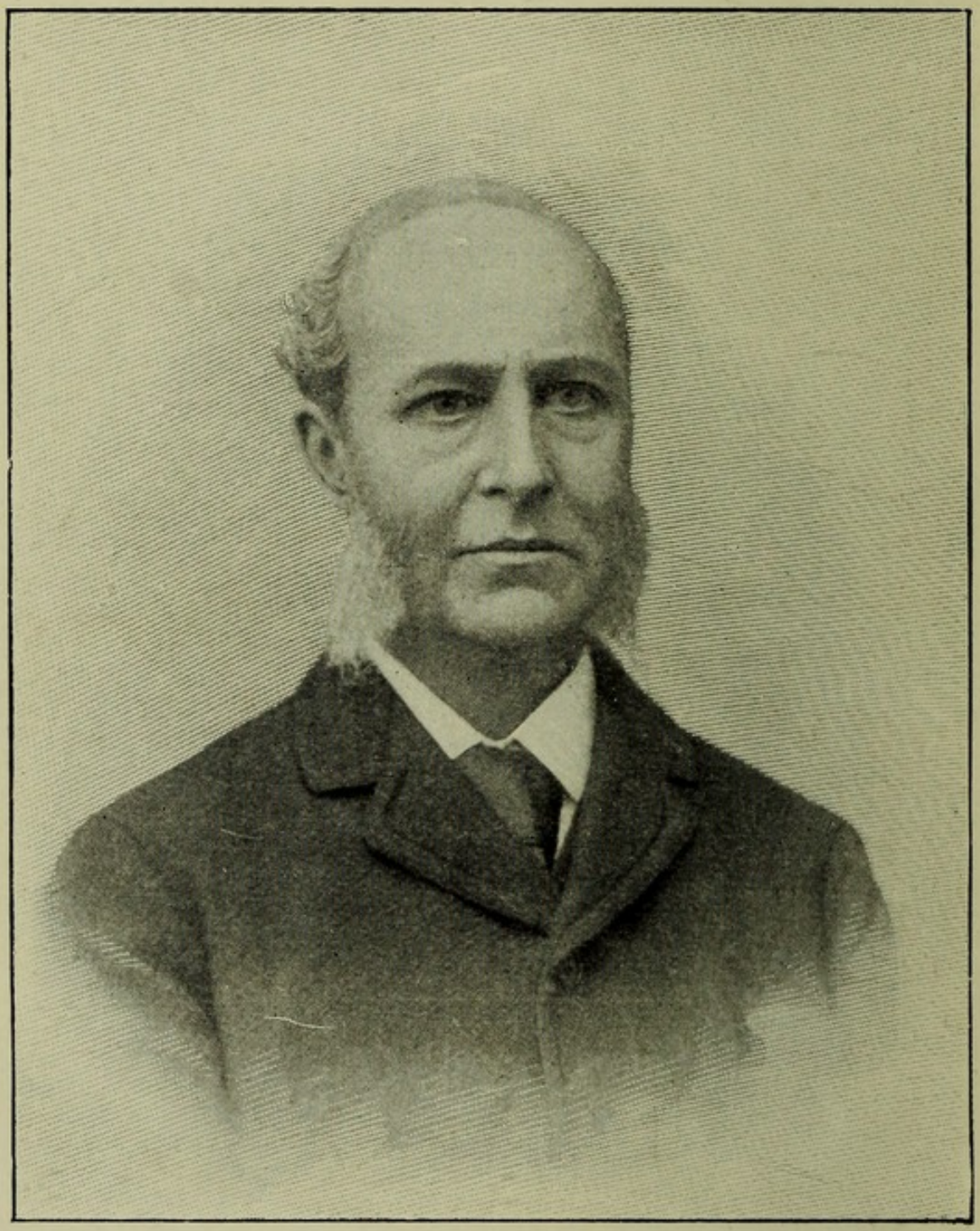
British bee-keeper's guide book to the management of bees in movable-comb hives, and the use of the extractor / by T.W. Cowan.

BRITISH Bee-Keepers GUIDE BOOK

T. W. COWAN



Thos. Wm. Cowan

Wallis F. Reid Esq.
with best wishes of
The Author
X. Mas /02

BRITISH

Bee-keeper's Guide Book

TO THE

Management of Bees in Movable-Comb Hives,

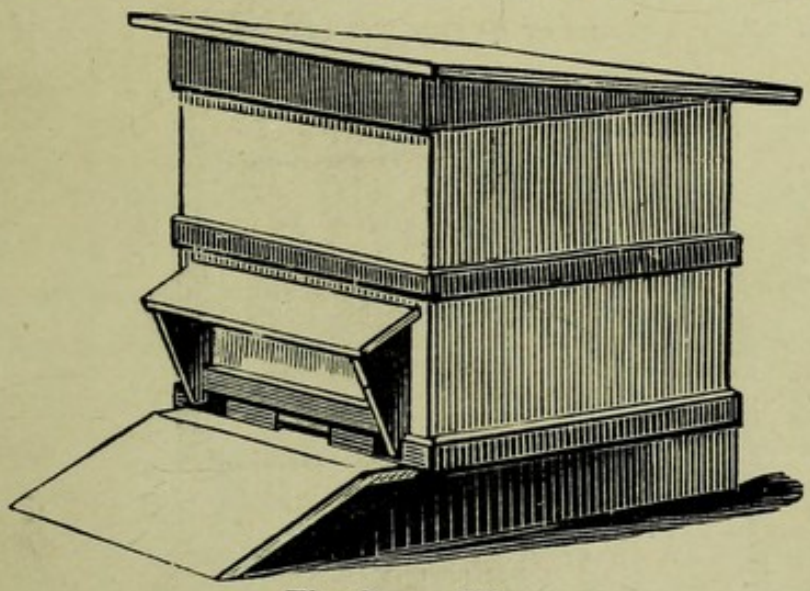
AND THE USE OF THE EXTRACTOR.

