature of things, a hindrance to bees, by being in the way of their operations. Man cannot teach bees anything, but he can hinder them by placing complications in their hives. All other things being equal, the best hives are those possessing the least complications; and the best bee-master is he who takes the most hindrances out of their way. The results from keeping bees in roomy but simple straw hives have never, to our knowledge, been approached by any kind of complicated hives. One straw hive and its swarms reached the gross weight of 328 lb., another 373 lb. This last one was in 1874.

2. Bar-frame hives have no cross-sticks in them to steady and support their combs. There will therefore be some risk run in removing them to the moors, where strong hives gather from 30 lb. to 50 lb. of honey each in favourable seasons.

3. They cannot be eked or enlarged to prevent swarming. Most bar-frame hives are ready for swarming before they are 50 lb. weight apiece, and often bees swarm rather than go into supers. Advanced bee-keepers, whose swarms in straw hives rise to 100 lb., 120 lb., and 150 lb. each, cannot well be tempted to try bar-framers.

But are the bar-frame hives not useful to the student of bee-history? Yes, very; for he can take out a bar of comb daily, or as often as he likes, to examine the brood in it. And this hive may be useful to those who want a bar of honeycomb occasionally, though to us it would be easier to cut honeycomb from a common hive, than to unscrew the lid and remove it from a bar-framer.

Here are two comb-knives, which are useful on many occasions: by using them, we can cut easily and speedily honeycombs from common hives. The one with chisel end is used for cutting the combs from the sides of hives, and splitting them elsewhere. The other is a small rod of steel, not more than a quarter of an inch thick, with a thin blade at the end 1½ inch long, both edges sharp, for cutting the combs from the crowns of the hives,

or crosswise elsewhere. To those who have a preference for bar-frame hives, let us suggest the desirability of having them made of straw, neatly and firmly sewed to the outer frames, and large enough to hold 13 or 14 bars each. It would be no difficult matter to have hives of this kind made, more pleasing to the eye, and much better every way, than any we have yet seen. An accomplished Scotch skep-maker would produce hives that would eclipse those made in the south, the straw of which is simply laid in so thinly, that any one can put his finger through it.

The latest *improvement* to the bar-frame hive consists in the substitution of "*a quilt*" for the wooden top. The inventor is of course a dealer, and till the invention was completed, no one heard of the wooden tops being at fault. In the language of the inventor, we shall now let the reader have a description of the quilt. He says: "For all crown covers, it is the very best for winter use, because it permits the escape of all noxious vapours from the hive, as soon as they are generated. The quilt arrangement comprises a piece of carpet, or other material of hard tex-

ture, with a hole in the centre for feeding purposes; two or three thicknesses of felt, flannel, or other porous materials, each with a hole in its centre of similar size as that in the carpet; a piece of perforated zinc or vulcanite as a feeding-stage; a pad like a kettle-holder to lay upon the vulcanite; a folded sack, blanket, or rug laid upon the whole,—after which the roof may be put on, and should be fastened to prevent blowing off. If closely covered, the whole arrangement will become sopping wet, simply because the vapours cannot escape."

I think no intelligent bee-keeper, after reading this description, will covet or ever purchase such lids; and it grieves one to know that, after discovering the unsuitability of wood as material for hives, the inventor has not hit upon something better and more sightly than a quilt made of carpet, felt, vulcanite, a pad, a folded sack or blanket, and a roof.

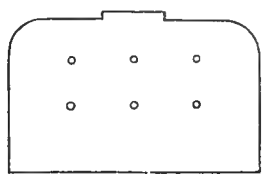
This quilt will soon be cast aside for something very much better. What will it be? We cannot tell the reader what will come next, but we agree with Mr Quinby that there is "nothing equal to straw for straining moisture out of hives." If wood is unsuitable for the crowns or tops of hives, it is equally unsuitable for their sides.

Guide-Combs and Cross-Sticks.

Guide-combs are simply little bits of clean old comb (the older the better) about two inches wide and one or two inches deep, fastened to labels, such as are used for naming plants. Well, the label and bit of comb are laid together, and cemented by dropping between them a little melted wax. This is best done by holding a warm poker over the two, and touching it with a bit of wax. The poker should be just warm enough to melt the wax: if too hot, the wax will boil and melt the guide-comb as it

falls. When the wood and comb are thus cemented together, the wood is nailed in the crown of an empty hive, as a guide to the bees to build their combs running from front to back. When the combs are so built, the bees can see the door from the centre of the hive, or anything going in at the door, which they could not do if the combs ran from side to side.

As soon as the guide-comb is nailed into an empty hive, we drive cross-sticks across the hive, from side to side. In a 16-inch hive we use four and five, and in an 18-inch hive we use five and six cross-sticks.



As soon as the combs are well started from the crown of the hive, they are securely fastened to the top centre-stick; and as they are enlarged they are cemented to the other sticks. The bottom sticks should be at least four inches above the board; for if less, the bees sometimes do not close their combs round them. Hives thus sticked and filled with combs may be safely removed from one end of the country to the other.

Another advantage of using sticks in hives is this, that the bees, being great economists, use them for cross-lanes. Where the combs cross the sticks, and are fastened to them, the bees leave little holes or doors in the combs, which they use as passages from comb to comb. They thus shorten their journeys for indoor work. In hives without sticks, such byways and convenient passages are very rare indeed.

The Leaf or Unicomb Hive.

This may be called "The Observatory Hive," for no other hive can be compared to it for observation; and it appears to us that no other is necessary. In this hive every bee, and all it does, can be seen, as well as all the movements of the queen and the attention she receives. A square or round hive with glass windows is all but useless for observing what goes on inside. All that can be seen in them are some combs and bees next the windows. But when there is only one comb with glass on each side of it, there is opportunity given for witnessing the internal operations of a bee-hive. As the unicomb hive is not meant for honey or profit, we need say little about it. To those engaged in the investigation of the habits of bees, we strongly recommend the use of unicomb hives.

CHAPTER XV.

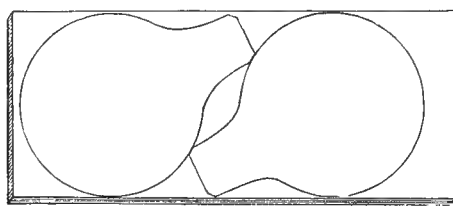
BOARDS.

Boards should be about 1 inch wider than the hives standing on them. They are best when made of one piece, without seam or junction. But whether made of one piece or two, it is necessary to nail two bars of wood on the under side of each board, to keep it from warping or twisting. The wood of which boards are made should be either $\frac{3}{4}$ or 1 inch thick.

The flight-boards should be 7 inches in diameter. Small flight-boards are objectionable, for bees returning with heavy loads often miss them. This is not all; for

bees require breathing-room at their doors, as well as a broad landing-stage. All birds and insects fill their bodies with air before they take wing. A pheasant hops while he does this, and a pigeon does it by taking two or three deep inspirations. If the pheasant is suddenly disturbed, and has to rise without hopping a bit, he does rise, but so heavily and slowly—with a great cackling noise—that he is often knocked down by the shot of the sportsman ere he gets a fair start.

If bees have a broad flight-board they run in and out quickly.



Two boards marked for sawing out of a deal board.

The Door of the Hive.

Some bee-keepers have channels cut in the boards for doors. Where this is done, the flight-boards are uneven and unlevel; but the hives are uncut. We prefer level boards, with doors 4 inches wide and 1 inch high cut in the hives. Our system of feeding, which will be mentioned hereafter, requires the flight-boards to be level.

CHAPTER XVI.

COVERS FOR HIVES.

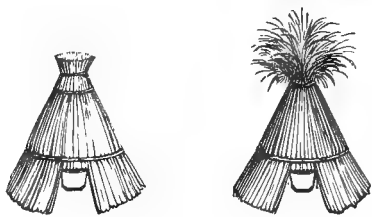
In summer as well as winter hives require protection. If not shaded from the summer sun, their combs are likely to become softened at their fastenings, and drop down in confused masses. And it is well when not a drop of rain can touch hives either in winter or summer. Of course, rains in summer that touch hives do less harm than those of winter, inasmuch as the wetted parts are sooner dried in hot weather. It may be stated as an axiom, that perfect protection of hives, from both sun and rain, should be aimed at in covering them.

Milk-pans are often used by cottagers in many parts. With small hives they answer in summer, but are a most unsuitable protection in winter. For cheapness and convenience, anything at hand that will shed the rain off hives is made use of. Three or four cabbage-blades placed on a hive, and held there by a stone, are sometimes used till something better turn up. We now use felt (sold at one penny per foot) largely as a covering for our hives. It is impervious to water, and very durable; indeed we cannot say how long it will last. The covers of felt that we got eight years ago have been in constant use, and are still as good as ever they were, and apparently will last for an indefinite length of time. These felt covers suit also in this respect, that they are light, soft, and pliable. When we remove our hives to better pasture or to the moors, the felt covers, being easily carried, go with them.

The felt, when first bought, is stiff and hard, but can be made as soft as flannel by holding it before the fire for a minute or two. When warm and soft it should be fitted on the hives. It becomes softer every year. It is rather

too thin for a burning sun; hence it is wise to place some hay, heather, or rags between the felt and the hives.

Sods cut off peaty land and dried, are impervious to water, and make excellent summer coverings. But straw coverings are incomparably the best of all — best for summer as well as winter; and they look better than anything else I have seen used as covers for bee-hives.



Straw Covers.

A row of well-thatched bee-hives, all nicely clipped, standing in a cottage garden, conveys to the mind of people passing by the idea of comfort and profit. When first used the covers should be dipped in water, then fitted on. Thus they set and stiffen, and may be lifted off and on like a man's hat. In another chapter the reader will be urged to use plenty of warm materials beneath the outer covering of hives in winter.

CHAPTER XVII.

STINGS.

If bees had not been furnished with weapons of defence, the probability is great that they would have been destroyed centuries ago. The treasures of a bee-hive are

so tempting to men and brutes, birds, and creeping things, that it was necessary to provide bees with a means of defence—viz., stings and bags of poison, which they can use at will. When they receive or anticipate molestation they are not slow to make use of their "poisoned arrows;" and every arrow is barbed, so that, if inserted, it sticks fast—so fast that it drags the venom-bag attached to it from the body of the bee. And after separation from the bee, the sting is moved by a self-acting machinery, intended, no doubt, to empty the entire contents of the venom-bag into the part stung; hence the wisdom of withdrawing a sting as soon as it is inflicted or inserted.

It may be stated here that bees cannot well insert their stings till they get hold with their feet, and thus apply a small amount of leverage. In many hundreds of instances we have saved ourselves by destroying the bees before their levers could act.

Some people are much disfigured by being stung on the face; and the question has been asked, "If these people were frequently stung, would the stings continue to have as great influence?" We cannot answer this question with certainty, though we have known men who suffered great inconvenience in early life from stings, disregard them after a time; the swelling or inflammatory power of stings was comparatively lost on them. Some people suffer more from the sting of a nettle than of a bee. The sting of a nettle annoys us for many hours, whereas the pain from a bee's sting does not last more than a minute.

Those who are liable to swell much on receiving a sting should wear a bee-dress when likely to be attacked by bees, or when doing anything amongst them. A bee-dress is simply a piece of crape or muslin tied above the brim of the hat, to hang over the face, and some inches below the chin. The other parts exposed are the hands

only, which can be protected by gloves. Fortunately we do not swell on being stung, and never use a bee-dress of any description. When bees attack one, or mean to do so, the hands should be spread in front of the face—or, better still, a bush held before it—then walk quietly away. When bees see the fingers or bush they are afraid of an ambuscade—as sparrows are kept from gooseberry-buds by the use of thread and string.

The venom of a bee is so immediate in its action that some injury is done, or pain felt, before any remedy can be applied.

CHAPTER XVIII.

FUMIGATION.

This is a grand invention. About seventy years ago, when selling honey in Edinburgh, my father met an Irishman, who undertook to teach him how to carry a hive of bees, open and exposed, through the streets of that city without receiving a single "*stong*," for a gill of whisky. Far too tempting an offer this to be rejected by my father. He got the secret, and, I presume, the Irishman got some whisky for it. The secret was worth all the whisky in Edinburgh; for ever since, we have been enabled to do what we like with our bees without risk or fear. Smoke from the rags of fustian or corduroy, blown into a hive, is the secret bought from the Irishman. A few puffs of smoke from a bit of corduroy or fustian rolled up like a candle, stupefies and terrifies bees so much, that they run to escape from its power. Tobacco-smoke is more powerful still, but it has a tendency to make bees dizzy, and reel like a drunken man; besides, it is more expensive

and less handy than fustian. Old corduroy or fustian is better than new, unless the matter which is used to stiffen it be completely washed out. The stiffening matter will not burn—will not let the rags burn; hence we use and recommend old stuff which has lost it. Let us ask the most timid apiarian to get a piece the size of a man's hand, rolled up and fixed at one end—not to blaze, but to smoke. Let him now place the smoking end so close to the door of the hive that most of the smoke may go in when he blows on it. After six or eight puffs have been sent into the hive, it may be gently lifted off the board, turned over, upside down, so that the bees and combs stare him in the face. By holding and moving the smoking rags over the face of the bees, and blowing the smoke amongst them, they run helter-skelter down amongst the combs, more afraid than hurt. Now he can carry the hive round his garden under his arm, and then round the house, without being stung. Whenever the bees are likely to rise, they should be dosed again. They always should get plenty of smoke before the hive is touched at all.

If the reader has hitherto not dared to handle his bees in this manner, we ask him to try the experiment, believing that he will be more than satisfied with the result, and find that he has now got the mastery of his bees, and can do with them as he likes. Yes; he will be able to drive his bees out of one hive into another, and, moreover, tumble or even spoonful them back, as men take peas from one basket to another.

This smoke does not injure the health of bees, or stop them from work more than a few minutes.

CHAPTER XIX.

WHETHER IS THE SWARMING OR NON-SWARMING SYSTEM OF MANAGEMENT THE MOST PROFITABLE?

This question is of great importance, and therefore will be considered as fully as our space will permit. The swarming system of management is not only more profitable, but, taking a run of years, is better every way, and more natural, than the system that prevents swarming.

One large apiarian in this neighbourhood who uses bar-frame hives, once said to us that "honey and swarms could not be obtained from hives in the same year." We venture to express a contrary opinion. During the last few years our best swarms have risen in weight to a greater figure than his non-swarmers; nay, our old stock-hives have been as heavy as his, which never swarmed at all. All this has not been owing to their being allowed to swarm, but partly to the size of the hives and our system of management.

But after making many trials, we can state that in fine seasons for honey, good early swarms will, at the harvest-time, weigh more than hives that never swarmed at all. A swarm put into an empty hive is doubtless placed at a great disadvantage, and apparently will never both fill its hive with combs and gather as much honey as an old one — a non-swarmer — already full of combs, weighing 30 or 40 lb. But wait a little: the swarm which is far behind during the first ten days of its separate existence, afterwards rapidly gains upon the old one, and generally overtakes it when both weigh about 70 or 80 lb. each; the young one now goes ahead, sometimes at the rate of 2 lb. for 1 lb. We have known many swarms

go beyond 150 lb. the first season, but we have never seen an unswarmed stock-hive approach that weight. And, besides the superiority of the first swarm over the hive which did not swarm, there are the mother hive and probably a second swarm from it, weighing by the end of the season from 50 to 80 lb. each. Of course these weights will not be gained in seasons unfavourable for honey-gathering; and in very unfavourable years, when bees have to be fed, the fewer hives we have the better, —as, in times of calamity or famine, or want of work, the working classes of Manchester and other cities find it cheaper to give up house and take lodgings—two or three families swarming into one house, instead of each family paying rent for a whole house. But, even in ordinary seasons for honey-gathering, the swarming system is by far the most lucrative.

If asked to explain how it is that swarms put into empty hives gather more honey and do better than hives not weakened by swarming, we might not be able to do so satisfactorily; neither can we explain how it is that a spring-struck verbena plant grows more vigorously and does better than an autumn-struck one. As with verbena plants so with bees: swarms do better, and often run ahead of stock-hives.

However, we may venture to guess, or give our opinion, as to the reasons why good early swarms of the current season outdo those that never swarm at all.

1st, The stimulus of an empty hive makes the bees work harder. In the absence of combs, all the eggs laid by the queen must be lost. Combs *must* be built to hold both eggs and honey. For the first two or three days, the greater part of the honey gathered is eaten by the bees with a view to secrete wax for comb-building, which goes on with marvellous rapidity. Liebig thinks that it takes 20 lb. of honey to make 1 lb. of wax; but let us

suppose that 2 lb. of wax is manufactured from 20 lb. of honey. Now, in good-sized hives there are about 2 lb. of wax. We have known a swarm fill, or nearly fill, its hive with combs, and gain about 28 lb. weight in ten days. What a stupendous amount of work these young colonists performed in ten days!

2d, The combs of swarms are sweet, and free from a superabundance of bee-bread; therefore the cakes of brood will yield a young bee from almost every cell, making the hatch of the swarm considerably larger than that of the old hive. By the end of a favourable season the swarm is more populous than the other which we are comparing with it. Even a second swarm, in honey years, will sometimes pull itself abreast the stock or mother hive, with a weight of 30 lb. to gain.

3d, By swarming we double and often treble the number of our hives annually, and therefore have two or three queens laying instead of one. By-and-by it will be seen more clearly how invaluable these additional swarms are to a bee-keeper, and therefore the superiority of the swarming system over the non-swarming one.