ILLUSTRATED.

BY

T. W. COWAN, F.L.S., F.G.S., F.R.M.S., ETC.

Chairman British Bee-keepers' Association, Editor "British Bee Journal,"
Author of "The Honey Bee: Its Natural History, Anatomy, and Physiology,"
"Foul Brood and its Treatment,"
"British Bee-keeper's Note-Book," "Bees and their Management,"
"Wintering Bees," "Doubling and Storifying,"
"How to make an Extractor and Bellows Smoker," etc.;
Member of the British Association for the Advancement of Science,
Honorary Member of several
Bee-keepers' Associations in Europe and America, &c., &c.



The Cowan Hive.

Seventeenth Edition. Forty-fifth Thousand.

LONDON:
HOULSTON & SONS, PATERNOSTER SQUARE.

[1901]

LONDON:
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GREAT QUEEN STREET, W.C.

PREFACE TO THE FIRST EDITION.

SINCE the British Bee-keepers' Association was established in 1874, Bee-keeping has made such rapid progress, and notwithstanding that our Bee Literature is already represented by numerous books and the *British Bee Journal*—a periodical exclusively devoted to bee-culture—the constant enquiries I receive respecting the practical management of bees in movable-comb hives is ample evidence that British Bee-keepers demand a treatise on Bee-culture, which, divested of all verbiage and superfluities, shall plainly point out the way to success. I am frequently asked to recommend a cheap practical work on the management of frame-hives. Some excellent books on the subject that are offered for sale contain a large amount of superfluous matter, which only aids to produce a volume of respectable size, increasing its selling price, and not the practical value, placing it in many cases beyond the reach of those who would be purchasers. There are others whose value is often in inverse proportion to their bulk and cost. Some are merely advertisements of special goods for sale; whilst most are, as the Americans say, not "up with the times," and do not even allude to matters of management, now considered indispensable by practical Bee-keepers. In endeavouring to supply this want, my object has been to produce a work which would contain the most valuable information on frame-hive management; and, to bring it within the reach of all, it has been condensed to the smallest possible scope consistent with a full exposition of the subject, with plain directions for the various most profitable operations for securing the best harvest of honey. Much disappointment is often caused by rash assertions of interested persons respecting the pecuniary profits which may be made by keeping bees, so that I do not intend to commit myself to any direct statement upon this point. How to make a golden fortune is always an attractive title, and one that has sold many a pamphlet upon eggs, pigs, poultry, bees, and such-like subjects. I do not intend to enter the lists with these, but shall be contented if those who read this book, who are in a position to do so, are induced by its perusal to take a deeper interest in the wonderful works of Nature, or to adopt a pursuit which, as it must be followed in

the open air, is likely to improve their health and increase their strength, while it may afford them an opportunity, not altogether to be despised, of adding a little to their income.

As the contents of this volume have been compiled from notes and practical experience, names of persons who may be connected with processes and different appliances alluded to are often omitted, not from intention, but from the difficulty of tracing the ideas back to their originators. As it is a work of a practical character, and not a history of the science, I trust that such omissions will not affect its value.

All the practical points embodied in this work have been thoroughly tested; and if the simple directions given be faithfully carried out, Bee-keeping may be made a pursuit not only interesting, but highly remunerative.

Not having any pecuniary interest in the sale of any Bee-keeping appliances, I do not hesitate to give such description of those I use as will enable anyone to get them made for themselves.

THOS. WM. COWAN.

Comptons Lea, Horsham,
November, 1881.

PREFACE TO THE SEVENTEENTH EDITION.

SINCE the preface to the first edition was written, sixteen editions, comprising in all about 40,000 copies, of this work have been exhausted, and the progress of Bee-keeping during that period has been so great that considerable alterations have been made from time to time in the different issues. The work has also met with great favour abroad, as evidenced by its translation into more foreign languages than any Bee-Book ever published. Among these are French, German, Danish, Swedish, Russian, and Spanish, in some of which two and three editions have been issued. The uniformly favourable reviews of the Press, together with the innumerable friendly letters—which are constantly reaching me—from Bee-keepers both in England and abroad, testifying to the advantage they have received from its perusal and the success achieved by following its teaching, make it quite certain that the work is accomplishing the object for which it was written. It needs no

further evidence in order to prove the increasing and extraordinary popularity *The Guide Book* has acquired than to point to the fact that although little over eighteen months have elapsed since the last edition, consisting of five thousand copies, was issued, the whole has been exhausted, and a new edition called for.

The 14th and 15th editions were very fully revised, and, through the kindness of Messrs. Newton & Co., who supplied photographs by Mr. T. E. Freshwater, taken at Mr. W. Broughton Carr's apiary, of his manipulations with live bees, some beautiful half-tone engravings were introduced, which, it was hoped, would add to the interest of the book. In this latter case, my expectations have been more than fulfilled, several beginners in Bee-keeping having gratefully acknowledged their indebtedness to these illustrations in making more clear than words possibly could the various items of bee-management, and the way in which live bees can be handled by an experienced bee-master.

Among other improvements was the half-tone block on next page, from a capital photo taken from life, of worker bees and queen on a frame of comb. For this picture I am indebted to Dr. Sterry, M.R.C.S., of Sevenoaks, Kent.

I am also indebted to Mr. H. W. Brice for the two beautiful photo-micrographs shown in figs. 86 and 88, which appear on pages 149 and 160 in the present edition, as does the photo on page 28, for which my thanks are also due to Sir W. J. Herschel, Bart.

To keep pace with the progress made in Bee-keeping, the last edition was thoroughly revised, enlarged, and a great portion entirely re-written, obsolete methods and appliances were expunged and replaced by descriptions of the most recent and approved ones. Several chapters were also considerably extended, and that on "Foul Brood" re-written in the light of present-day knowledge.

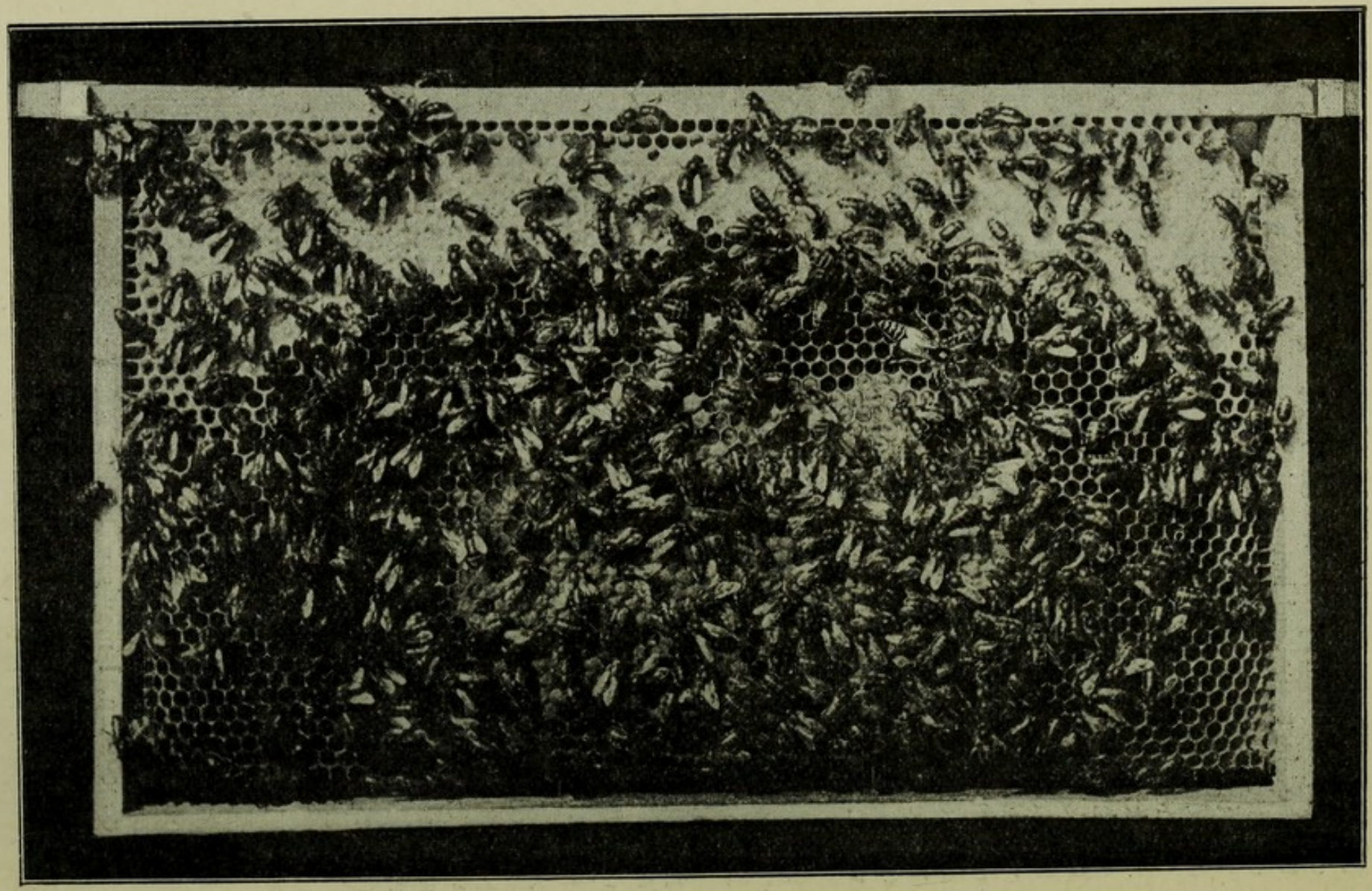
Seeing, therefore, how short a period of time has elapsed since the last edition was issued very few corrections were needed in order to bring the work up to date.

Although distasteful to me that my portrait should figure prominently in *The Guide Book*, I have, at the earnest solicitation of friends—and solely in deference to their oft-repeated wishes—consented to its appearing as a frontispiece.

In conclusion, I may say that no pains or expense have been spared to make the present edition of *The Guide Book* the most perfect of its kind, and I hope it will receive an equally favourable reception as have the sixteen preceding ones.

THOS. WM. COWAN.

Pacific Grove, California,
November, 1901.



FRAME OF COMB WITH BEES AND QUEEN. (*From life.*)

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BRITISH

BEE-KEEPER'S GUIDE-BOOK.

I.—INTRODUCTION.

APICULTURE—a term generally understood to include the practice and science of bee-keeping on modern methods—is admittedly one of the most profitable of rural occupations. It has engaged the attention of intelligent persons in all ages; but not till comparatively recent years has the pursuit been rendered not an entire matter of chance, as formerly, but of certainty, if the weather be not altogether adverse to the labour of the bees and the secretion of nectar.