4th, By the adoption of the swarming mode of management we can change our stock of hives every year—that is to say, we can set aside one of the swarms for stock, and take the honey from the old one and other swarm, and thus the combs of our stock-hives are full of new sweet combs, and free from foul brood, which is a great advantage. Hives with old combs are objectionable for many reasons.

Besides all these considerations, there is, in the swarming system well carried out, the CERTAINTY OF SUCCESS in bee-keeping. On the non-swarming system, hives are comparatively weak in bees in early spring; whereas, on the swarming system (as we recommend it to be done), the hives are of great strength and power even in early

spring. And we maintain that ten strong hives will do more work than twenty-five weak ones. How does the swarming system secure strong hives? In this way: the bee-keeper has one, and often two, swarms to spare for, and unite to, every hive he selects for stock in autumn. The hive selected for stock gets the one or two swarms from the honey-hive united to it, and thus becomes doubly or trebly strong. Hives of such strength are well able to face the difficulties of a severe winter—difficulties which often crush and kill weak ones; and when spring arrives, these strong hives gain weight fast, and are ready to swarm a month earlier than those that had no additional bees given to them in autumn. If hives are weak in bees in spring, they gain but little from fruit-blossoms, which are so rich in honey, simply because they are not strong enough to do much work; but when made strong in autumn by the addition of extra swarms, they gain daily off the fruit-blossoms, in fine weather, from 3 to 5 lb. per hive.

5th, On the non-swarming mode of management the queens become old and die; and at the time of the death of a queen there is a great loss sustained. The hive in which a queen dies will be without eggs for three weeks afterwards, or thereabouts; for ordinarily the young queens are not matured till about ten days after the old one dies, and it is ten days more before the young queen that takes her place begins to lay. There is, too, the risk of losing the whole; for if the old queen dies when she is not laying, the bees cannot raise a successor.

In the swarming system, the bee-master may have nothing but young queens in his hive, by destroying the queens of the first swarm when the bees are united in the autumn. We hope this matter is made so plain and simple that none will misunderstand our meaning.

But some bee-keepers may say, "We don't want

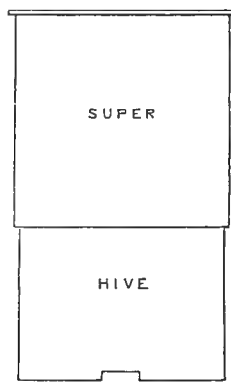
swarms; we want supers of honeycomb. It is not an increase of hives, but a supply of pure honeycomb we are seeking." And the question may be urged whether the swarming or non-swarming system is best for getting most supers of comb? At present we could not answer this question with any degree of certainty, for we have not tested it by experiment. And even if fairly tested by actual experiment in one season or locality, the same experiment in another locality or season may produce different results. We are strongly inclined to believe that the swarming system will yield more supers and more pure honeycomb than the non-swarming one, if the bee-master understands his work, and sets himself to the task of getting all the supers possible. How would you get supers and swarms too? We would have all our hives well filled with bees in autumn, as already described. They would be ready to swarm early in May; but before they were ready to swarm we would put a super to hold 8 or 10 lb. on each. If weather permitted, and the hives did not swarm, these supers would be filled in about fourteen days. After cutting them off, we would swarm all the hives artificially, and put the swarms in 16-inch hives, which is the smallest size we use. The mother or stock hives would be left full of brood, with bees sufficiently numerous to hatch it. On each stock-hive a super would be placed, for every day the population of the hives would be augmented by the brood coming to perfection. Probably no combs would be made in the supers for ten or fourteen days, when second swarms may be expected to issue. When second swarms are thrown off, the better way is to cast them back on the front of the hives whence they came, a few hours afterwards. They creep into their hives, and rarely come a second time. The hives are now full of bees with no brood to attend to. At this

time the bees generally gather a great deal of honey, and will fill supers, weather permitting. We know an experienced apiarian who thus obtains supers from hives not weakened by throwing off second swarms. In about three weeks from the time the first swarms were hived, they will be nearly full of combs, and ready for supering, if the weather has been favourable. They should have supers placed on them before they are quite full. With brood coming to perfection every day, these young swarms will not be long in filling supers from the fields of white clover, now at their best. Here we see the likelihood of having three supers of combs from one hive managed on the swarming system. With two strong hives in the middle of July, there is still left the probability, if not the certainty, of getting a super of honey from each of them before the season closes. In favourable seasons all this may be done under good management. Then there will remain a hive of honey for further profit, the bees of which will be united to the other, to be kept for stock; and this will be incomparably better for keeping than one that has never swarmed at all.

The great difficulty in obtaining supers of comb is the tendency of the bees to swarm; and this difficulty is greater by half in the non-swarming system of management—for it is as natural for bees to swarm once a-year as it is for birds to build their nests. In the hands of inexperienced people, hives that have received supers often swarm before a bit of comb is built in them.

In certain seasons it is well known that a great deal of pure honeycomb has been yielded by hives managed on the non-swarming mode. In 1863, Mr George Fox of Kingsbridge, Devonshire, got from two hives two glass boxes (or supers) of pure honeycomb, weighing respectively 109½ lb. and 112 lb., their gross weights being 123 lb. and 126 lb., the empty boxes being 14 lb. each. These

magnificent supers seem to throw into the shade all other results of bee-keeping. But in the same year Mr Fox got "an octagon box of fine white comb," which weighed 93 lb. 4 oz., from a swarm of June 28, 1863. Here is a late swarm yielding a super 93 lb. weight. If the swarm had come off four or six weeks sooner, which is the usual time, the probability is very great that it would have overtaken and outrun those that never swarmed at all. Well might Mr Fox say, as he does in a letter before us, "These glasses were exceedingly beautiful, but the risk and fatigue of removing them were great; and as I never like to ask assistance, in case of an accident, I had to exert myself too much."



Mr Fox's supers were filled on the *adjusting* principle. The above sketch will enable the reader to form a pretty correct idea as to the way in which it is carried out, and how Mr Fox succeeded in inducing his bees to fill such large glasses. The supers fitted or slipped over the outsides of the hives, and were let down so far that their crowns were not far from the crowns of the hives. The

bees had not far to go to make a commencement in them; but as soon as the combs came down, the supers were raised bit by bit till they were filled. The sides of the supers being glass, Mr Fox could see when to raise them. He says: "The season of 1863 was better for honey than any of the twelve years going before; but, notwithstanding, such large fine glasses of honey could not be obtained except by working the hives upon his adjusting principle."

We conclude this chapter as we began it, by saying that, with an eye to profit, we greatly prefer the swarming mode of management. Hives that do not swarm are often affected and made useless by that terrible and incurable disease of "foul brood."

CHAPTER XX.

SUPERS AND SUPERING.

These are made of straw, wood, and glass. Straw shallow skeps, small and neatly made, are better than small boxes for supers; and boxes are better than glasses. Glass supers filled are the most ornamental and pleasing to the eye, and therefore in some places realise a higher price; but straw and wood supers are more convenient for parties using their own combs, as well as more convenient to the bees while filling them.

It will be seen that one glass is a great improvement on the other; it looks better, and has a movable top or lid. In glass supers the combs are generally built upwards, and when they reach the tops they are fastened to them.

Supers of straw, wood, or glass, of all sizes, may be ob-

tained and used. Those that hold from 6 to 12 lb. are more readily sold than larger ones; but for ornament or exhibition, the larger they are the better.

It should be understood by all, that though supers may be obtained from hives of all shapes and materials, some kinds are better than others; and where the best kinds are used, both the bee-master and his bees are

Common Honey-Glass.

Improved Honey-Glass.

placed on vantage-ground. For instance, large hives are incomparably better than small ones; straw hives better than wooden ones; and those of simple construction are more easily managed, and give more freedom and scope to the industrious inmates, than those that are complicated.

The position of the holes in the tops of the hives, through which the bees reach and fill the supers, is of little importance. The holes in our hives are all in the centre of the crown, and measure 4 inches wide. Some modern inventors object to centre holes because they are immediately above the brood-combs, where queens are ever at work laying eggs, and may readily step into the supers and there deposit some. To avoid this danger these inventors have the holes in their hives nearer or over the outside combs, where honey is generally stored. Both answer very well, for excellent supers of comb have been filled through centre and also through side holes. We get supers weighing from 10 to 40 lb. filled over centre holes, without a cell of brood or a speck of bee-bread in them. The size of the hole is of some importance. We

think there should be a good thoroughfare and plenty of room for travellers between hive and super.

The health and strength of hives should be our guide as to the time supers should be placed on them. No rule can be laid down. About a week after the bees cover the combs of stock-hives they may be supered. And as soon as the hives of swarms are filled with combs they should be supered.

If the supers be made of wood or straw, two or three bits of clean white *drone-comb*, well cemented or waxed to labels, should be placed in and nailed to their crowns, before they are put on hives. Such bits of comb tempt the bees to go into them at once and commence work. From the crowns of the supers to the crowns of the hives we use ladders of wood about as thick as a child's finger. On these the bees go up, and commence to build their combs downwards. This is of great importance, for bees naturally build downwards; and where supers are thus filled, the combs are squared-off and finished before they touch the crowns of the hives. When only half filled they may be lifted and examined without injury. If guide-combs be not used, the bees would probably commence to fill the supers from below and build upwards. Drone-combs are used in supers as guides for this reason, that drones are seldom—we might venture to say are never—bred in supers of ordinary sizes. These supers of drone-comb are invariably filled with pure virgin-honey. "But if you had no drone-comb at hand, would you use bits of worker-comb instead?" Yes, certainly, to induce the bees to begin at the tops and build their combs in the natural way. Thus the combs in the supers are at some distance from the brood-combs, till they and the supers are nearly filled with honey. At the season of supering, any bee-keeper may lift one of his hives and cut out of it a few pieces of drone-comb to be used for supering. In-

deed, when we are bending our energies to get many and fine supers of honeycomb, we cut out of our hives all the white drone-comb we can get. We prefer it empty, so that it can be easily fixed in supers before they are put on hives. As soon as such supers are put on, the bees go up amongst the empty combs, fix them more securely, and begin to store honey in them; and when such supers are taken off, it is found that the clumsy work of the bee-master has been hidden amongst the more perfect work of the bees. These supers are just as beautiful and saleable as those that have never been touched and tinkered by the hand of man.

One year we made a special effort to get a great number of supers of comb. When all our straw and glass ones were filled, we went to our grocer and bought some small boxes which he had emptied of mustard and other things. They were about 1 foot square and 3 inches deep—just what we wanted. He charged 2d. each for them. A small hole, 3 inches wide, was cut in the bottom of each box; then they were filled as full and as neatly as we could with combs (white and beautiful) cut from large hives, and placed on hives ready to fill them with honey. Thus more than half the work was done for the bees before they entered these supers.

In placing and fixing empty drone-combs in supers before bees enter them, the bee-master should not forget that there is a right and a wrong way of doing this. The more closely we imitate nature, the more likely are we to succeed. All honey-cells dip to their bottoms; they are not horizontal. As combs are found and cut out of hives they should be placed in supers. If they be turned bottom upwards, the cells will slope the wrong way, and be much more difficult to fill. Well, then, let the combs be properly placed and partially fixed in the supers. In fixing combs in boxes we begin at one side and finish at

the other. The combs are kept apart by little bits of wax or wood; the lids are put on before they are placed on full hives. When filled with honey they are taken off, and other empty ones are used in the same way and placed on the same hives.

The reader is now asked to take another look at the improved honey-glass. It is narrow at bottom and wider higher up. The lid is movable. It will be seen at once how easy it will be to help the bees to fill this kind of super. When one of these empty glasses is placed on a full hive, we take the lid off and place at once some empty pieces of drone-comb on the crown of the hive inside the glass, and hold them erect and in proper position by wedges or little bits of comb. The lid is put on, and the super is thickly and warmly covered with cotton-wool or woollen cloths. In a short time the bees adopt and fasten the combs thus put in. "Why, these combs are 6 inches high to begin with, and the bees are building them upwards!" In filling very large glass supers (now called crystal palaces), to hold, say, from 50 to 100 lb. of comb, we remove the glass lids, and put in their places wooden or straw ones, with combs attached and pending. Thus the bees have combs artificially fixed from both top and bottom to unite and fill; and, when weather permits, they do it with marvellous dexterity and rapidity. When these supers are filled, the most expert apiarian or dealer in honey could not detect a flaw in them. Supers so filled are perfect in every sense, and cannot be surpassed for excellence by those which may be filled by bees managed on the old jog-trot system.

When the combs are well united and the supers nearly full, the wooden lids are cut off with a table-knife or bit of fine wire, and the glass ones put on. If the lids are dome-shaped, with a cavity to fill, a few pieces of nice comb may be placed on the tops of those broken by the

knife or wire, so as to fill the cavity. Then, finally, put on the glass lids.

If we have not white empty combs enough to half-fill or quarter-fill a super of glass, a guide-comb is sealed to the wooden lid, and a ladder is given to the bees to go up and commence building at the top. Bees can hold by rough wood and straw, but not by glass; hence the use of wooden lids and ladders. When the combs reach the sides of the glass, the wooden lids may be cut off, and the glass ones restored to their places.

With this art of supering unfolded before the reader, he will be able to help his bees to fill supers of any size, and almost in any season. All the honey of refuse combs and old hives may be given to bees when they are filling supers. The filters of bees are so perfect, that not a speck of impurity or a taint of pollen is carried from old combs into supers. Even honey mixed with flour, soil, or bee-bread, is well clarified when given to bees. All apiarians who prefer to eat their honey in virgin-comb may thus have a superabundant supply of it. The introduction of large pieces of unsoiled combs into supers (and feeding with honey when weather is unfavourable) may be compared to travelling by express train. The other way, of letting the bees do all the work, is travelling by the parliamentary one, which is longer on the road. We much prefer the speedier way of filling supers.

Let us here press on the attention of the reader the necessity of covering glass supers warmly and thickly with some material. If they are not warmly covered, the bees will not work in them; and if not kept quite dark, the bees will try to shut out the light by bespattering wax on the inside of the glass.

There should be no doors in supers. All bees from the outside world should go in by the doors of the hives. If outside workers were permitted to go into supers with

soiled feet, their combs would soon be discoloured. *The housemaids* only should enter supers.

When supers are full, they should be cut from their hives by a piece of brass wire or small cord. If the wire cut through any honeycomb, the supers should be raised about half an inch by wedges, and left in this position about one or two hours, to let the bees lick the honey from the broken cells, and make all clean and dry. In thirty years we have had three supers only that had brood in them when cut off. The patches of brood were cut out, and honeycombs from other hives were fitted in their places, when the supers were replaced on the hives for two or three days; and, when finally taken off, the patchwork could not be discovered.

The only question now to be considered is how to drive bees from supers after they are cut off. The smoke from fustian rags vigorously blown into the top holes of supers is generally successful. Before this smoke the bees run helter-skelter out of supers into their hives in a short time. In cold weather they are more difficult to drive, and on two or three occasions we have had to place a very small bit of brimstone rag amongst the fustian, the fumes of which frightened the bees out of the supers very quickly. The smallest taste or sniff of it is enough to make them run for their lives. But let us warn the reader of the danger of using brimstone in this work, for the fumes of sulphur are destructive of bee life if not given in the smallest possible doses. And there would be twenty times more difficulty in removing dead bees than living ones from supers well filled with honeycomb.

CHAPTER XXI.

EKES.

Can bees be prevented from swarming? Yes, by the use of ekes; and what are these? Additions or enlargements from below—that is to say, eked or lengthened. Hives are eked by riddle-rims, or hoops made of four or five rolls of straw of the same description as those in a straw-hive, the same width as the hives raised by them. These ekes are fastened to the hives by nails or staples going into both, and the junctions covered with any kind of cement or paste.

Straw ekes, like straw hives, are better than wooden ones. The sides of an old hive make two ekes, if properly cut and sewed a little.

Are ekes better than supers for getting a great weight of honey? Very much; for bees can put more than 3 lb. of honey into ekes for every 2 lb. they can put into supers. (This is another proof of the superiority of hives of simple construction over those that are complicated.) Bees not only gather more honey, but they breed more by the use of ekes, and are thus prepared to do more work for the future. The markets will determine whether eking or supering is the most profitable. If the price of honey be 1s. per lb., and comb 1s. 6d. per lb., the one mode of enlargement will appear equal to the other for profit. In the use of supers there is the risk (in hot seasons very great risk) of swarms coming off unexpectedly and flying away. In the eking mode there is the trouble of extracting or running the honey and jarring it for sale.

But eking hives does not always prevent their bees from swarming? Not always, but in ninety-nine cases

out of a hundred it does. In some hot seasons, and on rare occasions, bees have been known to square the ends of the combs before their hives were quite full, and swarm. This so seldom happens that it may be considered exceptional, and out of the usual run of events. When our hives are timely eked we have never the shadow of a fear that they will send off swarms.

It is by the use of large hives and ekes that the bee-master can get his swarms in good seasons to weigh from 100 to 160 lb. each. But why not have hives big enough to do without eking? This question has been already answered. In many cold seasons, swarms cannot fill such large hives; and it is of great importance to have all hives kept for stock full or nearly full of combs in autumn.

When ekes are used, cross-sticks must be put into them at the highest parts, so that the combs may be fastened.

CHAPTER XXII.

NADIRS.