Many of the advantages possessed by the bee-keeper of to-day are, no doubt, fairly attributable to the vastly improved bee-appliances introduced during the last fifteen or twenty years; but not a little of the progress is due to the spread of apicultural knowledge by the literature devoted to the subject, as well as to the numerous press notices, having reference to the profits got from bee-keeping. This latter fact, however, has led to not a few failures, owing to persons—stimulated by the exaggerated accounts in the daily press—purchasing stocks and engaging in the pursuit without possessing even the most elementary knowledge of bees or their

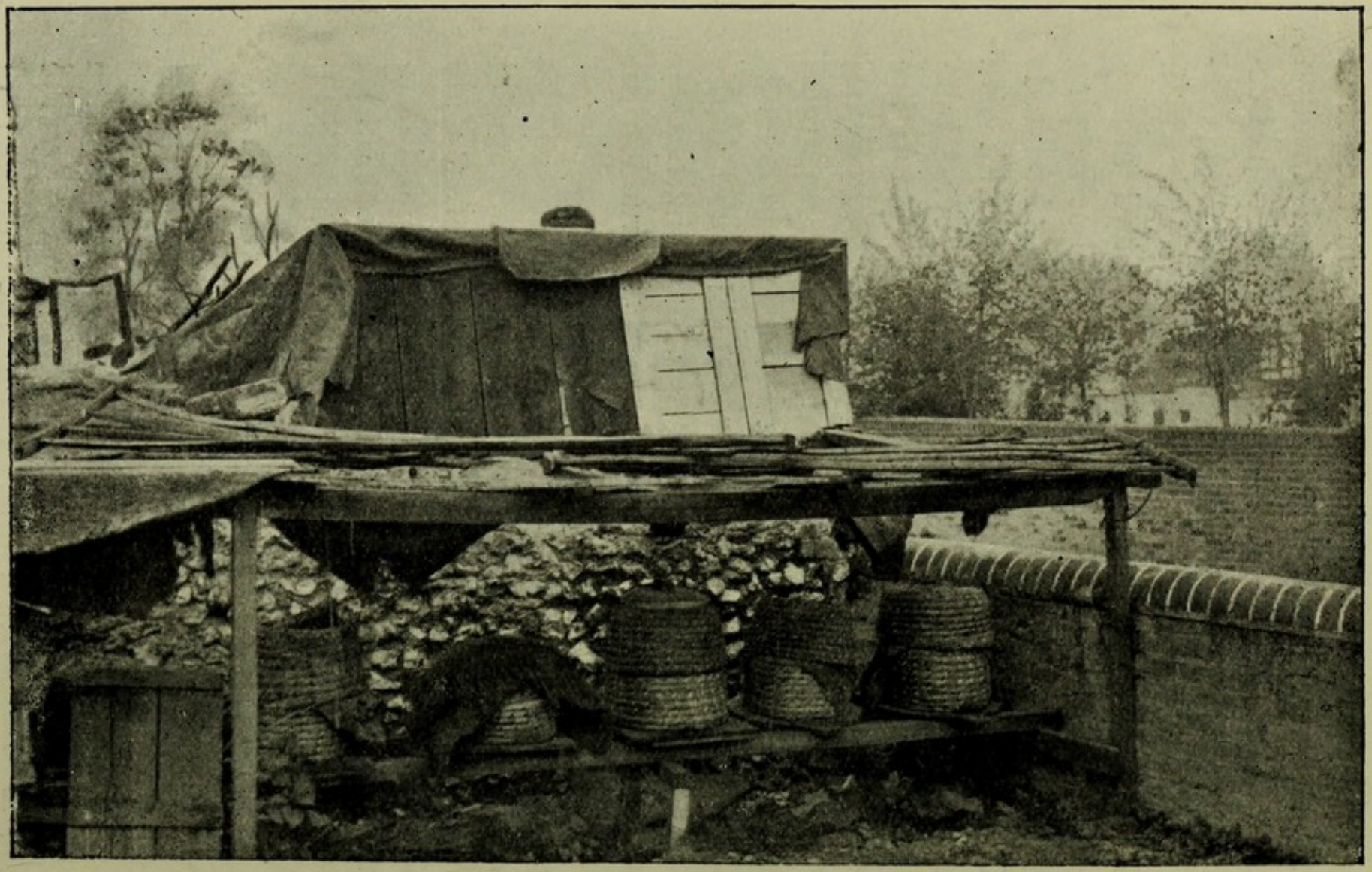
management, and after keeping them in an ignorant and slovenly fashion for a few years, have given them up in disappointment and disgust through failure arising from want of a knowledge of the first principles of bee-culture.

Although any one may possess bees, it is not every one who can become a proficient bee-master. Only energy and perseverance, together with aptness for investigation, can insure real success. While some degree of talent is essential, in this as in every other pursuit, ordinary ability—directed to the attainment of a specific end—will be more likely to be rewarded by success than the most extraordinary talent divided among half-a-dozen different pursuits. The man thoroughly conversant with his business, familiar with all its requirements, master of its every detail, and who, moreover, is industrious and energetic, will succeed; and if, in addition to this, he possesses good executive abilities, his success will be above the average. Such a person could easily acquire all the knowledge needed for making a substantial success of bee-keeping.

So far as the opportunity for gaining technical instruction in the science of bee-keeping, it may be said to be well within the reach of all, from the village labourer upward; for, in addition to the many works published on the subject—together with the very valuable help rendered by the British Bee-keepers' Association and its affiliated County Associations—direct instruction is now brought to the very doors, as it were, of the humblest cottager, and to all dwellers in rural districts, by means of free

lectures and practical demonstrations in the art of bee-keeping, paid for out of the public funds through the various County Councils. The British Bee-keepers' Association holds annual shows in connexion with the Royal Agricultural Society, at which silver and bronze medals, certificates, and money prizes, are awarded for honey and bee-keeping appliances, and where its Bee Tent draws hundreds of visitors to witness the manipulations with live bees and to hear the lectures given on bee-culture by practical bee-keepers. Tents and experts are also sent to County Societies' and agricultural shows. Many of the affiliated County Associations have now their own bee-tent and expert, who attends with the exhibition tent, at agricultural and horticultural shows in all parts of the kingdom, besides visiting apiaries to give help and instruction in practical bee-keeping.

Monthly meetings are held in London by the Council of the British Bee-keepers' Association, at which duly appointed representatives of County Associations take part in the proceedings, and have an equal voice with the Council in the deliberations of that body. Quarterly meetings are also held, when papers relating to bee-keeping are read by practical bee-keepers; and these are followed by discussions. New inventions, too, are shown and their merits freely detailed. Periodical examinations are also held at various centres throughout the kingdom, and gentlemen duly appointed by the Central Association attend for the purpose of examining candidates for certificates of proficiency



An old-fashioned Apiary in Kent. (Photo from nature.)

in bee-keeping. In addition to the above, special examinations are held in London and elsewhere, of candidates for certificates of a higher grade than those mentioned.

There are now a good number of County Associations affiliated to the British Bee-keepers' Association and working in harmony with it; and as the benefits to be derived from association are more fully recognised, it is hoped that every county will have its own Society co-operating with the Central Association. The subscriptions are small, and every bee-keeper should contribute his share, however little, towards the advancement of the objects in view.

Bee-keeping has made rapid progress since the formation of these Associations. The old straw skep of our forefathers—well illustrated on opposite page—as well as the ignorance and superstition connected with it, are steadily dying out; and since the introduction of the movable-comb hive, bee-keeping is regarded in a more favourable light and receives more attention. Modern hives are now considered by practical bee-keepers to be indispensable to profitable apiculture, as placing bees under complete control by the bee-master.

Beyond the frame-hive, however, in progress of time and as experience has been gained, many most useful appliances have been introduced, all tending to save labour either to the bees or the bee-master, and thus helping to increase the latter's profits. Foremost among these aids to successful bee-keeping may be mentioned the honey-extractor, by

means of which full combs of honey may be removed from the hive, emptied of their contents, and returned (uninjured) to the bees, to be by them refilled, and the operation repeated so long as the season lasts. Second, and hardly less in importance, stands comb-foundation, a most useful invention, and indispensable for profitable bee-keeping. With it we can save at least one-half of the work of the bees and make use of our old wax, get straight and more uniform combs, and can avoid drone-comb when not wanted. Passing onward, we find many appliances—all more or less useful to the bee-keeper—which will be described in succeeding pages; the selection of the most suitable for each one's requirements being, of necessity, left to the discrimination of the reader.

In selecting, difficulties will present themselves to the novice; but by visiting any of the numerous shows held during the summer season, he may see hives and appliances of every kind, and by conversation with experienced bee-keepers will be assisted in making a fair start. If possible, he should also visit the apiary of some successful bee-keeper, where, in a short time, more about practical management of bees may be learned by observing the manipulations of a skilful bee-master than from many hours of reading.

Those who wish to keep pace with the times will also read the current bee-literature of the day, or at least take in the *British Bee Journal*—the only weekly periodical in Europe exclusively devoted to bee-culture—or its monthly issue the *Bee-keepers'*

Record. These two publications are conducted by the author of this *Guide-book*, assisted by Mr. W. Broughton Carr, who, with an efficient but entirely voluntary staff of able contributors, are at all times willing to afford information on bee-management as the season goes on, while in their pages will be found useful directions for the guidance of learners.

Every bee-keeper should also keep a record of all his observations and operations, so as to prevent mistakes, which might occur in trusting to memory. To facilitate these observations the author has prepared *The British Bee-keepers' Practical Note-book*, a pocket companion which enables the bee-keeper to simplify and methodise the various entries in the history of his stocks.*

It must not be supposed that all the appliances described in this work are absolutely necessary; in fact, the fewer articles—consistent with efficiency—that can be made to answer the purpose, and the simpler they are, the more does it go to prove the thorough bee-master. Such appliances as are illustrated in these pages are those in use by one or other of our best and most practical bee-keepers. One thing, however, we do most strongly advise—viz., to studiously avoid anything like multiplicity of style in the appliances used. There should—so far as possible—be uniformity, so that what is used in or upon one hive may be interchangeable with every hive in the apiary.

* Published at the *British Bee Journal* office, 17, King William Street, Strand, London, W.C.

Lastly, persons intending to keep bees should bear in mind the important fact, that bee-culture is a business to be learnt like any other trade or profession, and success depends in a marked degree upon knowledge and experience.

II.—NATURAL HISTORY OF BEES.

All who aspire to become successful bee-keepers should be well informed regarding the natural history of the bee. Full particulars of its anatomy and physiology will be found in *The Honey Bee*, by the author of this work,* to which readers are referred; it will, therefore, be only necessary here to glance briefly at the internal economy of the hive.