Nadirs are the opposites of supers. Nadirs go beneath bee-hives, and supers above them. If a hive which we wish to keep for stock becomes heavy in July, we place a nadir beneath it—that is to say, we lift it off its board, place a hive with cross-sticks and a large crown-hole on the board, then place the full hive on the empty one, pin the two together, and cement the junction. The bees are soon found hanging in a large cluster, like a swarm, through the crown-hole of the nadir. New combs are speedily built from the upper hive, through the crown-

hole, down to the board; and in process of time the nadir is filled with combs and brood, almost all the honey going to the upper storey. At the end of the season the top one is taken off for honey, and its bees driven into the bottom hive, which is kept for stock.

Nadirs are most useful for early swarms that become heavy before the end of the season. By placing nadirs beneath them, both honey and a stock-hive may be obtained. Since the first edition of this work was published, we have had two stock-hives that swarmed with nadirs beneath them, though we never knew a case of the kind before.

Last year our earliest swarm was taken off about the 10th of May. By the end of four weeks it was full, and nearly ready for swarming. Instead of taking off a virgin swarm, we placed it on a nadir. At the end of the season we found that it weighed 70 lb. All the bees were driven below, and the top one taken. It weighed 50 lb., and the nadir 20 lb. We thus got nearly 30 lb. of honey and a stock-hive from a swarm of May. A few pounds of refuse honey were given to the nadir, which was a strong hive in the spring following.

We consider nadirs inferior to ekes when weight of honey is the only object sought. We use and recommend them when both honey and stocks are sought from swarms of the current year. For gaining great profits in a favourable season, and for continued prosperity for a succession of years, the system of having strong hives and early swarms is far before all the other systems of managing bees. Supers, nadirs, and ekes are useful, profitable, and indispensable for hives that require enlarging later in the season. The question of which is best, the interest and aims of the bee-master must determine.

CHAPTER XXIII.

ARTIFICIAL SWARMING.

It does not pay to wait and watch for hives casting, and it does not pay to lose swarms. The adoption of the invaluable invention of swarming artificially saves the bee-keeper from a world of anxiety and the loss of swarms. Probably Bonner was the inventor of artificial swarming, for he wrote a book about 80 years ago, which my father read at the time. Bonner's system (with some slight modifications) was adopted by my father, and carried into practice for forty years. He swarmed his bees artificially before he knew the value of fustian smoke for stupefying them. After finishing his day's work, he often swarmed three or four hives on an evening. The only bee-dress he ever used was a cabbage-blade hung over his face; and this was for ever cast away when he was taught by an Irishman to use the smoke of fustian rags.

The bother of bee-keeping would be too great for us if we did not swarm artificially. We can easily take off four swarms in an hour; and with the assistance of a lad to drum a bit, we could take off six swarms, place them all in proper places, and cover them up in less than an hour. The process of artificial swarming is a very simple affair—so simple that no person can see it done without understanding it pretty well.

It is more easily performed and sooner done than we can describe it with our pen. Take a hive ready for swarming, and a skep prepared to receive the swarm; another empty hive and a table-cloth or piece of calico are required. These are placed some yards—it does not matter how many—from the old hive to be swarmed.

A few puffs of smoke are blown into the hive, which is

then carried to where the empty hive and calico are. It is turned upside down—that is, placed on its crown; then the empty hive is placed on and over it, and the calico rolled round the junction of the two to keep all the bees in. The hive to receive and contain the swarm for good is placed on the board of the old hive, with a view to prevent the bees flying about from going into other hives. The reason why the hive with cross-sticks is not first placed on the hive to receive the swarm, is owing to the difficulty of seeing the queen in it. The bees would hang in clusters on the sticks; hence they are first driven into an empty hive, in which the queen is easily seen, then shaken into the other hive prepared to receive the swarm. Now the drumming or driving commences, which is simply done by beating the bottom hive with open hands for about five minutes. This drumming confounds the bees, and causes them to run up into the empty hive, and in nineteen cases out of twenty the queen goes with the bees or swarm so drummed up. But to be quite sure that the queen is with the swarm, we take the hive (now containing the swarm) of the parent hive, turn it upside down, exposing the whole swarm to view, in order to see the queen. She is easily distinguished, and when we have seen her, we take the swarm back to the old stand, and shake all into the hive ready for them, the calico meanwhile being spread over the combs and bees in the old hive. The swarm is now placed three, six, or nine feet to the right, and the mother hive as far to the left, of the spot or stand on which it stood before. How easy and simple this work is! how soon over, and how natural it appears! It is just about as easily done as shaking a natural swarm from a branch into an empty hive. Look at the advantages: the bees are not allowed to waste their time in clustering about the door of the hive before swarming; and this clustering, in some cases and seasons,

continues for weeks. Again, the bee-master can use this artificial mode of swarming at his convenience—morning, noon, or evening, and when there is the appearance of a continuation of fine weather. It is a great advantage to a swarm to get three or four fine days after being put into an empty hive. In the chapter on feeding bees, the advantage of feeding young swarms in showery weather will be pointed out. When the first swarms are taken off artificially, a number of royal cells are generally occupied or employed for rearing young queens at the same time—that is to say, three or four queens are set about the same time —and these coming to perfection together, afford a greater certainty of getting second swarms ; and this is an important affair in an apiary of large hives, for in a honey season large hives that do not send off second colonies become far too heavy for stock-hives. In mentioning the advantage of second swarms, we are aware that the great bulk of English apiarians do not agree with us ; but we are fully convinced that as soon as they adopt larger hives, and seek the largest quantity of honey from them, they will consider second swarms an advantage—and not a small one.

Other favourable views of the advantages of artificial swarming could be presented here, but we think that the fact of its answering as well as natural swarming, and that it can be done in a few minutes at any time of the day, are sufficient to convince every earnest bee-keeper of the folly of waiting and watching day by day for swarms coming off naturally.

But the reader may say, "I am timid, and can't believe that I could manage to swarm my bees." A great American once said : "*I can't do it* never did anything ; *I'll try* has done wonders ; but *I will do it* has performed prodigies." The reader must allow us to tell him that he can swarm his bees artificially if he wills to do it ; and what now appear wonders and prodigies in the manage-

ment of bees, will by-and-by be felt in his hands to be a very simple affair.

But suppose the reader adopts this art of swarming, how is he to know when his hives are ready for swarming, and what size of swarms to take when they are ready? These questions are important. A little experience will give more instruction than our pen can. Of course when bees begin to cluster at their doors they are ready for swarming. Large hives seldom cluster outside before swarming, and small ones almost always do. But by using the smoke of fustian rags we can ascertain when hives are ready for swarming—that is to say, full enough for swarming. When smoke is blown into a hive, the bees run up amongst the combs; and if the hive be lifted off the board, there will be but a thin sprinkling of bees left on it. When they so run up amongst the combs, the hive is not ready to swarm. But when ready, the hive is full of bees, so that the smoke drives them from the door, but not up amongst the combs, which are pretty well packed. Well, on lifting this hive there will be found a rope or ring of bees on the board about as thick as a man's wrist; and this rope of bees begins to run over the edges of the board, so that, when the hive is replaced, many bees are on the outside of it, most behind. Of course the number of bees on the board will be greater in some hives than others, according to their construction, size, and ripeness. This is a far better test of the readiness of a hive for swarming than the appearance of drones in it, or even the heat or noise of it. A hive is often ready to swarm before drones are perfected in it; and in unfavourable weather, it is often as full of bees as it can hold when there is neither much noise nor heat. The examination should be made when the bees are all at home.

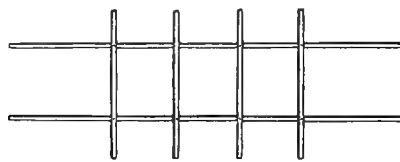
The other question may be answered by saying that we

follow the rule of the bees themselves. When a swarm comes off naturally, bees enough are left to cover the combs barely or thinly, so that the brood of the hive may be all hatched. In artificial swarming we leave the combs of the old hive as well covered with bees as in natural swarming. If too many have been driven up with the swarm, we put a few spoonfuls back; and if too few have gone with the swarm, we drum up a few more, and unite them. A very little experience will make this matter safe and easy to the hand and judgment of the reader.

In bee-houses, and where many hives are standing close together, there is some difficulty in placing the swarm and mother hive aright, so as to prevent the bees of the one going into the other. When each can be placed at least four feet from the old stand, one to the right and the other to the left, there is scope for successful action in this matter. We always succeed—though there may be less than four feet on each side; but then we have to use a little stratagem. The front of the hives and flight-boards have to be disfigured, so that the bees may not know or discover the entrance of the old hive. When the doors of the two are near each other, the bees of the swarm are apt to go into the mother hive. This we prevent by so altering the appearance of the door for a day or two that the bees do not know it. A few pieces of broken bricks or stones or coals laid on the flight-board up to the entrance answer admirably. After the swarm has been at work for a day or two, the bees will not go back to the mother hive.

The reader will remember our saying that the farther hives are placed asunder the better; and where the artificial system of swarming is practised, the wisdom of that remark will be acknowledged. Artificial swarms must not, like natural ones, be placed 12, or 20, or 40 yards from the stands whence they were taken; for if they are taken

so far, the bees will return to their old stands. If moved one or two miles off, they will be out of the influence of their old home, and, weather permitting, will do well there. My father being on good terms with all the farmers of his parish, was permitted to put his bees on any convenient place on their farms. Well, on an evening he often swarmed three or four hives, put the swarms on a light hand-barrow, and with the assistance of another carried them 1½ mile off, placed them under a hedge, or in an old lime-kiln or quarry, or in any odd corner, where they remained unmolested till they were removed to the moors.



Bee-Barrow.

This barrow is simply made of six larch rails, thin and light, not weighing many pounds—being held together by eight screws or nails. As soon as the bees are placed, the screws are withdrawn, the rails tied together, and carried home. We had an exceedingly light and convenient barrow of this kind made of five pieces of bamboo-cane. When only two hives are removed, a common "yoke" placed across the shoulders—the hives hanging like a couple of pails of water—is a safe mode of carriage.

It will be seen and understood that we take care to see that the old queen goes with every first swarm. Hence we look for her—and the way and time of doing so has been already described. But it is not absolutely necessary to see the queen in every swarm, or even to look for her. Young beginners, mere 'prentice hands in bee-man-

agement, will succeed beyond their expectation by drumming rather more than half the bees of a hive ready for swarming into one prepared with sticks and guide-comb for the swarm, and placing them right and left of the old stand. And when no time is spent in looking for the queen, anybody can take off a swarm, artificially, in ten minutes at most, and often in five minutes. It should be remembered that five minutes is quite long enough to drum in hot weather; and during the day, when the bees are at work, four minutes is long enough: when weather is cooler, the bees do not run so fast. If the queen does not go with the swarm, all the bees will return within the space of an hour to the old hive. Farther than loss of time, no harm has been done. A second effort will have to be made. It is but rare indeed that the queen does not go with the bees on being first driven up.

But in artificial swarming, the old or mother hives are deprived of their queens, and, generally speaking, have no eggs set in royal cells. They are therefore without the appearance or prospect of successors to their thrones. What happens? The bees, on discovering their loss, are thrown into a little consternation, which is of short duration. Some few bees will now and then come out of their hives, and run about the front of them in search of their lost queens. When fully convinced they have gone for good, they commence to prepare royal cells for the reception of eggs—common worker-eggs—from which they raise queens. Very often they let the eggs selected for queens remain where they find them, but so alter the shape and size of the cells containing them, that they become at once "royal cells."

No fears need be entertained as to the ability of the bees making queens for themselves. They never fail to raise queens, if the hives have left in them sufficient bees to cover their combs thinly. Well, these eggs placed in

royal cells, or otherwise royal cells built around them, become perfect princesses in fourteen days, when the piping and barking begin, which was explained in a former chapter. After three nights' piping, second swarms may be expected, if the weather be at all favourable for swarming. Second swarms are less particular than first ones about having fine weather on the occasion of their leaving home as colonists. But cannot second swarms be taken off, as well as first ones, artificially? Yes; but it is necessary to be a little more cautious while doing it, for such young princesses are apt to take wing during the operation. Old queens never take wing, however much they may be tossed about in swarming and uniting of swarms. Not so with these young unimpregnated queens. Hence there is a little manœuvring required in swarming second swarms by art. As soon as the queens are heard calling and answering each other (piping), we turn up the hive and cut two of the royal cells out—those that have queens in them—and wrap each up in a corner of our handkerchief, separate, and so that they cannot come out of their cells. We have got over the difficulty; and in less than five minutes a swarm is drummed up into a hive prepared for it: the swarm is set on one side of the old stand, and the mother hive on the other side. In the handkerchief there is a queen for each hive. We generally take the lids off the cells, and let the beautiful young creatures run in at the doors. It requires no masterstroke to do it; any one who puts aside the mistrust of his own powers will manage this affair easily. Second swarms generally come naturally on the day following the third night of piping. If piping ceases, no second swarm will be obtained.

If there are more than two queens in a hive—and frequently there are four or five—we cut them all out, if possible, on such occasions. But presently we shall come to

notice the use of these spare queens. Hives that yield first swarms have sometimes small second swarms taken from them, and two of these united thus making one good swarm—leaving the old ones strong in bees, and scarcely feeling the loss of those taken from them. Let us, by figures, show how this is done.

At the commencement of the season, let us suppose we have two stock-hives—standing at 2 and 6. When the swarms are taken from them they are moved to 3 and 5, and the swarms to 1 and 7. 2 and 6 are blotted out for the present, and 4 remains unoccupied. Suppose we want one swarm more from the old stocks. Part of a swarm is taken from each and set at 4, removing the old ones back to their original stands, 2 and 6, leaving 3 and 5 empty. If it be deemed advisable to take a second swarm from each, and keep them separate, their positions will have to be arranged a little differently.

Surplus Queens.

Now we come to notice the uses of these surplus queens. By using them aright, the bee-keeper does exercise some master-strokes of policy and good management. They will be welcomed into hives without queens, and into hives with princesses unmatured, if presented to them. Suppose we have one or two hives ready to swarm for the first time when such queens are available. We hasten to take swarms from them; and as soon as the bees in the old hives have discovered the loss of their own queens, we give them young ones instead. The hives that thus get queens as soon as their own are taken from

them are *lifted* fourteen or sixteen days in advance of those that do not get queens. For it would take them fourteen days, at least, to rear queens, even if the eggs were set the hour on which they lost their old ones, and the queens from such eggs were allowed to leave their cells on coming to perfection. These transplanted queens would lay about 28,000 eggs in fourteen days—that is to say, before queens reared at home could begin to lay at all. Of course, the introduction of these surplus queens to hives that have just swarmed, either naturally or artificially, prevents all preparations being made for throwing second swarms. The old hives are never without brood, for the young queens thus implanted begin to lay before all the brood is hatched. Such hives soon become very strong, and capable of doing a great deal of work in various ways. In honey seasons they will rise to a great weight, and fill a good super with comb.

In the case of hives swarming late, it is of vast importance to give them queens from early swarmers; for, if left to rear queens for themselves, the season is nearly over before the eggs of such queens come to perfection. Let us see how long it is before young bees are matured from such queens. Suppose a swarm be obtained on the 15th of June, the eggs will be matured into queens in fourteen days—*i. e.*, about the last day of the month. If there be no days wasted in piping and preparing to send off second swarms, the young queen will take the drone in three days, and commence to lay in about ten days after—say about the 12th of July. Well, the brood is three weeks in the combs, so that the month of July is nearly gone before young bees are hatched. First swarms have pregnant queens, and generally do well, though they be not obtained till the end of June; but it is otherwise with the old hives and second swarms. How manifest, then, is

the advantage of having all hives ready for swarming in May, or very early in June—also the advantage of importing queens from early swarmers into later ones!

Small bee-keepers oblige one another by transplanting surplus queens from one apiary to another. One thus enriches his neighbour without impoverishing himself.

The question has been asked how queens can be found or seen amongst the bees that have been driven into empty hives. After a swarm has been driven into a hive, it is turned on its crown—not gently, for we wish all the bees to fall from the sides of the hive on the crown; and when they are running back, we try to get a sight of her majesty. She is conspicuous and easily known, but the eye of the bee-master does not see all parts of the swarm at once; and as the queen is very modest, she often hides herself amongst the bees before she is noticed. In about two minutes all the bees leave the crown of the hive and settle on its sides. When she has escaped our notice the first time, we give the hive a great "thump," and thus bring all the bees on the crown of the hive again, when they rapidly leave it for the sides, giving another opportunity of seeing the queen. But instead of shaking them down a second time, we sometimes shift them down to the crown of the hive with a tablespoon, allowing each spoonful to run off before we put another down; and by beginning at one side of the swarm and going all round it, we do not fail to see the queen if she is with the swarm—and in nineteen cases out of twenty she is. It is very rare indeed that bees sting, or ever think about it, when dealt with in this manner.

CHAPTER XXIV.

NATURAL SWARMING.

This has been described in the first part of this work; but as there are so many things in natural swarming that should be well understood, we trust we shall be excused if we venture to examine briefly a few of them.

The time or season of swarming depends on both the locality and the management of the hives. Some places are warmer and earlier than others. Some places have more spring flowers than others. In the southern parts of our island, swarming in ordinary seasons should commence in the beginning of May. Much depends on autumn treatment. If hives kept for stock are well filled with bees in autumn, they will be ready to swarm four weeks sooner than those that are left to their own resources. We have already touched on this point, and may return to it again.

When hives are ready to swarm and mean to do so, eggs are set in royal cells generally about four days before the swarms issue. The combs are well filled with brood from the egg up, in all stages. The hives are choke-full of bees. There is much noise, and the internal heat is very great. They may or may not cluster outside. Usually small hives do cluster and large ones do not.

Hives, whether large or small, that have but little honey in them, are much better filled with bees than hives containing a good deal of honey. Bees do not sit closely on honeycomb, even on the eve of swarming. Those with little honey in them yield the largest swarms, and afterwards remain stronger in bees. First swarms vary in weight from 4 to 8 lb. each; second swarms, from $1\frac{1}{2}$ to 5 lb. The second swarms from small hives

are hardly worth the price of the hives into which they are often put.

We have said that the eggs are generally four days in royal cells before first swarms issue. But sometimes the weather prevents swarming till the young queens are nearly matured. The time is therefore uncertain. Sometimes there is a miscarriage. The swarm goes without the queen, and soon returns. Next day, probably, a successful attempt will be made, both swarm and queen going together. Sometimes there are several miscarriages. The swarm always returns. How is this? The queen cannot fly. In attempting to follow the swarm she falls over the flight-board, and may be found crawling on the ground. The noise of the bees on their return to the hive attracts her to it. This may happen again and again; hence these miscarriages. Such queens are old, and will soon die. If a young queen (virgin) could be obtained anywhere, it were wise to unite her to the swarm rather than carry the old one to it. If the old queen found below the flight-board be put in an empty hive, and placed on the stand of the old one for an hour till all the bees return, the swarm may now be placed in any part of the garden, and the old hive put back to its original place.

While a swarm is in the act of leaving the hive, there sometimes comes a sudden change of the atmosphere. The sun is clouded, the air chilled, and rain may fall. The bees already on the wing cannot fly. They are full of honey, and come to the ground in thousands,—bees being unable to carry such heavy loads in cloudy cold weather as they do in the sunshine. If a shower follow, thousands never rise. If the sun shine out warmly in the afternoon, or even next day, many of the bees which fell will rise and go back. The attempt to swarm at an unfavourable moment is often disastrous. The skill of the bee-keeper

can do little in such a case. If a small cluster reach the place chosen by the bees, all should be brought back and thrown on the front of the old hive.

Swarms generally alight on a branch of a tree or bush or hedge, if these grow near their mother hives. Where there are no trees or hedges, they will settle on a stone, or post of a fence, or clod, or big weed in a garden. It is wise to have some bushes near an apiary managed on the swarming system; for swarms can be easily hived from branches that bend.

Hiving is usually done by holding the hive prepared for the swarm underneath it, and then giving the branch on which it hangs a sudden shake or jerk, when all the bees lose their hold and fall into the hive. The hive is set on the ground with its crown downwards, and mouth and swarm exposed. The board is *instantly* placed on and over the whole, just giving the bees time to gather their feet and get hold of the sides of the hive (about half a minute) before it is inverted into its proper position. Let it stand for a few minutes to gather in all the bees that have not been hived—the noise inside speedily attracts them—and then let the hive be placed where it is to remain. When a swarm goes into a thick hedge, or settles on a stone or wood fence, the hive is placed over it, so that the bees can easily run up into it. If on the trunk of a tree, the hive is tied on above it; and when it settles on the branch of a tree far from the ground, the branch is usually cut and let down.

Nothing should be put in hives intended for swarms but cross-sticks and guide-combs. Ignorant people often wet their insides with sugared ale or sugar-and-water, a most foolish practice.

Another foolish practice, and a widespread one, is to make a great effort to induce swarms to settle by drumming on kettles and frying-pans, thus producing artificial

thunder, to frighten the bees from all idea of flying away. Sand and soil are thrown up amongst the bees to make them believe it rains. Such artificial thunder and rain have no influence whatever over a swarm of bees. It is understood by some that in ancient times these noises were made to intimate to the neighbours that a swarm of bees was on the wing, believing that the noise gave the owner a legal right to claim and hive the swarm wherever it alighted.

Fortunately swarms almost always settle near home for a short time before they seek a more abiding habitation elsewhere; but when they have decided to go to a distance, and have commenced their march, nothing will stop them. We have known one or two fugitive swarms shot at. The poor fellow who shot said, "If I can hit and bring down the queen the bees will return." He was right enough in his ideas, but unfortunately he missed the queen, and lost his swarm.

These fugitive swarms rise higher than houses and trees, and travel at the rate of about eight miles an hour; so it is hard work to follow them.

If swarms are not speedily hived they may be lost; and sometimes they will hang for a day before they depart. Old combs in the hollows of trees or roofs of houses are very inviting. All hives that have lost their bees in winter should be placed where swarms belonging to other people cannot find them. All honest persons will do this. Some dishonest persons expose their dead hives with combs in them, for the purpose of catching swarms not their own.

When a swarm alights on two separate places, both lots should be put in one hive.

In large apiaries two swarms, and sometimes three, issue at the same time, and generally unite. The queens go with the multitude, and follow the noise. It is an

awkward affair when two swarms unite, for to separate them is rather difficult. Some of the extensive bee-keepers of America use "swarm-catchers" to prevent such unions. These swarm-catchers are about 12 inches square at the end, and 4 or 5 feet long. Four posts about one inch thick, fastened as a frame and covered with muslin or other thin cloth, may be termed "the American swarm-catcher," and is simply a square sack of thin materials. Well, when one swarm is half or wholly on the wing, and another commences to issue, the sack is placed around the door of the hive, and the swarm rushes into it, and may be hived as convenience dictates.

But two swarms united may be separated—that is to say, the two queens may be caught and put into different hives, and the bees divided between them. There are various ways of doing this, all of which will answer if done with a skilful hand. The man who can swarm bees artificially has experience enough to divide and subdivide swarms as much as he likes. The man who has not courage to do this will let both swarms remain together. If separation be attempted, it should be done as soon after swarming as possible, otherwise one of the queens will be destroyed.

When two swarms belonging to different people unite and cannot be separated, the one who retains the swarm should allow the other about half value—say 10s. for a 20s. swarm, for it is of less value in its united state than when separate and single.

In natural swarming, as has already been explained, the old queen goes with the first swarm, and leaves behind her in the old hive eggs or grubs in royal cells. When these come to perfection, the piping commences, and lasts three days and nights. If the bees determine not to send off a second swarm, the piping is stopped at first, and all the surplus queens are killed and cast out. If

the piping continues, a second swarm may be expected; and if a second swarm issues, and the piping continues still, a third swarm may be expected on the day following. Third and fourth swarms have been known to come off on the same day. It does not answer for queens to pipe three days before third and fourth swarms; the time for their impregnation has arrived, and they cannot wait with safety. In north-west Aberdeenshire a bee-keeper got four swarms from one hive in 1874. The first swarm rose in weight to 124 lb., the second to 75 lb., the third to 45 lb., the fourth to 36 lb., the mother hive to 93 lb.—altogether, to 373 lb.

The year 1874 was a good one for honey in the north of Scotland. In ordinary years it is not profitable to take third swarms. In very favourable seasons they may fill their hives, and weigh 40 or 50 lb. each. Two swarms are sufficient to take from one hive in ordinary seasons.

It is often not desirable to take second swarms from late swarmers. But if they come when we do not want them, what is to be done? Hive them, and let them remain for a few hours in their hives, and then throw them back on the flight-boards of the hives that cast them off. In nineteen cases out of twenty they do not issue a second time. But is it not wise to kill the queens of second swarms before returning them? We never do it when uniting swarms at the swarming season. We have known one instance only in which the conflict of two queens ended in the death of both. The bees generally interfere to prevent a conflict between two queens thus brought together. In such cases one of the queens may be often found in the centre of a cluster of bees termed "a regicidal knot." In such a knot the queen comes to grief.

If the piping be heard after the second swarm has been returned to the old hive, it will probably issue again, and

should again be thrown back; but this, as we have said, seldom happens—for after the second swarm has departed, all the queens but one are generally destroyed, and no more swarming takes place.

There is in the history of swarming a critical time for old hives and second swarms. A day or two after second swarms have left their mother hives, the queens of both go out to meet drones. The bees become very uneasy if their queen stay long away. Sometimes they never return—have been lost on their marriage-tours. When the bees find that they have lost their queen, they make manifest their loss by their wild excitement and bewilderment. No one can witness this excitement without seeing that something is wrong. Every now and then the bees are in a state of wild commotion, rushing hither and thither in search of their lost queen. During these paroxysms of grief every bee in the hive seems to be affected. They have no eggs, and therefore are unable of themselves to make good their loss. What should be done with hives thus bereft of their queens? If surplus ones can be obtained, they should be introduced at once to these queenless hives. If ripe queens cannot be obtained, probably royal cells containing infantile queens may be had. One of these cut out of its hive, and placed between two combs of the queenless one, answers well; for the bees soon cement it to their combs, and bestow proper care on their now infant and future queen. In the case of the swarm, it is rather dangerous to turn the hive upside down, with a view to place a royal cell between its combs just being formed, as they are apt to fall. Even the smoke of rags should be gently blown into a swarm recently hived. But if one person lifts the hive off the board, say 3 feet perpendicularly, and another person puts in the queen-cell, the work may be easily and safely performed. And if no combs at all have been formed before the queen has

been lost, how can a royal cell be given to the swarm? In such a case, we resort to a pin or skewer of wood, sharpened at both ends. The royal cell, with a bit of comb attached, is stuck on one end of this skewer, the other is stuck in the side of the hive, leaving the comb with the infant queen in the centre of the swarm. The bees know the value of the boon thus bestowed—a great calm and hum of joy take the place of the wild roar of excitement. If neither a matured queen nor an infant one can be obtained, the case is not hopeless. Remember that bees can make queens from common eggs; so that we have only to cut a small bit of comb containing eggs from another hive, and place it between the combs of the queenless one, in order to avert its threatened loss. The moment a queenless, eggless hive receives the gift of a few eggs from another hive through the hands of their owner, the bees begin to fashion royal cells, and royal tenants in them. Two notable instances of bees without queens finding eggs for themselves have been known. They had been without queens, and of course without eggs, for fourteen days or thereabouts, when an egg was seen in a royal cell in each hive. This was a most unusual and extraordinary occurrence! Where did the eggs come from? They must have been obtained from other hives, not by the hand of man, but by two bees remarkable alike for wisdom and courage. Brave bees! you injured no other community, but you saved your own from ruin and extinction!

If a second swarm or the old hive lose its queen on its marriage-tour, and the other does not, they could be united. And in other ways queenless swarms can be used up. They could be united to weak stocks and small swarms, and removed to a distance for a while.

Virgin swarms are the grandchildren of stock-hives; they come from swarms of the current year. They are generally obtained from first swarms, and therefore possess

the oldest queens. They are misnamed, but we have no desire to give them a new name. In seasons remarkable for earliness and abundance of honey, virgin swarms are not uncommon. Indeed in one such season our stock-hives began to send off a second series of swarms. In such fine seasons it is easy to multiply greatly the number of hives; but for profit, we find that it is better to enlarge hives than to take virgin swarms from them.

CHAPTER XXV.

TURNOUTS.

This is a name we give to swarms evicted or ejected from parent hives three weeks after they sent off their first swarms. Second swarms may have gone from them as well as first ones; but on the twenty-first day after the first swarm leaves a hive, the combs are free from brood, save a few drone-cells—drones being twenty-four days in being hatched, and workers twenty-one days. The eggs laid by the queen on the morning of the day she left the hive with the first swarm, come to perfection on the twenty-first day after. The young queen that has taken her place has not begun to lay, and therefore there is no brood in the hive. Very well. Large hives gather a great deal of honey before they swarm. If the weather be fine while fruit-trees are in blossom, they generally gather from 2 to 5 lb. a-day per hive. In fine seasons, large hives, properly managed, contain from 20 to 30 lb. of honey before the end of May. New honey will not be in the market for a month or two after May, if we do not turn out or evict the bees from these hives. But we do turn

them out; and for sixty years at least, my father and his son have practised this mode of getting honey in great quantity so early in the season. Such honey is super-excellent, having been gathered chiefly from fruit and sycamore trees, and commands a high price and ready sale. We reckon 1s. 3d. per lb. for run honey, and 1s. 6d. for honeycomb, a fair price. If there be only 20 lb. in a hive, we drum the bees out of it into an empty one. In this way 25s. worth of honey, and another swarm (the evicted one), which we term "a turnout," are obtained from the stock-hive, which has before yielded one or two swarms. Thus we get two or three good swarms, and 20 or 30 lb. of honey from a stock-hive. These turnouts are generally a shade better than the second swarms from the same hives; and when no second swarms have been obtained from the hives, the turnouts are very large swarms indeed, and require large hives. By practising this mode of taking honey from stock-hives three weeks after swarming, the apiary contains hives that are filled with fresh young combs, free from foul brood, and never overburdened with bee-bread. Then there is the encouragement of profits already in the pocket, and two months of summer yet to come.

A hive should weigh 42 or 45 lb. weight to yield 20 lb. of honey. Sometimes we pass sentence against hives of less weight, drum the bees out of them at the proper time, and take the honey; and sometimes, instead of taking their honey, after the bees have been driven out, we place them in a dry room till autumn; and if we then find it will be advantageous to keep them for stock, and take the honey from heavier hives, they are refilled with bees taken from honey-hives, and placed in the garden.

The process of turning bees out is simply that of driving them into empty hives prepared for them. In the case of artificial swarming, we drum but a few minutes;

but when we wish to drive all the bees out, we drum for fifteen or twenty minutes. When there is brood in a hive, the bees are loath to leave it; but as there is no brood at the time of eviction, the bees are easily driven out.

It is understood that, if the spring months be unfavourable for honey-gathering, the hives will be too light for yielding much honey. In such a season it is unwise to have turnouts, unless it be to rid the apiary of old hives and old combs.

But looking closely into this turning-out system, the reader may say, "It is not a wise and economical one; for by putting the bees into empty hives, you compel them to make new combs, which cost them a great deal of honey. Leave them in their own hives, and thus save the consumption of honey necessary in the building of fresh combs." This remark is both logical and full of common-sense. No sensible man will attempt to resist its force. But nevertheless it is a system which has many advantages, some of which are already mentioned. Stock-hives that swarm early become too heavy in good seasons for stocks. If they yield 25s. worth of honey each, and swarms (turnouts) that will become excellent stocks by autumn, as they often do, we thus realise both honey and good stocks from old hives after they have done swarming. Another thing is this, that a few pounds of sugar, now costing very little, given to turnouts, enable them to half fill their hives with combs. We do not turn the bees out of all our stock-hives. Our aim in this chapter has been to point out the advantages and disadvantages of the system, that the reader may be guided by his own judgment.

CHAPTER XXVI.

FEEDING.

In bee-keeping, as in many other things, it is not all honey and sunshine. Stings and venom-bags are placed side by side with honey-bags in the bodies of these industrious creatures. Cold rainy seasons come sometimes; and when they do come, bees have to be fed pretty constantly. One year, well remembered by some apiarians, the best hives, though well attended, never rose in weight beyond 22 lb. each. They were near starvation-point the whole of the summer. In such seasons the management of bees is attended with anxiety, disappointment, and loss. Part of the profits of former years have to be spent on sugar to keep them alive. In two noticeable years, bees had to be fed from April to August, when the weather changed, and became so favourable for honey-gathering, that strong hives rose rapidly in weight to 70 and 80 lb. It is rather an unfortunate circumstance for a working man to commence bee-keeping in an unfavourable season. His bees must be fed again and again; and his wife does not like to see so great a waste of sugar, and may grumble sorely about it. To put an end to such loss and dissatisfaction, he sells his bees at a sacrifice. Such failures we have seen with sorrow. We should be glad if any words of ours contribute in the smallest degree to encourage all beginners to go forward, even if one bad season succeed another. Success is certain to the persevering. During the last fifteen years we have had far more favourable seasons for honey-gathering than unfavourable ones. In our native village in Lanarkshire the profits of bee-keeping in 1864 were

about £4 per hive; in 1865, about £3; in 1866, about £2; in 1867, nothing; in 1868, between £3 and £4; and in 1869, about £3. Our own profits altogether from 1870 to 1874 * from bee-keeping are upwards of £220, after deducting an annual expenditure of 10s. per hive. But years unfavourable for honey-collecting may be expected; and when they come, our bees will require attention and feeding. We do not care much how bees are fed, so that they get enough.

As large hives, well populated, gather more honey in fine weather than small ones, it should be borne in mind that they consume more in rainy weather. Strong hives lose 1 lb. in weight during the night in summer, and no one can tell how much food is consumed during the day when the bees are at work. In a large hive there are probably upwards of 50,000 bees, and about the same number in embryo in their cells. Both bees and brood need food, and a great deal of it. He is the best bee-master who feeds his stock liberally and judiciously in rainy summers, for he will receive a return for all his attention and liberality. If bees be well fed they remain strong and healthy—the hum of prosperity and contentment is kept up—breeding goes on—thousands are added to the community; and if fine weather come, they will gather twice or thrice as much honey as those that have been barely kept alive. Bees that are kept on the point of starvation instinctively cast out their young, and *wisely* refuse to set eggs. Their combs become empty of brood; their numbers decrease; their bankruptcy blights them for a month, if not for a whole season. We speak of stock-hives in the months of April, May, and June.