A prosperous colony of bees at the beginning of the swarming season consists of a fertile queen, a few hundred drones, and from thirty to fifty thousand workers. The mother-bee, or queen, as she is usually called, is a perfectly developed female, and deposits all the eggs from which the other bees are produced. These eggs are of two kinds; the one developes into drones, and the other, under ordinary treatment, produces worker-bees, which are undeveloped females; but the same eggs, under different treatment and care, produce perfect females or queens.

* *The Honey Bee: Its Natural History, Anatomy, and Physiology.* Published by Houlston & Sons.

THE QUEEN, Fig. 1, will live from three to four years if allowed, and is distinguished from the other bees by her form, size, and colour; being longer, darker,* and of more slender structure, with comparatively shorter wings than either drone or worker. As but one queen (except in rare instances) is allowed in a hive at one time, young queens are only reared when a colony is either deprived of its queen, is about to swarm, or if through age or other causes, the fertility of the mother-bee ceases. Usually in from three to five days after birth the young queen leaves the hive for fertilisation by the drone, or male bee, and when this is once accomplished, it suffices for life, as ordinarily she never afterwards leaves the hive, except when accompanying a first swarm. If her death occurs, or she from any cause becomes unproductive at a time when there is young worker brood or eggs in the hive, the workers construct larger cells called queen-cells, round the young larvæ, supply them with an abundance of special food, and what would otherwise produce worker-bees are thus developed into queens. Should the queen not deposit eggs in any of the queen-cells, the bees will supply them with eggs carried from worker-cells. If there are no worker-eggs, queen-cells are sometimes con-

Fig. 1.—Queen.

* This description refers only to the common black species. The Ligurian queens are described on page 133.

structed around drone-eggs; but these will not produce queens, and are recognised by being smoother than genuine queen-cells. If a queen from any cause fails to become fertilised, she will only lay drone-eggs. The queen is capable of laying as many as from two thousand to three thousand eggs a-day when in her prime—*i.e.*, from one to two years old—after which her laying powers decrease. She has also a curved sting, which she uses when contending with a rival.

THE DRONES (Fig. 2) are more bulky than the queen, and larger than the worker-bee. They have no sting, lead an idle life, and, with the exception of assisting to keep up the temperature of the hive, do not work for the support of the colony, but live by the labour of the workers. They are called into existence at the approach of the swarming season to fertilise the young queens. At the end of summer, when the honey flow ceases, or when no longer needed, food is withheld from them by the workers, and they are driven forth from the hive to perish.

Fig. 2.—Drone.

Fig. 3.—Worker.

THE WORKERS (Fig. 3) are smaller than either queen or drones; they are moreover so well known that a minute description would seem superfluous. Upon them devolves the whole work of collecting and defending stores, building combs, feeding and protecting the

queen, brood, and also feeding the drones. They rule and regulate the whole economy of the hive, performing all its offices except those having direct reference to the reproduction of the species. During the summer months, the workers seldom live more than from six to eight weeks, owing to the hard work they have to perform; but worker-bees hatched in the autumn generally live through the winter, and commence the work of the hive in the spring.

The following table has been arranged, and will be found useful as showing at a glance the usual periods of the various transformations of bees from the egg to the perfect insect:—

METAMORPHOSES OF BEES.

	Queen. Days.	Worker. Days.	Drone Days
1. Time of incubation of egg...	3	3	3
2. Time of feeding the larvæ...	5	5	6
3. Spinning cocoon by larvæ...	1	2	3
4. Period of rest	2	3	4
5. Transformation of larvæ into nymphs	1	1	1
6. Time in nymph state	3	7	7
Total	15	21	24
	Date.	Date.	Date
1. The hatching of the egg takes place, and the grub emerges on the ...	4th	4th	4th
2. The cell is sealed over on the	9th	9th	9th
3. The bee leaves the cell as a perfect insect on the	16th	22nd	25th
4. The bee leaves the hive to fly on the	5th	14th	14th

By the above table it will be seen that an egg deposited by a queen in a cell prepared by the workers hatches into a small grub in three days; it is then fed and cherished until about the

ninth day, when it becomes a nymph, and is sealed up in its cell to emerge a perfect bee. The workers mature in twenty-one, the drones in twenty-four, and the queens in from fourteen to seventeen days from the day the egg is laid.

FERTILE WORKERS.—These physiological curiosities of bee-life sometimes appear in hives which, besides being queenless, no longer have the requisite means of raising a queen to replace the one lost. The "fertile worker"—though at best an imperfect female bee—possesses certain powers of reproduction in so far as being capable of producing eggs from which only drones can proceed. Unlike the queen, whose eggs are deposited singly and regularly in the cells in compact masses, the fertile worker lays her eggs very irregularly, several being often found in single cells here and there, while most of those adjoining are empty and unused. It need hardly be said that they are considered a pest in the apiary, and are got rid of without delay as soon as their presence is discovered (see page 121). So long as a fertile queen is present in the hive the bees will very rarely tolerate a fertile worker.

HONEY-COMB (Fig. 4), which is made by bees from a fatty substance known as wax (described on page 14), consists of six-sided cells. That in which worker-bees are bred goes by the name of worker-comb; the portion containing only cells in which drones are reared being called drone-comb. Worker-cells are smaller than those of drones, five of the former measuring 1 inch in width. The thickness of such comb, having two cells with one

base between, measures about seven-eighths of an inch. Drone-cells are larger, four measuring 1 inch, the thickness of the comb being one and a quarter

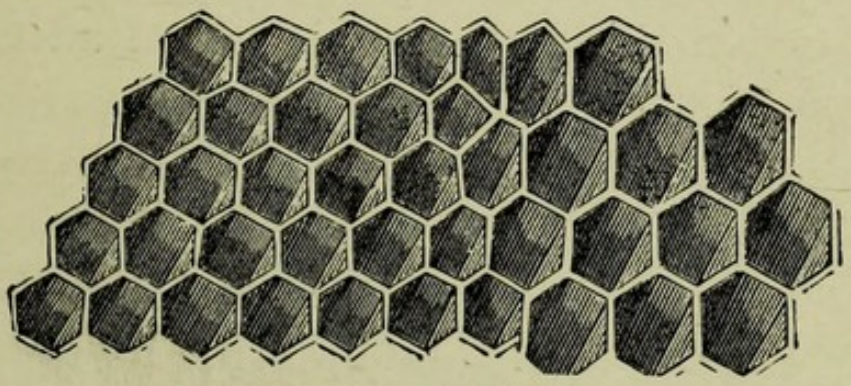


Fig. 4.—Worker and Drone-comb.

inches. There are 28·86 worker and 18·47 drone-cells to a square inch on each side. Where both sizes of cells are built on the same comb, irregular-sided intermediate ones are built between them. Both sizes of cells, varying greatly in depth, are used for storing honey.

The cappings of honey-cells consist of wax only, whereas those of cells containing brood consist of a mixture of wax and pollen, and are more porous in their nature than those of the former.

Queen-cells (Fig. 5), as will be seen, differ very much in form from both the above, somewhat resembling an acorn in shape, about an inch in depth, and one-third of an inch in diameter. Made from a mixture consisting of wax and pollen, they are covered with a number of depressions which give the cells greater strength. The walls of queen-cells are very thick and porous, requiring in their construction much wax, which, when the queen has hatched out, is used elsewhere, and the cell is cut

down by the bees until it resembles a small acorn-cup. Queen-cells usually hang with their mouths downwards, while all other cells open sideways, and have a slight inclination upwards. The cell on left in illustration shows the capping open after queen has passed out.

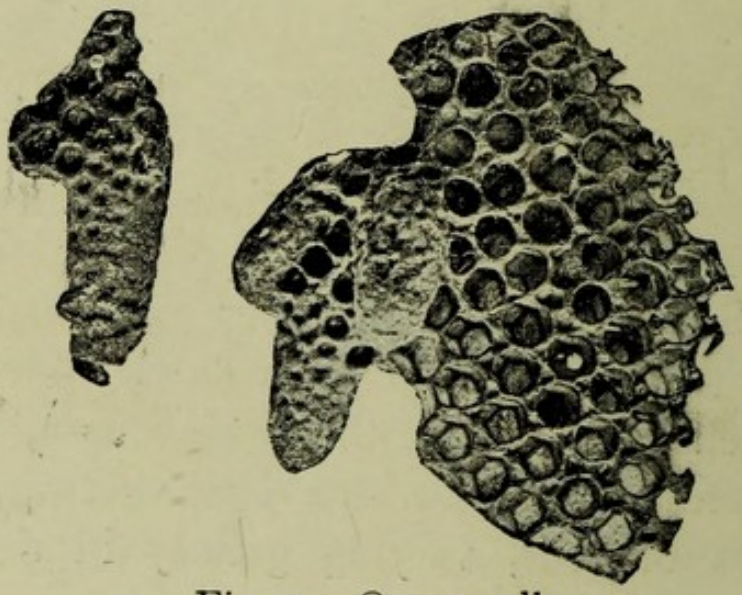


Fig. 5.—Queen-cells.

WAX is a secretion, produced in the body of the bee, not gathered. It has been estimated that from 13 to 20 lbs. of honey are consumed in producing a pound of wax. The weight of empty comb required to fill an ordinary-sized hive is about 2 lbs.; so that, taking into consideration the time lost by the bees while building comb, which might be otherwise employed in gathering honey, it would make each pound of wax equivalent to between 17 and 25 lbs. of honey. This honey, at 1*s.* per lb., would make the cost of each pound of comb between 17*s.* and 25*s.*, but, if melted and sold, the wax would not realise more than 2*s.* From these figures the bee-

keeper can judge the value to him of good combs,* and the importance of preserving them for future and continuous use.

POLLEN is the fertilising dust of flowers, gathered by bees, and after being by them moulded into ball-shape, is borne on their hind-legs to the hive, and afterwards used by them in the preparation of food for the nourishment of the young grubs. A small portion of pollen is also used by the mature bees, along with their principal food of honey, and for mixing with the wax used for queen-cells and the capping of brood-cells. Pollen not required for immediate use is closely packed in the worker-cells for future need, and for preservation is often covered with honey, and capped over with wax.

PROPOLIS is a resin-like substance obtained from buds and limbs of trees, especially from the horse-chestnut and the different kinds of pine. It is carried, like pollen, on the hind-legs of the bees, and is used to seal up every small crevice about the hive.

III.—BROOD-REARING.

Stocks in good health and condition, and having plenty of food, usually begin breeding in the latter part of January, the first batch of brood occupying a small circle in the centre of the cluster of bees. This circle becoming enlarged, smaller ones are

* Recent experiments of M. de Layens show that under certain conditions bees may consume as little as 6·3 lbs. of honey to produce 1 lb. of wax.

begun on the adjoining combs, the patches of brood spreading more and more as the spring advances, and according to the strength of the colony, until nearly all the cells not occupied by pollen or honey are filled with eggs, larvæ, or by rapidly hatching young bees. After the swarming season is over, the amount of brood decreases until about November, when breeding generally ceases for the year. As we have already said the brood of a fertile queen is compact and uniform, while that of a fertile worker is scattered nearly over the entire comb, hardly ever more than two or three adjoining cells being occupied together. The caps over such brood project nearly an eighth of an inch.