Look at swarms lately hived. Every natural swarm can live three days on the food it takes from the mother hive. The bees of artificial swarms, being hurried out of

* Four of these five seasons were considered unfavourable.

their mother hives, have not all filled their bags so well as those of natural swarms. If rainy weather overtake these young swarms, and continue some days, they will starve if not fed. Thousands of young swarms are ruined for want of feeding after being put into empty hives. If they do not die right out, they never recover from the blight and blast of hunger then undergone.

We have known swarms starved out of their hives. Having made a few pieces of comb, and being without brood, no eggs having been set in them, the bees, from sheer want, cast themselves on the wide world. These are called "hunger-swarms," and their name has a very painful significance.

But if swarms are well and liberally fed in rainy weather, after being hived, they rapidly build combs, and these combs are as rapidly filled with eggs from pregnant queens. A few pounds of sugar given to a swarm will enable it to build combs to its own circumference and size; and these combs, as we have seen, will soon be filled with brood, which will quickly come to perfection, and thus greatly add to the strength of the community. During the cotton panic, and at other times when no work was going on, some of the wealthy mill-owners of Lancashire kept their machinery in order, and even enlarged their premises; so that when the dark day had passed away, and the sun of a brighter sky fell upon them, they found themselves in possession of greater powers for active and successful work. So the skilful bee-master is not inattentive to the machinery and mill-hands of his factories when they are not working "full time." Idleness in a bee-hive is often the mother of mischief. When weather forbids bees leaving their hives, it is a stroke of good policy to give them something to do indoors. A few pounds of sugar (made into syrup), wisely administered, keeps up the hum of health and prosperity,

promotes breeding, and prevents collapse and disaster. Often when feeding is not absolutely necessary, when there is plenty of honey in a hive, a little sugar given to it in dull weather is of great service in keeping up its temperature, and in promoting the laying and hatching of eggs.

Loaf or refined sugar boiled in pure water, at the rate of one pound of sugar to one imperial pint of water, is excellent food for bees. No artificial food is so good for them as this; indeed it is better for them than heather-honey. The mortality of bees fed on heather-honey is greater in winter than when fed on pure sugar-and-water, mixed and boiled as described above. Flower-honey, as it is termed in Scotland, or clover-honey, is the best and healthiest food for bees; and, strange as it may appear, 10 or 11 lb. of this honey lasts or feeds a hive as long as 15 lb. of heather-honey. Brown sugar is relaxing, and should not be given to bees as winter food. On the score of cheapness it is often used in summer, and with safety. White soft sugar, now sold at 3½d. per lb., is nearly as good as loaf-sugar for feeding bees.

Some old-fashioned gentlemen, doubtless fond of a glass of good ale themselves, like to give their bees sugar-and-ale instead of sugar-and-water; and some are so kind as to give them wine mixed with sugar. Pure water mixed with the sugar is better for bees than either ale or wine. The elephant grows strong on water, the ox fattens on water, the horse does its work on water, and bees want nothing better.

In mixing sugar and water for bees, it is desirable to present it to them sweet enough, and yet not too thick and sticky. We have mentioned one pint of water to one pound weight of sugar—that is, nearly weight for weight. We wish to make ourselves well understood here; for the English and Scotch pints are very different.

The imperial pint-measure of England holds 4 gills; the Scotch one holds 16 gills. In Yorkshire and Lancashire many people call half a pint "a gill." It is the English or imperial pint of water which we use with one pound of sugar. One pound of each, slightly boiled, makes excellent syrup for bees. It is about the same thickness or substance as honey when first gathered from flowers.

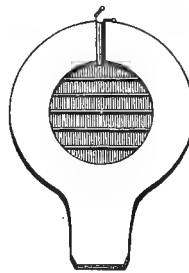
There are various ways and appliances for feeding bees. Many amateur bee-keepers feed from the tops of their hives. It is a very good plan. A kind of tin trough or cylinder, with a wooden float full of holes, is used for this purpose. The lid on the top of the hive is removed, and this cylinder, filled with syrup, is placed there. The bees speedily find their way to the syrup, and carry it down into the hive. This system prevents strange bees from getting the syrup.

The following are the only instruments we have ever used in feeding, all of which are cheap, simple, and excellent.

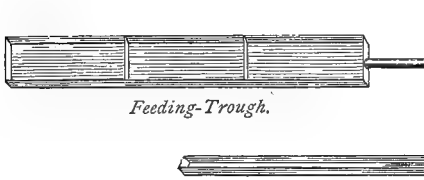
The trough of our feeding-board is 11 inches wide, $1\frac{1}{2}$ inch deep, and holds 3 quarts or 6 lb. of syrup. It is a very useful instrument, and can be refilled without touching the hive or troubling the bees. For feeding young swarms, or giving large quantities to a hive, it is far superior to anything of the kind we have ever seen. In the plate of this feeding-board it will be observed that there are cross pieces of wood in the trough for the convenience of the bees getting at the liquid. We think this is an improvement on ours, which is used without them; but then we have to use chips of wood to keep the bees from drowning. We have never known a bee lose its life in the trough of our feeding-board.

The feeding-cistern holds about 3 pints of syrup, and is handy. When it is used, the board of the hive must be placed very level, so that the liquid runs to the far

end of the trough attached. The trough is about three-eighths of an inch deep and 12 inches long. The opening between the trough and cistern must be *less in height* than the edges of the trough, in order to prevent the



Feeding-Board.



Feeding-Trough.

Feeding-Cistern.

syrup from running over, and the bees from going into the cistern. As the bees empty the trough, the cistern fills it. It is generally used at nights—*i.e.*, when bees are not flying about.

The feeding-trough is an exceedingly handy thing. It is used for giving syrup in small quantities. It holds about a gill, but one could be made to hold more or less. A single troughful of sugar-and-water, costing about one halfpenny, given to a hive daily in dull weather, has a wonderful influence for good, even if the hive is not hungry. For the feeding of bees in spring this little trough is unsurpassed for excellence.

In hives that are not full of combs, a common soup-plate or a flower-pot saucer, answers well for feeding bees. Some chips of wood or short straws are placed in these saucers. After being filled with the bee-food, they are placed on the boards inside the hives. In times of comb-building, the hives should be lifted off their boards with the greatest care, and without turning them in any way; otherwise their combs might be jarred down. We frequently use flower-pot saucers for feeding swarms. Lifting the hive off the board, and gently placing it on the ground for a moment or two, we put the saucer on the board, fill it with the liquid, and then lift the hive on the board.

In feeding bees we have always tried to do the work simply and rapidly. When we have one or two dozen of stock-hives needing food, we do not call to our aid feeding-troughs of any kind. We simply pour the sugar-and-water amongst the combs and bees, and can easily give 20 lb. of sugar to fifteen hives in half an hour. In doing this we dose a hive well with the smoke of corduroy, turn it up, and hold it with the combs in a slanting position to the left. From a pitcher or jug with a spout the syrup is now to be poured first along one comb and then another, till all are gone over; then turn the hive with the combs slanting to the right, and pour the liquid on the reverse side of the combs in the same manner. Owing to the slanting position of the combs, the syrup runs into the open cells before it reaches the crown of the hive. Thus one hive after another is fed; and if necessary or convenient to give more, each hive can get three or four such doses every day. The liquid thus poured amongst the bees does no harm whatever, as they lick it off one another quite clean in a few minutes. The syrup, as we mix it, is not thick and sticky like treacle or honey, and when administered as above, does not injure a hair on the body of a bee.

In the spring and summer months, when the weather is unfavourable, constant feeding by small quantities is the better way, because it keeps hives full of glee ; but in autumn the more speedily it is done the better. By giving the food rapidly, 3 or 4 lb. a-day, the bees store most of it up, and then settle down into the quiet of winter life. If autumn feeding be continued for days or weeks, the bees are kept in a state of excitement, and may consume as much as they store up ; and moreover, may be induced to commence breeding at an untimely season.

Sometimes hives have not been fed enough at the proper time in autumn (September), and the bees in them may be found in the dead of winter nearly starved to death, so cold and hungry that they will not leave their combs for food. What should be done to save them? Take them into a warm room or hothouse for an hour, and pour amongst them a very little warm syrup, which will revive them in a few minutes. I say "a very little" syrup, for it is not wise to wet much comb with syrup in winter. Of course the door of the hive should be closed while it is in the house, unless the place be in complete darkness.

The practice of exposing refuse honey, or hives and combs wet with honey, to all the bees in a garden or neighbourhood, cannot be too strongly condemned. Honey thus given to bees is like blood to a tiger ; they will have more, and make earnest attempts to rob their neighbours. And there is great danger of making bees of different hives *too familiar* with one another in a mixed congregation thus brought together. Bees should be fed at home, and never tempted to come in contact with those of another family.

In presenting refuse honey or combs wet with honey to a hive, we put it in an empty hive, and place over it a board with nine holes braced through it. At night the

hive to be fed is placed on this board. The bees go through the holes and carry the honey from the combs into their own. In this way, too, we present honey to hives on which supers are being filled by artificial means.

CHAPTER XXVII.

THE DISEASES OF BEES.

Amongst the many distempers of bees, dysentery may be named. It is of rare occurrence; but doubtless it is caused by unwholesome food, or a cold damp dwelling-house in winter. Damp hives are very destructive of the lives of bees in weak stocks during the winter months. To-day (January 17th) some of our hives were examined. All were found quite dry save a few that were eked with riddle-rims. Even the hives of these were perfectly dry; but the insides of the wooden ekes were as wet as water could make them. This shows the danger of wooden domiciles for bees! For dysentery, loaf-sugar and water boiled is a safe and certain cure.

Foul brood is the great and incurable malady of bee-hives. From some cause or other, and in some seasons more than others, larvæ, or half-hatched bees (or brood), perish in their cells, and become a putrid pestilential mass in a hive. Prosperity departs from a hive whenever this happens, and sometimes the stench of it has driven the bees wholly out of their hives, and made them build fresh combs underneath their boards; and sometimes they have gone off as swarms, abandoning their hives in utter despair and detestation. An experienced bee-keeper can smell this disease outside the hive in which it exists long before

it is so fully developed as to make the bees forsake their hive, and will not hesitate to give the bees suffering from it a clean hive as soon as he wisely can. Foul brood in a bee-hive is as dangerous and destructive of health and life as foul air or choke-damp is in a coal-pit. We are not going to waste time and space in theorising as to the cause of this distemper in bee-hives, which is not understood. Long and elaborate essays on foul brood have been printed from the pens of great and distinguished apiarians of both Europe and America during the last few years, a careful perusal of which will convince any man of ordinary intelligence that the writers themselves are not quite certain as to the correctness of their opinions. The best of them, to say the most, are but "good guesses." But the last, and every attempt made to clear up the mystery of foul brood, indicates that the person who makes it thinks that all who have gone before him have failed in their attempts. Though we are unable to speak with authority or certainty on this subject, we may be excused for saying that we are yet to be convinced that it is in its nature infectious or self-communicating, or that it is ever carried in honey from one hive to another. That it spreads in an infected hive of living bees, all will admit; but a satisfactory explanation of the law or process by which it spreads we have never seen. Many single cells of foul brood, far asunder in a hive, often appear. These cells are covered with lids, rather flat, or slightly concave or scooped, resembling in shape the lids of honey-cells. The lids of cells containing healthy brood are slightly raised or convex. The disease spreads—the cells multiply, apparently not by contact, but singly and separately all over the brood-combs, like berries of a bunch of grapes colouring one by one.

A great deal has been said about chilled brood perishing and becoming foul. The bees of a hive full of brood

seem to dread the exposure of their combs to a cold, chilling atmosphere. In the spring months eggs are as widely set as the bees can cover them; but if severe weather overtake the hive, and compel the bees to creep together for mutual warmth, some brood may be left uncovered and perish. Some years ago, we placed a hive in a garden of gooseberry-bushes. A mischievous boy found it and kicked it over for a lark. The hive remained in this position some days. The boy had cast a stone into the centre of the hive and bees, which we found on placing the hive on its board. In about fourteen days after, we took a swarm from this hive and gave it a young queen. In the autumn we found foul brood in it, but as there was but little of it, we cut it clean out, and put pieces of healthy comb in the place of what was cut out. The hive did well the following year. Foul brood is often found in hives that have suffered more from heat than cold; those hives that are long on the point of swarming, and prevented from swarming by some cause or other, oftener catch the distemper than those not so full. In fact, the non-swarmers are oftener affected with this disease than swarmers or their swarms: and this is an argument in favour of the swarming system of management. By keeping young hives—that is to say, swarms of the present year—for stock, no bee-keeper will suffer much from foul brood, if he ever suffer at all. If hives containing older combs are kept as stock, they should be carefully examined twice a-year to see that they are free from diseased brood. The first examination should be made from the 21st to 24th day after first swarms are obtained. All the healthy brood is hatched, and the young queens have not begun to lay. The second examination should be made at the end of the season when breeding has ceased. By blowing the smoke down amongst the combs the bees will leave them, so that we

can see whether any cells have lids. If the cells are all apparently empty, the hives are clean, and eligible to be kept another year. If some cells have lids covering them, *at once* proceed to drive the bees out of such hives into empty ones. If this happen at midsummer, the bees will do better in every way in clean hives. If the diseased brood be discovered in autumn, drive the bees out and unite them to other hives. There can be no prosperity in a hive containing diseased and stinking brood; and to the bee-master there will come from it loss and disappointment instead of profit.

CHAPTER XXVIII.

THE ENEMIES OF BEES.

It has been said that swallows, sparrows, tomtits, frogs, and hens eat bees. We have never seen them do so, or even attempt to seize a living one; we are therefore sceptical on this point.

Mice often rob bees of their honey in the winter months when they are sitting quiet and in little compass. Indeed mice sometimes take up their winter quarters in a bee-hive, which they find comfortable every way. Mice dare not enter hives in summer when bees cover all their combs. Experienced men contract the doors of their hives about the middle of September, and so contract them that mice cannot enter. The doors of our hives are about 4 inches long and 1 inch high. We cut pieces of wood to fit the doors, in each of which we cut a small doorway about 1 inch in length and one-quarter of an inch in height. The small doorways prevent the mice from going into hives, and allow the bees ample room for all the

traffic they need, and for carrying out their dead during the fine days of winter. These contracted doors assist greatly in keeping up the warmth of the hives in cold weather. It should be known that mice kill bees and eat their heads off. Both house and field mice do this in cold weather when bees are sitting closely together. The mice pick off from the mass a bee at a time and carry it outside for decapitation.

Snails are very fond of honey and frequently find their way into bee-hives, and there live and consume a great deal of honey. Bees will face and kill a lion, but will not touch a snail; it is therefore allowed to go in and out without let or hindrance. A bee-master should kill all the snails he finds in the neighbourhood of his hives. Hornets, wasps, and humble-bees seldom do harm or get admission.

Bees of one hive often rob those of another. A hive of bees is a community of selfish creatures, which will, without reluctance or remorse, rob another community of all its stores. The greed and predatory habits of bees are very remarkable. Doubtless these habits are the outcome of the instincts of industry—instincts which make bees the greatest enemies of bees. If one swarm succeeds in its efforts to enter the citadel of another, it is sacked in a comparatively short space of time. When once a hive is invaded by a number of robbers, it can be saved only by removal. We remember a strong hive of ours being robbed by a second swarm belonging to a neighbour bee-keeper. The second swarm had stolen about 20 lb. in two or three days previous to our discovery of the robbery. We removed the strong hive to a distance of two miles (where it soon gathered as much as it had lost), and placed another hive on the spot where it had been robbed. Early next morning the robbers came for more plunder, when every attempt to enter the hive was re-

sisted. The robbers, thus thwarted, instantly let the whole fraternity of their own hive know that "their game was up"—that no more honey could be got from that quarter. Often have we seen hives assaulted again and again with spirit and determination, and every assault successfully and spiritedly resisted. These continuous and persistent attacks are probably owing to one or two of the enemy having got access to the city, and escaped with some spoil before the defenders were aware. It has ever been a marvel to witness the result of a few bees intimating to their companions that honey has been found, and that more may be had. How the intimation is given we cannot tell; but sometimes combined attacks are suddenly made, and sometimes as suddenly ended. When the bee-master sees any of his hives assaulted, and every assaulting bee hurled back, he has little to fear; and all that he can do is to contract the door, and thus enable his bees to defend their citadel. If robbers have no mercy, neither have the defenders. Every bee defending its hive is a qualified judge and executioner. If a robber is caught, lynch-law takes its course.

Bees know each other by smell, and they know strangers in the same way. If robbers are not resisted, and kept out of the hive attacked at first, there is no attempt made to resist them after having been allowed to go in and out for some time. They soon pillage the hive of all its treasure. While this pillaging is taking place, the bees work early and late, wet and dry. Weak hives are generally the sufferers; but sometimes strong ones are invaded and robbed while busy gathering honey.

Every experienced apiarian knows robbers by their stealthy manner of attempting to enter hives for plunder, and he knows them by the way they leave the hive laden with it. This knowledge cannot be obtained by reading, but is gained by observation.

CHAPTER XXIX.

TRANSPORTING BEES FROM ONE PLACE TO ANOTHER.

Earnest men who keep large strong hives find it profitable to remove them to the neighbourhood of orchards, clover, and heather, when these are at some distance from their own gardens. In some Continental parts, carts are made on purpose, shelf over shelf, to carry hives. In Scotland, the bee-keepers, generally speaking, remove the bees to the moors every year. In August, large hives in good seasons will gather from 40 lb. to 60 lb. each off the heather; whereas, if they had no heather within reach, they would lose weight during that month. We remove our bees farther into the country every spring, bring them home in August, and take them to the Derbyshire moors —a distance of twenty-five miles. Many of the apiarians of this neighbourhood are copying our example—and we expect their number will multiply annually. There are three seasons for honey—viz., the fruit-trees yield honey in April and May; sycamore-trees, field-mustard, beans, and clover, &c., in June and July; heather in August. With large hives bees will gather honey enough in one day to pay the expense of removal from here to Derbyshire and back. We put fifteen hives on a green-grocer's cart which leaves here at 4 o'clock in the morning to catch the train leaving Manchester at 5.45 A.M. In less than an hour after, they are dropped from the train at a station on the edge of a moor skirted by the Manchester and Sheffield line of railway. In September the hives are brought home in the same way.

Our mode of confining bees for removal is as simple as

it is safe. The doors of our hives are pretty large, and the holes in their crowns are about 4 inches in diameter. We nail a piece of fly-proof wire over their mouths and crown-holes, then tie the hives tightly to their boards with strong string or cord, and drive three two-inch nails through the bottom rolls of the hives into the boards. They are thus prepared to bear pretty rough handling. The fly-proof wire at the doors and on the tops secures ample ventilation for hives as full as they can be; indeed this ventilation is so great that the heat of full hives is less at the end of the journey than it was before they started: and frequently the bees lessen the ventilation by waxing up the wire on the tops. If hives are not full or crowded with bees, we do not always put wire on the crown-holes. The wire at their doors, and a few thin wedges or penny-pieces, slipped in between the hives and their boards before they are tied together tightly with the string, prevent suffocation. They travel safely. The nails are used to make all doubly secure. If hives travel over a rough road on a cart, the jolting sometimes causes them to move or slide on their boards, especially if the bottom of the cart is not level. The nails through the rolls of the hives, driven into the boards, prevent the hives from moving laterally. Of course hives are thus prepared for travelling either before they commence work in the morning, or after the outdoor labour of the day has closed. In this way not a bee is lost; and the cool of the day is the better time to transport and transplant hives. If the weather be cold or rainy, and the bees not at work, they may be confined at any hour, and their hives secured as already described. In fact, the colder the weather is, and the less the bees are at work when about to be transported and transplanted, the less danger there is, for in cold weather the bees need less ventilation. This is our mode of ventilating and securing hives for

travelling hundreds of miles, and we have no breakdowns.

The value of cross-sticks in each hive to support its combs will be seen; indeed they are indispensable, for if combs are not supported and kept steady by cross-sticks they are easily shaken down. Hives without cross-sticks are exposed to great risk in being moved at all. And if bar-frame hives are not full of combs, and these combs cemented to bars, it will be risky to transport them by cart. Sometimes they are turned upside down in being removed, but even in this position their combs will not bear much jolting or shaking.

Inexperienced persons almost always learn a lesson never to be forgotten on their first journey to the moors with their bees. Some of their best hives have been suffocated. It should be well understood and remembered, that whenever a hive of bees is closed up to keep in the bees, natural ventilation comes to an end; and moreover, the commotion of the bees caused by the first and continued motion of the hive increases the internal heat. The admission of plenty of fresh air into their hives is the secret of success.

When hives are so full that some of the bees are clustering outside, they should be enlarged by ekes or nadirs one or two days before they are prepared for removal to a distance.

On arrival at their destination, all hives should be speedily placed where they are to stand, the wire on their crowns removed, and their lids put on, then covered, and their doors opened. If the weather and time of the day be favourable for honey-gathering when the bees arrive, they will begin to work in less than fifteen minutes after having been set at liberty, if they have not suffered during the journey. How quickly bees find honey-flowers and return with loads from them may be seen by placing

hives in a strange locality on a fine day. If they have suffered from being overheated by the way, the bees will not go into full work for one or two days afterwards.

CHAPTER XXX.

THE SELECTION AND PREPARATION OF STOCK-HIVES FOR ANOTHER YEAR.

This is a very important matter in the profitable management of bees, and "bad luck" is often the consequence of inattention to it. When we see our hedgerows and the fruit-trees of our orchards covered with blossoms in spring, we should not forget that we are indebted to the autumn's suns of last year for the beauty and abundance that meet our eyes. Those suns ripened the wood, filled the buds, and set the flowers before the cold and snows of winter came. This year's suns can develop those buds into blossom and fruit. So the autumn treatment of bees is to be considered of primary importance.

In selecting hives for keeping, one should have his eye on many points.

Hives that are full of combs, well built, and as free from drone-cells as possible, are to be preferred to those that are not full of combs or that contain much drone-comb. In the spring months, or in prospect of breeding young queens for swarming, bees do build too much drone-comb; hence it is desirable to select hives in autumn that are filled with combs or nearly so—it is the number of drone-cells in a hive that determines the number of drones bred in it.

In this work of selecting hives for stock, the age of

queens must not be lost sight of or forgotten. All the old queens will be found in the top or first swarms (if all the hives have swarmed); and if any of these containing queens more than two years old be selected for stock, it is desirable to remove and destroy their queens, and put younger ones in their places. All parent hives, second swarms, and turnouts have young queens. Second swarms and turnouts with pretty and closely-built combs, weighing from 36 to 50 lb. each, make valuable stock-hives. If some of them have faulty combs, or are otherwise objectionable, they are marked for honey, and the parent hives kept for another year.

First or top swarms in ordinary seasons are too heavy for keeping, and are therefore generally put down for honey, but in rainy seasons they are often kept for stock.

Now let us suppose a bee-keeper has twenty hives at the end of August, ten for stock and ten for honey. Should he apply the brimstone to the ten for honey? No, but drive the bees out of them, and unite them to those selected for keeping. This is a consideration of prime importance; for hives thus plentifully furnished with bees in autumn are worth much more than those which, being otherwise equal, receive no additions of bees. Hives thus strengthened are well able to bear the severities and difficulties of cold winters: they swarm about a month sooner than others in spring; and their first swarms, in fine seasons, will have their hives filled with combs, and be nearly ready to swarm (virgins) themselves before hives not so liberally and skilfully dealt with begin to swarm at all. No words of ours can describe the value of this hint. Let it go and be circulated widely with that of large hives, and the success of those who carry it into practice will soon stimulate the attention of those who do not; the awful brimstone-pit used to destroy

valuable lives will soon be considered as something belonging to "the dark ages." The way to unite swarms is simple and easy, and will be explained presently.

Let me here say that hives so well filled with bees in autumn require more food in winter than those not so well filled. A Continental writer, "a Swiss clergyman," has broadly stated that two swarms united eat no more honey than each does separately. This wild notion has now a pretty wide and free currency, having been quoted and repeated by one writer after another.

Some experiments have been made to test the truth of this statement. The results, as recorded, seem to favour the clergyman's opinion; but what strikes one is the exceedingly small quantity of honey eaten by the swarm, doubled and trebled in the recorded experiments. Neither single, nor double, nor treble swarms eat more than 7 lb. of honey from September till March, whereas each of our strong hives consumes 15 lb. of honey in the same space of time! Who can *rationally* account for the difference between 7 lb. and 15 lb. consumed if numbers are not considered? We think the clergyman is wrong in his statements and doctrines as to the food required by bees in winter. It were easy to put bees enough into a hive to consume 7 lb. of honey in a few weeks in autumn. Fifty thousand bees require about as much honey in one hive as they do in two.

In autumns of rainy seasons, what should be done with hives containing but little honey? The bees of them should be united to others selected for stock. If there be not more than 5s. worth of honey in each hive, it is better to let it remain in the hives and combs, and be carefully preserved till the following spring for new swarms, than to break up the comb for honey. A hive of fresh young combs is worth 7s. at least for receiving a swarm. Three years ago two good swarms came off on

the 20th of May. One was put into an empty hive, and the other into one containing some sweet empty combs. In about two months the swarm that was put into the empty hive weighed 70 lb., whereas the other that had the advantage of the combs weighed 90 lb. The swarm, on being hived amongst the combs, was apparently a little less than the other. A hive even half or a third full of young combs is a great advantage to a swarm, for the bees at once begin to collect honey and set eggs. If it be desired to feed the hives kept for stock with honey in those set aside for swarms next season, it is easily done by placing the comb-hives under the bee-hives for a single night. The bees will go down and empty every cell of honey, and carry all up into their own combs, without injuring those of the beeless ones. Thus the weak hives are made to feed the strong ones in unfavourable honey years.

But one of the greatest difficulties which overtake a bee-master well up in the profitable management of his stock, is when all his hives become too heavy for keeping. Some seasons his second swarms and turnouts and stock-hives will rise in weight to 70, 80, and 100 lb. each, and first swarms will go 30 or 40 lb. beyond 100 lb. weight. When this happens, both the season and the locality are favourable for honey-gathering. Well, what should be done with such heavy hives? Put them *all* down for honey and honey-comb. The profit in such a season is very great. But if all the hives are put down for honey, there will be none left for stock. Stop a little. There are three ways of keeping up the number of stock-hives and getting honey from all the hives.

1. One is to drive the bees out of all the hives before the honey season ends, and put two swarms into an empty hive. A few days of fine weather will enable the bees to fill their new hive with combs, but there will be

a proportionate loss of honey by interfering with heavy hives before the season is over. When two swarms are thus united, the oldest queen should be destroyed before the union takes place.

2. The second way is to select the proper number of stocks from these heavy hives, and greatly reduce them in weight by freely using the comb-knife in cutting out 20 lb. of honey or more from each hive, and uniting to them the bees of those that are wholly put down.

3. The other way of meeting the difficulty is *the best*, though it causes a little more trouble to carry it out. The bees are allowed to gather all they can in their own hives till the season ends, which is generally about the commencement of September. Suppose we have twelve or fifteen hives, and wish to have six stocks. Well, all the bees are driven out of their hives into empty ones, and united in pairs in 16-inch hives—that is to say, all the bees of the twelve or fifteen hives are put into six empty ones, with cross-sticks in them. If the swarms are very large, these hives will hardly hold them; in that case they should be enlarged with ekes. Now they are to be fed *vigorously*, each to get 25 lb. of sugar boiled in its own weight of water. The feeding-boards are suitable instruments to use in giving large quantities of syrup for comb-building and storing-up. The 25 lb. of sugar will make about 50 lb. of syrup. All this should be given to a hive so filled with bees in ten, twelve, or fourteen days. The door should be well contracted, and the hive kept warm to promote comb-building. By the end of fourteen days, every hive so filled and fed will be nearly, if not quite, full of combs, and many of the combs well filled with eggs and brood. The weight gained by the hives will be found to be equal to the weight of the sugar (or thereabouts) given to them. From 50 lb. of syrup, a

swarm can nearly fill its hive with combs and store up 25 lb. of food.

When the bees creep together by reason of cold weather the ekes may be taken from them; and if some combs have been built down into the ekes, they should be shortened or pared to fit.

These sugar-fed stocks are generally very prosperous ones in the following year, their combs being young and containing scarcely any bee-bread. Almost every cell yields brood in spring. But it should be understood that combs made from sugar are more brittle and easily broken than combs made from honey gathered in the fields. We have frequently known every hive in an apiary put down for honey, and all the stocks made as now described. We think it was in 1864 when a cousin of ours realised £40 profit from nine stocks. He found all his hives too heavy for keeping, hence he took all the honey, and formed his stocks by feeding.

In a year or two after, we found him forming stocks in the same way. He had his hives placed over holes or pits in the ground about a foot square, and the syrup in dishes at the bottom of these pits. The hives were well covered; and in this novel and rustic way he succeeded in furnishing his apiary with hives of surpassing worth and strength.

CHAPTER XXXI.

ON DRIVING AND SHAKING BEES FROM HIVES AND UNITING THEM TO OTHER SWARMS.

Though often mentioned before in other chapters of this work, this matter deserves separate and distinct treatment.

Take a hive full of combs and bees, and an empty one into which the bees are to be driven. After the full hive has got a few puffs of smoke, it is turned upside down, the empty one placed on it, mouth to mouth, and a table-cloth is tied round the junction of the two hives, to prevent the escape of a single bee. The drumming or driving now commences, simply by beating the bottom hive with open hands, or little blocks of wood. This beating confounds the bees, and causes them to run upwards. In running up into the empty hive the bees make a great noise as in swarming, and this noise facilitates the work in hand. In hot weather all the bees, or almost all, may be thus driven out of a large hive in twenty minutes. The drumming should be continued the whole time, for if the bees have time given them to think, they will cease running, the noise will abate, and those that are below will cleave to the brood-combs to keep them warm. In driving bees the work should be done quickly, allowing no time for play or palaver.

In cold weather this work is more difficult to accomplish, the bees being then more disinclined to leave their own comfortable habitations. But the work has to be done, and the bee-master's ingenuity will not forsake him in a job of this kind. About ten minutes before he commences to drive his bees in cold weather, he will remember to turn up their hive and pour about half a

pound of syrup (sugar-and-water) amongst the bees, and place it on the board. Every bee will get a feed. The heat of the hive will speedily rise twenty or thirty degrees, and in a short time the noise and mirth of the bees will be great.

If the empty hive has been standing in a cold place, it should be warmed by holding it before the fire for a few minutes, before it is placed on the other. The bees are now easily driven up; they run as fast and furious under such treatment as they do in the warm days of August. It is a hard-fought battle that kills every soldier, and it is an unusually successful achievement when all the bees are driven from the bottom hive. Sometimes two or three dozens will refuse to leave the hive. The brimstone-rag, or a puff of powder, will soon clear them out; and though we never use the brimstone-rag, or patronise it in any way, for killing whole swarms of valuable hives, we do not hesitate a moment about applying it to destroy a few stragglers.

When hives are less than 30 lb. in weight, we take their bees from them by a speedier mode than driving; we shake them out in less than half a minute of time. When this is done no smoke is used; the bees are taken unawares. The hive to receive the bees is placed on its crown; the other is gently raised off its board, but not turned up. The bee-master now places his fingers inside the hive, and his thumbs outside, the hive being fairly balanced on his hands, and his legs pretty well astride the empty hive. He now acts as if he were going *to dash* the one against the other, but they never touch; the bees, however, go forward, and fall into the empty hive. A few violent thrusts or shakes, well performed, are often enough to empty the hive of every bee. In cold weather, when bees are sitting fast amongst their combs, they cannot be shaken out in this manner without first feeding

them as described above. A few minutes after having been fed, they will be found moving lightly about over their combs, when they may be shaken out readily in less than half a minute. This expert "express" mode of driving bees from light hives is useful to us; for we have many to drive, and little time to do it. But the thing is so simple and easily done, that the greatest novice in the world in bee-management could, on seeing it once done, do it well. We often perform this operation by candle-light, by feeding the bees about sunset, and taking them into a room, or barn, or hothouse for a short time. Say in about half an hour afterwards, they may all be readily shaken on to the floor of the room, and a hive placed over them; and often there is not a bee lost in doing it. Of course the hive containing the bees should be placed on its stand before they begin to fly next morning.

Hives beyond 30 lb. are not so easily handled. A man of ordinary strength is unable to put them in motion rapid enough to make the bees loose their foot-hold and go forward.

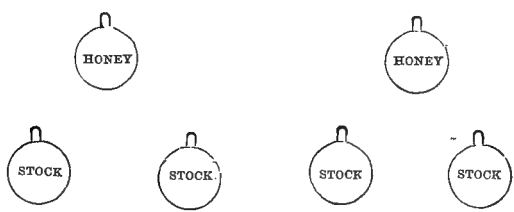
The art of uniting swarms is a very valuable one, and easily learned. The hive to receive the bees, or additional swarm, is turned up, and some sugar-and-water, strongly scented with mint, is poured over the bees. In about fifteen minutes after they have been sprinkled, the other swarm (temporarily driven into an empty hive) is shaken over the combs and bees, and some more syrup sprinkled over them. The hive is again placed on its board, and the work is done. This minted syrup prevents the bees from discovering which are strangers, and therefore prevents fighting. On the Continent the bee-keepers have begun to use nutmeg grated in the syrup, which they give to swarms when uniting them. It is the same idea and practice. If the nutmeg smells stronger than the mint, it is better for this purpose. We could unite a

hundred swarms successfully without the use of either mint or nutmeg; but these strongly-scented articles used in the marriage-feast of two swarms tie the knot at once, and cement a union lasting as life. When swarms are united about sunset, and plenty of unminted syrup is given to the bees, they rarely kill each other. When they do, the work has not been well done.

The immediate effects of placing sweets in the mouths of young folk are very noticeable. A kind of intoxication or hilarity comes over their minds; and when this takes place, it is rather difficult to make them cross-tempered. All this kind of thing happens in a hive if the bees are well fed with sugar. It is therefore wise to give them some about fifteen minutes before the other swarm is shaken amongst them. A swarm may be divided between two hives, or three, as successfully as when wholly given to one. We are now speaking of uniting bees in autumn.

The oldest queen of the two swarms should be killed before the union takes place. And it is necessary to remember that the hives standing against each other in the same garden are the most eligible for being united, as each swarm will be near its own stand.

When our hives are brought home from the moors, we place the honey-hives in front of, or side by side with, those marked for keeping, thus :—



Here the four stock-hives get the bees of the two

honey-hives, and if there were four honey-hives the stocks would get a whole swarm each.

But suppose a honey-hive is standing at some distance from those we wish to strengthen by its bees, how can we act without risk? There is some, if not great, difficulty in arranging such matters.

1 2 3 4 5 6 7 8 9

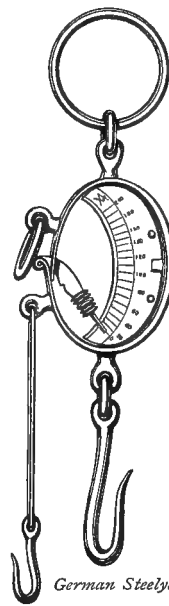
Suppose we want to get the honey from No. 2, and strengthen with bees 7 and 9. If the bees of 2 were to be put into 7 and 9 they would return to their old stand, and probably be killed at the doors of 1 and 3. In such a case we drive all the bees out of 8 and unite them to 7 and 9. Then we drive the bees out of 2, and throw them into 8, placing 8 on stand 2. Thus the honey is obtained, and all the bees preserved.

Sometimes it may be desirable to unite the bees of two weak stocks in the winter season or in cold weather. This is done by candle-light in some room or house. The bees of the hive to be surrendered are fed by sprinkling syrup over them. In about fifteen minutes after, they are suddenly shaken into the other hive, or otherwise on the floor and the other hive placed over them. We have never known an unsuccessful effort made to unite bees by candle-light. Of course the candle must be speedily removed, as the bees on the floor would naturally fly or creep towards it. Before daylight next morning the united bees should be placed where they have to stand. A little self-confidence, and a fair share of celerity, will enable any bee-keeper to accomplish all he wishes to do in his apiary.

CHAPTER XXXII.

ON TAKING HONEY AND WAX.

When we lived in Oxfordshire, we were pleased to find the cottagers there could sell their honey in the hives. Certain honey-factors came round every autumn, and bought honey-hives at sixpence per lb. gross weight, after the bees had been killed by brimstone. We then thought, and think still, that the cottagers got a fair price for their honey, and doubtless the factors got a fair margin of profit.



German Steelyard.

It is not difficult to know pretty accurately how much honey is in a hive before the bees are removed from it. Here is an illustration of a German steelyard, which is a handy instrument for weighing hives. The dial or plate is figured on both sides—one side for the large central hook and ring, numbering from 1 lb. up to 200 lb. The other side, indicating from 1 lb. to 40 lb. only, is used when the hive is lifted by the small hook and ring seen on the left-hand side. This steelyard is small enough to be carried in a coat-pocket.

There are other kinds of steelyards, perhaps more accurate than this German one, but they are more bulky.

To ascertain how much honey is in a hive, we have a rule or standard of calculation which comes near enough

to certainty for all practical purposes. After deducting the weight of hive, board, and bees, we reckon 5 lb. of honey for every 7 lb. weight. Suppose a hive weighs 60 lb. The hive and board may weigh 10 lb. jointly, and the bees 8 lb., leaving 42 lb. In this case there are 30 lb. of honey, and 12 lb. of refuse combs. Another hive may weigh 100 lb., the hive, board, and bees of which may be 21 lb.—leaving 79 lb. According to our standard, there would be 57 lb. of honey and 22 lb. of refuse. In the case of hives containing old combs, the yield of honey is less in proportion to weight than it is in young or virgin combs. Again, if the brood be all hatched, there will be less refuse and more honey. And we need not add that the yield of poor lean hives will be found wanting; and that in the yield of very fat ones, and those beyond 100 lb., there will be found a surcharge of honey.

But let us now come to the process of taking honey. As soon as the bees are driven out of honey-hives, they should be carried into a warm room, and not allowed to cool, for it is very difficult to impart heat to honeycomb without melting their wax. The sticks crossing the combs are withdrawn by a pair of pincers, the combs removed from their hives, and the honey portions of them carefully cut off and placed on a flat dish or milk-pan, standing near the fire, but not so near as to melt the combs. Any pure white comb may be set aside for sale as it is, and all the rest containing honey broken up with a knife, and then put into a bag of cheese-cloth or thin towelling to drain off into a vessel placed underneath. The honey thus drained is as pure as it possibly can be, if the bee-bread in the cell has not been broken by the knife. As many of the cells contain both bee-bread and honey, there is great danger (in taking honey) of having its flavour tainted by bee-bread. In this school we ourselves are but pupil-teachers. We disapprove of hand-

squeezing; and yet where there is much pollen amongst the honey, we have found the squeezing process safer and better than that of cutting the combs with a knife. In the case of heather-honey some pressure is absolutely necessary, for it will not run without it.

We have seen instruments for pressing honey from combs. Though small and imperfect, they did their work well, but the process was slow and tedious. We earnestly hope that the ingenuity of some bee-keeper will soon furnish us with an instrument which will enable apiarians to take hundredweights of honey from combs easily and speedily.

"Have you never seen the American machine called the Slinger?" Yes, we have seen several of them, and tried one here that was highly commended at the apiarian *fête* that came off at the Crystal Palace in September 1874. We regret that its trial here was disappointing; for though it cast the clover-honey from the combs by the action of centrifugal force, it could not cast or sling off the heather-honey in the same way. Heather-honey is beyond the power of "the American Slinger," or honey-extractor.

The Slinger is intended for use with bar-frame hives—that is to say, by apiarians who adopt the movable-comb system of management. When honey is wanted, the bars of combs are taken from the hives, the lids are cut off the honey portions of the comb with a knife, two are placed in the Slinger, the revolving action of the instrument slings the honey from the cells, and then the combs are replaced in the hive. It casts the clover-honey out pretty well; but, as we have said, heather-honey will not go at the command of this American instrument, however fast it revolves. The value of this instrument, we are told, is that it takes the honey without destroying the combs, and thus saves the bees from wasting much honey in building more combs. In much that is said about the Slinger by its patrons and advocates (who are chiefly

traders in bar-frame hives), there is the ring of common-sense which always captivates. But do you think the Slinger is likely ever to come into general use in this country? The present instrument, we think, will never suit the bee-farmer whose object is profit, and therefore will not come into general use. Some are, we are told, endeavouring to improve the Slinger by making it more efficient in action, and smaller in bulk. We sincerely hope they will succeed. Those who keep bar-frame hives may find the instrument useful in taking honey in small quantities from their hives, but there are many objections that could be offered to the use of the Slinger.

1. Honey and brood are generally found in the same combs; and it appears to me that the whirling of the machine will cast out unsealed brood as well as honey. If it does, the honey will be impure. The breeding season was over when we put the instrument to the test here.

2. The Slinger is used to preserve combs two years old. Young combs are too tender to stand the whirling of the machine. Now we think combs quite old enough at the end of their second year. At that age they are black and tough, and moreover they are pollen-bound—that is to say, their centre parts are clogged with bee-bread. The bees cannot find empty cells in such combs for the eggs laid by their queens. We hold that the preservation of old combs in hives is neither wise nor profitable. Bees thrive better and gather more honey in combs young and sweet than they do in combs two years old. A swarm put into a good straw hive in May will fill it with combs and gather more honey in a good season than any kind of hive managed on the non-swarming system.

3. The combs of a large hive yield about five shillings' worth of wax. This sum would nearly buy sugar enough for a large swarm, which, if properly given, would enable the bees to fill an ordinary bar-frame hive or a 16-

inch straw one with combs, and store up food enough for themselves from September till March. What advantage, then, can be found in the use of old combs? Most certainly there can be no gain or profit in their retention.

We are most anxious to find an instrument that will enable bee-keepers to take their honey from the combs speedily; for honey-taking, in any form, is very unpleasant work. In the old process of draining or running honey through a bag into a vessel beneath it, we have to say, that after it has stood for a day in the vessel, it is skimmed, jarred up, and made ready for use or sale. A short time after honey is jarred up, it begins to set or crystallise; and crystallised honey is gritty to eat. Those who wish to use their honey in a liquid state have simply to put the jars into an oven for a time. It soon liquefies there, and becomes, as good to eat as when first taken from the combs.

Honey in the combs does not candy so soon as run honey, but even in the comb and supers of comb it sometimes does candy. By placing such comb in a warm place, the honey liquefies, and the comb appears as in its virgin state. Both honey and honeycomb will keep good for two years, if not for a longer period of time.

Wax is obtained by putting the refuse combs into a bag of cheese-cloth, and boiling them in a large pot of clean water over a slow fire. If the bag be pushed to the bottom of the pot, and held there by some contrivance, all the better. The wax speedily comes to the surface of the water, and appears there as a beautiful yellow oil or fat. This oil is ladled into a bag of fine cloth or strainer, through which it passes into vessels. The wax may be boiled again in clean water and put through the bag once more, and thus become purified. Combs that yield £10 worth of honey, yield rather more than £1 worth of wax.

CHAPTER XXXIII.

ON WINTER TREATMENT.

Doctors differ in their opinions as to the treatment bees should receive in the winter months. One says, Keep them warm; another says, Keep them rather cold. One suggests a nice warm spot facing the south; and another recommends all hives to face the north, lest the warm rays of the sun tempt the bees to come out when the atmosphere is too chilling. One prefers to winter bees in the garret; another has buried them in cavities underneath the ground. In America, some large bee-keepers have erected large houses on purpose to hold their hives during winter. These houses are meant to protect bees from the severity of American winters. In Great Britain such houses are quite unnecessary: here bees can be kept sufficiently warm without anything of the kind.

Would you keep bees warm, then, in winter? Yes; as warm as possible out of doors, so that they get fresh air enough to breathe. The importance of keeping bees warm in cold weather cannot be magnified too much. They are easily benumbed by cold—easily chilled to death. When a bee drops into snow, it seems to die sooner there than if cast into a hot fire. Though bees apparently die on touching soft snow, they are not quite dead; for if speedily gathered and carried to the heat of a fire, they recover their powers. When snow is on the ground, especially if the wind blows from the south or west, all hives should have their doors closed, so as to prevent bees leaving them.

In cold weather bees creep close together, but some of them must necessarily be more exposed to the cold

than the rest. Those on the outside of the mass as it sits among the combs suffer most. Sometimes they become benumbed, and lose all power of motion. The rest creep closer together, leaving the others to perish in their helpless condition. Many hives are thus weakened for want of sufficient protection in cold winters. Weak hives are often killed outright by cold. Bees need extra covering in winter, and they cannot well get too much of it. Beneath the outer covering plenty of other materials should be used. Soft dry hay, two or three inches thick, or waste cotton, or tailors' clippings, old carpets, or grassy sods, properly placed around hives, are a great protection to bees in winter.

The seeds of consumption, and other diseases of the human frame, have been sometimes sown at a date more ancient than we think about; and so the "bad luck" of many bee-keepers in the summer time could be traced to their bad management during the winter season. Warmth as well as dryness for bees is of prime importance in every apiary in which profit is sought.

About the end of September, when all stocks have received some additional bees, and feeding, if necessary, they should be neatly plastered to their boards with some kind of mortar, and then covered up as described. The doors of the hives are to be contracted at this time. No more attention is necessary for five or six months, save that of keeping the bees inside their hives when snow is on the ground. But here let us say that bees breathe and require fresh air in winter as well as summer, and that they prefer to go abroad to evacuate; hence care and thoughtfulness are required in closing their doors to keep them in. Bees in wooden hives soon perish if their doors be closely shut. Bees in straw hives will be suffocated too if their doors be closely shut for some time, if they have been crowded in autumn by the addition of

extra swarms. During long storms, the lives of bees in very weak hives may be preserved by taking them into the room of a dwelling-house. Bees have been wintered beneath the ground in America. It has been found that they consumed as much honey below as they did above ground. The dampness of the air below ground, as might be expected, rotted their combs.

CHAPTER XXXIV.

WHEN SHOULD HIVES BE PURCHASED?

We think September is the best time to purchase hives for stock, for then almost every bee-keeper has some to part with—viz., those which he has marked for honey. If he can get the value of the honey, hives, and board, he will readily sell them, and thus save himself the trouble of running and selling the honey. The taking of honey and wax is the most disagreeable thing in bee-keeping, and we would much rather sell our hives than put them down for honey. This month is the cheapest time, too; for hives that have weathered the winter are higher in price, because all danger is over, and they are nearer the time of multiplying their numbers. But bee-keeping can be commenced at any time,—with stock-hives in spring, autumn, and winter; and with swarms in May and June. And those who keep bees largely will readily sell at any season.

THE CALENDAR.

In writing the first edition of this work, it was our intention to add a Calendar of operations to it; but we found that there was writing enough in the manuscript to fill the pages without it. In this edition one or two unimportant chapters have been left out, and all unnecessary illustrations, so that the work could be improved without increasing its size. Indeed, the Calendar itself will be confined to narrow limits. Since the publication of our first edition a few years ago, a considerable advance has been made in apiarian science by a widespread section of intelligent readers. The progress made in practical bee-keeping of late is so perceptible, that we cherish the hope that we may have the happiness of knowing that thousands of the rural population derive a substantial income from this source. From all parts of the country we are receiving most gratifying reports—reports of successful management, and honey-harvests greater than were ever dreamed of a few years ago.

January.—If bees have food enough in their hives now, the less they are disturbed, indeed the quieter they sit amongst their combs, the better. Though all healthy

hives are benefited by the bees taking an occasional airing in mild weather during the winter months, the inmates of healthy hives sit more closely and quietly together than those of unhealthy ones. On turning up a hive infected with foul brood, we invariably find the bees sitting very loosely in it, and that they begin to spread themselves over the combs rapidly.

Sometimes bees, in coming out for an airing, take so much honey that they cannot fly. They become benumbed outside, and cannot return to their hives. This is very evident when a great number of hives are standing near each other, and especially when the bees are living on heather-honey. The ground amongst the hives becomes thickly strewed with chilled bees. When this happens the bees should be swept together, gathered into small supers or boxes, and well warmed before a fire or in a half-cooled oven. The heat soon restores them, and when let go, enables them to return to their hives.

Though September is the best month for feeding bees for winter, some bee-keepers fail to give enough then, and continue to feed afterwards for months. This late feeding cannot be too strongly condemned. There is often great difficulty experienced in getting bees to take food during cold weather. If necessary (from past forgetfulness) to feed bees in January, let the food when given be warm, say 100°, or blood-heat. If the bees will not take it, let them be brought into a warm room or hothouse, and there fed with warm food, keeping them in their hives while indoors.

The smallest door possible affords bees in straw hives ventilation enough, but those in wooden hives are benefited by ventilating-holes in them. Such holes help to let the moisture escape, which otherwise would condense on their sides and rot the combs. Their crown-holes should be left open, but covered with wire to keep

mice out. If wooden hives have no crown-holes, one or two dozen of small holes bored through their sides and crowns with gimlets or small brace-bits will tend to rid them of moisture.

It has been said by some one that bees die in a temperature of 34°—that is to say, when the mercury falls to within 2° of the freezing-point inside a hive, bees cannot live. I have not yet put this to the test of experiment; but if it is a fact, the importance of covering hives well in winter cannot be too strongly insisted on.

Cottagers who make their own hives should get them ready during the long evenings of winter; and amateurs, too, should prepare beforehand for an increase of swarms.

February. — This month is one, generally speaking, of inactivity amongst bees. As the days lengthen, the hopes and enthusiasm of bee-keepers are awakened, and some preparations are made for future events. The seasons from 1870 to 1873 inclusive were unfavourable ones for honey-gathering. 1874, though not one of the best seasons for bees, was very favourable in the months of June and July, enabling good swarms to rise in weight to 100 lb. each. In the north of Scotland some rose to 120 lb. and upwards.

When the weather is mild, queens generally begin to lay this month: in the south, early in February; in the north, not till the end of the month. In this neighbourhood, which is about half-way between London and Edinburgh, I once saw young bees on the wing on the 15th of February. The queens that year commenced to lay in January. About four years ago we had a very late spring. The first batch of brood that year was not hatched till the middle of April. An open early spring and a warm early locality are advantageous to bees, for their lives are of short duration, — nine months — but

many of them do not live so long. If a hatch of brood be not obtained in March to fill up the ranks thinned by death, many hives become so weak in bees that these have a hard struggle to live. In a cold spring and late locality, I think it is desirable to stimulate bees by artificial feeding, and thus cause them to breed earlier than they otherwise would do ; but great care is necessary in this work. Better be a little late in beginning it than too early; and when once begun, continue feeding till the bees can work out of doors. It should be borne in mind that spring feeding is merely to stimulate and keep alive. Half a pound of sugar and half a pint of water, boiled, will make four or six doses for a good hive during this month. As a rule, March is soon enough to begin feeding bees.

This month all the boards of hives should be well scraped or cleaned. If the bee-master wishes to change the position of his hives, he may venture to do it this month, for bees come out but seldom now ; and when they do come out, it is for a winter dance and purposes of cleanliness, and they never then go far from home. In times of honey-gathering, bees leave their hives and go straight to field or orchards, and may not discover that the position of their hives has been altered (if altered it has been) till they return to the old stand. In summer, hives should be removed from one part of a garden to another by short stages—say one or two yards every day. This month they may be removed from one side of a garden to another without much risk. When this is done, all the hives should go at once ; for naturally some bees would return to the old place, and if they found a hive near it, they would seek a home there instead of going to their new position.

March.—By examining hives at the commencement of

this month, we ascertain how they have kept their bees in winter. By gently lifting them off their boards, and turning them up, we may see in what condition they are, without the use of smoke. In cold weather they now sit quietly amongst their combs; and if a hive contain four or five seams of bees—that is to say, four or five lots of bees—about the size or breadth of a tea-cup saucer, or crown of a man's hat, and each lot separated by a comb from the next lot, the hive is (all else being well) in first-rate condition, and will probably be ready for swarming early in May. If a smaller hive have three such seams of bees at the beginning of this month, it will in an ordinary season be ready to swarm some time in May. The seams of bees in weak hives are often reduced to three, and these not much larger in a frosty morning than a gentleman's watch. Such weak stocks often go spark out, not for want of food, but for want of bees. When two hives standing together have only two seams of bees each early in this month, they should be united at the earliest opportunity, for one good hive is better than two weak ones. By examining hives frequently, their state may be well understood. When bees are moving about, the smoke should be used before hives are turned up.

Bees commence to breed in February and March; and when they do begin, they may be seen seeking for water. And in about ten days after they begin, patches of sealed brood may be found in hives—the strong hives with larger patches, and more of them, than the weak hives. A hive containing five seams of bees will have three patches of brood to begin with; and those of three seams only, one patch of brood. Here we have evidence of the value of strong stocks. While these early patches of brood are being hatched, the weather gradually becomes warmer, and bees cover more comb. The patches become larger day by day, and other combs are embraced, and

brood put in them. This goes on till the extremities of the combs are covered.

By using the smoke of fustian, and by examining his hives often, any young apiarian may become in a short time—say, three months—a master of the mysteries of bee-keeping, and an expert in the manipulation and management of his hives.

By one calm examination of a hive this month, the position and shape of royal cells, and the difference between worker-comb and drone-comb, may be well understood.

As bees increase in number, and move more actively about, more food is consumed in a hive. If artificial feeding is necessary, more should be given at the end of this month. Whatever is worth doing, should be done well. And when progress and prosperity begin, they should be encouraged. Hives should have plenty of warm covering for two months after breeding commences.

April.—Now the populations of hives multiply very fast, and every fine day a great quantity of pollen is collected. Honey is now gathered from the flowers of gooseberry, plum, and other trees. Strong hives rapidly increase in weight, and eggs are set as widely as possible—that is, as far as the bees cover their combs. The fertility of queens, and the industry of bees, are marvels in the history of bee-hives. When all the combs of a hive are covered with bees, and filled with eggs and brood, it is, in ordinary seasons and circumstances, within three weeks of being ripe for swarming. In examining a hive at this time, to ascertain if the bees cover their combs, no smoke is used; the hive is simply raised high enough to let us see the bees in their natural position.

If swarms are not wanted early, or at all, supers should be put on hives shortly after all their combs are covered by their bees. If the reader will once more read over

the chapter on Supering, he will see that it is important to induce the bees to commence to fill supers at or from their tops or crowns, and that this is done by the use of guide-combs. A few pieces—the larger the better—of white drone-comb, fixed in a super, induce the bees of the hive on which it may be placed to commence to fill it at once.

Both on the swarming and non-swarming systems of management, drones will appear in strong hives about the end of this month or beginning of next. Early drones, it is said, indicate early swarms; but this is not invariably the case; for we have known hives possess a superabundance of drones for weeks before they were ready for swarming, and we have known hives send off colonies before a drone was hatched in them.

In the case of small hives used for supering, it is desirable to enlarge them by ekes, and wait till the ekes are nearly filled with combs before supers are placed on them. They will thus be enabled to breed more bees and do more work than they could do without the ekes.

May.—May and June may be deemed the most interesting and busy months in the apiary. Now all is activity. The bees go abroad early, and carry in water for the day while dew is on the grass, and before honey can be obtained from the flowers. Almost from sunrise to sunset bees may be found returning to their hives with water, or pollen, or honey, and frequently with both pollen and honey. It is a time of activity too for the owners of large apiaries. The time of multiplication is at hand. Swarming commences this month. The bee-master should examine his hives internally every week to ascertain their state and ripeness. We have seen that if a hive is not ready for swarming, the smoke blown into it drives the bees up amongst the combs, and few

are left on the board when the hive is turned up. The *sweat* of the bees of such a hive lies in drops in the doorway in the morning. But when ready to swarm, the heat of the hive is so great that the sweat or condensed moisture at the door is dried up or driven out two or three inches beyond the door. The noise of the hive is great in fine weather, and many bees have to work hard at the door to temper the excessive heat of the domicile; and this is done by the rapid motion of their wings, which increases the circulation of air inside. About four days before first swarms issue from their hives, eggs are placed in royal cells, and very often these may be seen on examination when many of the bees are abroad seeking honey. Hives, with queens set in them, should be carefully watched in fine weather; and if the owner or his family have no time for watching, swarms should be taken from such hives artificially, as already described. Swarms that come off naturally should be hived as soon as possible, and placed on a stand (where they have to remain) before the bees begin to work.

Sometimes swarms decline to stay in their hives, and leave it to cluster again on the branch of a tree. In such cases they act from caprice; and this should be remembered, for if returned to the same hive, they would probably leave it a second time. They may readily accept another hive; and another swarm as readily accept the one that was capriciously deserted. Eking, supering, and nadiring, may be practised this month according to the aims and notions of the bee-master. If feeding be necessary this month, every strong hive should get not less than a pound of sugar dissolved in a pint of water. Both bees and brood require much food during this month.

June.—If the weather during last month has been

favourable for honey-gathering, the supers that were placed on strong hives at the end of April may be examined. If found filled and sealed, they should be cut off the hive with a bit of fine wire, raised with wedges for about an hour, and then taken off. If more honeycomb be wanted, and not swarms, larger supers with guide-comb in them should take their places. We say larger, for almost all hives are stronger in bees at the end of May than they were at its commencement. If larger supers be not used, or supers large enough to hold all the bees, narrow ekes should be placed below the hives as well as supers over them. It is bad policy and practice to let bees cluster outside their hives for want of room inside.

Second swarms may be expected about ten days (generally) after natural swarms, and about seventeen days after artificial swarms. But the time depends on the age of the grubs in royal cells at the time of swarming. By turning up hives as soon as swarms have left them, the royal cells will be found with either eggs or grubs in them. If they contain little worms, floating on something shining, like a drop of milk in each cell, we conclude that they have been there two or three days. If the royal cells are nearly filled, and being covered in (lids formed over them), they are about seven days old, and will be perfected in seven days more, when piping will commence: and three days after this begins, second swarms will issue.

In every apiary at this season there is a superabundance of young queens, and some of the supernumeraries may be utilised. Lessons of great importance to those who seek to manage bees profitably may be learned from using surplus queens. Almost every hive that has swarmed naturally, or been swarmed artificially, has one, two, or three more than it requires. These can be cut out and often used with advantage. In the case of late

swarmers, we put queens in them, or royal cells with royal inmates (cut from earlier swarmers). To give late swarmers perfect queens as soon as their own have left or been taken from them, is one of the master-strokes of bee-management. They are thus helped by getting perfect queens long before they could rear them. By giving queens in this way to late swarmers, second swarms will not be obtained from them, if the introduction of queens from other hives has been successful.

Before we leave this subject, let us give the reader another idea (a little bit of our own peculiar practice), which he may find in future years to be of some importance. In bee-keeping, practice must vary with the season. A man with open eye and active brain will not always be guided by rote and rule; he improves upon his own practice and the teaching of others. In most seasons large bee-keepers have early and later swarmers. Some seasons hives contain but little honey three weeks after swarming. In such seasons we do not get much honey at the first harvest; but still occasionally we turn the bees out of hives when they do not contain much honey, and put them into empty hives; and immediately take swarms from later stocks to repeople those hives from which the bees have been driven. Why? Because the queens in these hives are just born, and will not commence to lay for ten or twelve days; whereas the queens in the later swarmers are laying two thousand eggs daily. The bees have thus an opportunity of setting the eggs laid by their queens, and filling their hives with brood from side to side; and the "turnouts" put into the empty hives have time to make combs before their queens commence to lay. It is not necessary to wait till the twenty-first day before the bees are turned out, if their hives are repeopled immediately afterwards, for the swarms imported to them hatch

the brood that may have been unhatched at the time of turning out. This practice is of considerable importance, for late swarms are thus made equal to early ones. And by turning the bees out of hives as soon as piping commences, or as soon as queens are born in them, there is no fear or danger of losing second swarms from them. The turnouts of large hives that have not yielded second swarms are valuable, because they are large and have young queens.

As to the first harvest of honey, which generally begins in June, we have to ask the reader to consult the chapter on "Turnouts." If early honey be specially wanted, or bees transferred from one kind of hive to another without sacrifice, the bees of parent hives should be turned out of them about three weeks after first swarming, and put into empty hives. But when the turning-out system is not adopted, the hives of early swarmers will require supers or ekes before the honey season ends.

In about four weeks after first swarms have been put into empty hives, they should be examined to see whether they require enlarging. If they are full or nearly so, and the weather be favourable, they should be enlarged by supers, ekes, or nadirs, as their owner may determine. If not enlarged, preparations will be made for swarming; and swarms from swarms of the current year are termed "virgin." The seasons are exceptionally fine when it is profitable to take virgin swarms.

July.—In writing a calendar, one is constantly beset with the difficulties and differences of early and late seasons, as well as early and late localities. In 1868, bees were gathering great stores from heather on the 24th of July. Some three years later the heather was just bursting into blossom about the 20th of August. A firm hold of

principles will do more for the reader than an enumeration of details of management; for after all that can be said, much must be left to the judgment and experience of every apiarian.

July is perhaps the best month for honey, taking one county with another. White clover is the principal honey-plant this month.

Swarming is permitted by many experienced bee-keepers till the middle of this month; but where bees are not removed to the heather, swarming should be prevented after the first week in July by eking and supering. Late swarmers are generally heavier when they swarm than those that swarm earlier, and therefore often contain a great deal of honey three weeks after swarming. By putting all their bees into empty hives, their honey may be obtained. This is the system advocated in the chapter on "Turnouts." Late swarms and turnouts should be well attended to during the first ten days of their separate existence, for then they have a passion for comb-building. A few half-pounds of sugar given at this time enable the bees to build comb rapidly and fill them with brood. This branch of bee-management is less attended to than many others. Indeed all should be kept in a state of progress this month. Breeding should be encouraged and promoted to the uttermost in all hives intended to be kept for stock another year, for hives filled with brood in July and August will be strong and populous during the following winter and spring.

Parent hives or turnouts and second swarms should be carefully noticed about ten or fourteen days after their queens are born; for, as we have already seen, young queens sometimes never return from their marriage tours. Swarms which thus lose their queen are seized with fits of grief in which they may be found making a great noise,

and racing and running wildly both inside and outside their hives. In such queenless swarms drones are never killed ; if the bees are seen killing their drones, the bee-keeper has evidence that they not only have queens, but queens timely fertilised and in a normal state. Some few days after young queens begin to lay, the bees begin to worry their drones. Queenless swarms should be furnished with queens from other hives.

Eking and supering should be well attended to this month. All full supers should be taken off and others put on. Let us remind the reader that it is an easy matter to get supers filled in July, weather permitting, for now plenty of white comb can be obtained from the hives of swarms, and placed in supers. The bees speedily fix such combs in the supers and fill them with honey.

In bar-frame hives, the bars filled with honey should be removed, and empty bars placed in their stead.

August.—Generally speaking, August is the last month of honey-gathering in Great Britain ; and where bees are taken to the moors, it is often the best. From 20 to 60 lb. of honey are frequently gathered per hive on the moors. About the first week of this month is the usual time, in ordinary seasons, for removing bees to the heather. Young apiarians are often very unfortunate in their first journey with their bees to the moors. An excellent clergyman, who lost a cow by death, wrote in his diary these words, " This day I am a cow poorer, but a thought richer." And many a bee-keeper finds that his first journey with his bees has made him a hive poorer, but a thought richer. Experience is the most effective teacher. In sending off or removing hives in summer, thorough ventilation should be secured before

they are moved; for in moving them by cart or railway, all natural ventilation is stopped. Fly-proof wire on the doors and crowns of hives will give the ventilation necessary. If the combs of hives be not fastened to cross-sticks, it is exceedingly difficult to remove them in hot weather without shaking the combs down.

If the weather be favourable for honey-gathering while the bees are on the heather, it is often necessary to enlarge hives even in August. We have had supers of 30 lb. each filled by swarms while on the heather. The accumulations of honey is often so rapid in hives on the moors, that they hang outside in clusters soon after they are placed there.

As bees do not sit on honeycomb, it will be understood that the more honey a hive contains, the less room it has for bees. Eking and supering may have to be continued till the end of this month.

When honey-gathering ends, hives lose in weight very fast. But the honey the bees eat then is generally in the brood-combs; and for some days after outdoor work ends, the bees remove some honey from centre combs to other parts of the hive. The bee-farmer will not sustain much loss by letting his hives remain a week on the moors after the honey has gone from the heather. The hives cool and their combs harden by being left for a time before they are brought home.

Before hives are taken to the moors they should be examined with a view to select and mark those to be kept for stock. If too heavy for keeping, 10 or 20 lb. of honeycomb may be cut from each of them. Those marked for honey should be supered or eked before they go.

September.—In apiculture this is the month of general

harvest—and honey-taking is the most unpleasant work the bee-keeper has to perform.

Before the honey is taken, another examination of every hive should be carefully made—and hives pretty full of well-formed worker-combs selected for stocks. From 40 to 50 lb. each is probably the most eligible weights for stock-hives in September. But their weights may range from 20 to 60 lb. each. Strong stocks cause no anxiety to their owners, and will yield as much profit as twice or thrice their number of weak ones. And now is the time to make stocks strong for another year. The bees of the honey-hives should be driven into empty ones and united to those selected for keeping. Thus every hive may be made strong in bees. Those who know better than destroy valuable hives in the brimstone-pit, should beg the cottagers to preserve their bees, instead of suffocating them with sulphur. Those who have no bees of their own to strengthen hives, should drive the swarms of cottagers, and give 2s. 6d. per swarm for them. For years I have bought condemned bees in September at 1s. per lb.; but now there is great difficulty in finding cottagers in this locality who will part with their bees. The sulphur-pit will soon be a thing of the past. Those who use bar-frame hives may strengthen their stocks by taking some honey-bars from their stocks and putting brood-bars from honey-hives in their places. The brood that is hatched in August and September lives till spring; and hives with plenty of brood in them now will be in good condition in March and April. Six sheets of brood now indicate five seams of bees in March; and five seams of bees, as large as the crown of a man's hat, in a cold morning in March, indicate that the hive is one of great strength.

If any queens in an apiary are three years old, they

should be destroyed, and young ones put in their places, and when all the brood is hatched, a careful and thorough examination of every hive should be made to see if foul brood exists, and if any be found the hives containing it should be put down for honey.

This month is the time for autumn feeding—for giving to stock-hives enough to keep them till March or April. Swarms put into empty hives now, and fed well, make combs and store up honey enough for themselves. We prefer two swarms in September for one hive to be filled by sugar alone. Instructions have been given in one of the chapters how the sugar has to be given.

As soon as the bees have been driven from honey-hives, their sticks should be withdrawn by a pair of pincers, and the combs placed before a fire. Whatever process be adopted for extracting honey, it should be put in operation as soon as possible after the bees have been driven from the combs. We have always believed that a very simple instrument will be invented and used for pressing honey from combs.

In taking honey from hives, the combs with brood in them may be placed in an empty hive, mouth upwards, in a natural position, and held upright by wooden pins or wedges. As soon as the hive is pretty well filled with combs of brood, a swarm of bees should be cast amongst them, and a board placed over all. The bees hatch all the brood in the combs thus roughly pinned in, and with this swarm doubled in population by the birth of so many young bees, a bee-master can strengthen many of his hives. Under careful, good management, both the bees and brood of honey-hives can be utilised with great advantage in an apiary of large hives kept for profit.

By putting a swarm into an empty hive with a small straw or wooden super on it, the bee-master may get many

pounds of pure honeycomb by feeding this swarm with all his refuse combs and impure or soiled honey. We have filled supers by feeding swarms placed in empty hives in September. The bees in such cases take no impurities from the combs to the supers. After filtering impure or soiled honey, they present it to us in a beautiful state of purity.

After the refuse combs have been well licked or cleaned by the bees, they should be boiled in pure water for wax. Wax is so adhesive that it is difficult to remove it from any pot or dish it may touch. A good handful of soda used in water destroys in a great measure its adhesive powers, and therefore makes easy the work of cleaning dishes in wax-boiling.

September, of all the months of the year, is characterised by robbing and fighting amongst bees. They have thievish propensities all the summer months, but then they can find honey in flowers more readily than by becoming housebreakers. In September, robbers are prowling about constantly, and test the defensive powers of every stock in the garden. If they get admission, and are not resisted, a hive is soon robbed of all its honey. Generally speaking, the enemy is repulsed. The doors of hives should be contracted as soon as honey-gathering ends.

October, November, and December.—Under proper and enlightened management bees require no attention from September till March. If feeding in September has not been attended to, it should be done as soon as possible. Late feeding is very dangerous, for it may induce bees to commence breeding, and a frosty night may come and chill the brood to death. We have known hives ruined by late feeding. The chilled brood became foul. We have tried late feeding with a view to get a late hatch of

brood to strengthen hives; but finding the loss greater than the gain, the practice has long since been abandoned. Autumn feeding should be finished as early as possible.

As soon as it is over, all hives should be protected and covered well. When snow is on the ground, the reader will remember to shut the doors of his hives to keep his bees from going out till the snow be thawed.

THE END.

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EDITED BY

REV. W. LUCAS COLLINS, M.A.

Author of 'Etoniana,' 'The Public Schools,' &c

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