The object of the bee-keeper is to have his stocks always strong, and for this reason he will keep them, except in winter, constantly breeding by stimulative feeding (see Feeding).

IV.—NATURAL SWARMING.

If the weather be mild early in spring, with hives strong, and food plentiful, brood is generated very rapidly; and about the time apple-trees are in full bloom, natural swarms begin to leave their hives. This generally takes place about the end of May or beginning of June; but, in some instances, when the spring is unusually mild and favourable, swarms will issue as early as the beginning of May or the end of April.

The usual signs of the approach of swarming are the crowded condition of colonies, the sight of

drones on the wing or in the hives, and the building of queen-cells. The latter can be easily found in a frame-hive by taking out the central combs and carefully looking along their edges or among the clusters of bees for cells having the appearance of those shown on page 14 (Fig. 5). Should any of these be found capped over, the swarm may be expected before long. Bees on the point of swarming are frequently prevented from doing so by a few days of rainy or cold weather, in which case the queen-cells are destroyed, and swarming checked until a second set are prepared, often causing a delay of some weeks; and, in some instances, the bees do not swarm at all that season. There is no mistaking the issue of a natural swarm; the bees rush out of the hive like a liquid stream, they appear almost frantic, rushing out pell-mell over each other in such large numbers that the atmosphere seems alive with tens of thousands of bees circling around overhead in a condition of joyful enthusiasm which rarely fails to communicate itself to the onlooking bee-keeper. The swarm will generally settle on some bush or tree at a short distance from the hive, and should not be disturbed until most of the bees have joined the cluster and have become quiet. First swarms are accompanied by the old queen, and usually leave the hive between ten o'clock in the morning and four in the afternoon on a fine day. Should the queen not join the bees when clustered, they will return to the old hive. Swarms sometimes, although very rarely, are disinclined to cluster; and when the bee-keeper

perceives, instead of clustering, that they rise higher and higher into the air, he should endeavour to arrest their movements by throwing water from a syringe over them in such a manner as to resemble rain. Sometimes two swarms will issue simul-

Hiving a Swarm under difficulties.

taneously, and join together of themselves; when this occurs they should be treated as one, not separated, and the increased strength of the swarm will amply repay the bee-keeper at the honey harvest. If he wishes to preserve one of the queens,

she must be found and secured at the time of hiving the bees.

The careful bee-keeper will always endeavour to have fertile queens in readiness (see Queen-Rearing), and much time will be saved by destroying all the queen-cells in newly-swarmed hives and introducing a laying queen to the stock from which the swarm has issued (see Introducing Queens, page 126).

V.—AFTER-SWARMS, OR CASTS.

After a first swarm has issued—and assuming that the bees remaining in the hive have prevented the first hatched queen from destroying the young queens in the cells—after-swarms, usually called "casts," may be expected. In her attempts to destroy her rivals the queen frequently utters a shrill, piping sound. When this is heard a swarm may be expected within a day or two, as the queen, failing in her intended destruction of her rivals, rushes from the hive accompanied by a portion of the bees. Casts usually leave their hive on the ninth day after the first swarming. They issue, at almost any time of the day, regardless of the weather, whereas an old queen and a first swarm will not leave the hive unless the weather be favourable. Sometimes third and fourth swarms may be thrown off at intervals, generally of one or two days.

The issue of all swarms beyond the first may—if so desired—be prevented by our destroying all queen cells and introducing another queen.

Second swarms, if early, may be made profitable;

but subsequent ones are usually of little value, even in favourable seasons, and should be prevented (see Prevention of Swarming), for they so weaken the stock as to render it practically useless.

Casts often cluster further away from the old hives than first swarms, because young virgin queens are more active and rapid in their movements.

Sometimes, after the second swarm has issued, the bees seem to have had the swarming-fever satisfied, and destroy all remaining queen-cells by tearing them open at the sides.

VI.—PREVENTION OF SWARMING.

Those who desire honey rather than increase of stocks should endeavour to prevent swarming. This is frequently very difficult, seeing that once bees have got the swarming fever, no device of the bee-keeper will check it. If steps are taken in time, swarming can, however, generally be prevented by giving room in the hive and supers, a little in advance of the requirements of the colony. Keeping the hive cool and giving plenty of ventilation also assist in checking swarming. Another way is to give the queen room for ovipositing, by removing combs containing brood and substituting empty combs, or comb-foundation. Should the combs be filled with honey, additional breeding-space can be given by extracting it. Whatever plan may be adopted, the bees should never feel cramped for want of room, or be distressed by lack of ventilation. Artificial swarming is dealt with later on (see page 93).

Should the bees, notwithstanding all these measures, persist in swarming and abandoning the supers, remove all the combs containing brood—brushing the adhering bees back into the hive—and substitute frames of comb-foundation and return the swarm. The combs of brood taken away must be given to other stocks to hatch out. This will generally check all further inclination to swarm, and work in the supers will be continued. Young queens under two years are preferable to older ones, as the bees with them are less disposed to swarm. After-swarms may be prevented in frame-hives by examining the combs and cutting out all queen-cells except the most perfect one. In due time the remaining queen in the cell will take her place as queen of that hive, and swarming be over for the year.

VII.—HIVING BEES.

Hives should always be prepared beforehand for the reception of swarms as the season for the issue of such draws near. In all cases it is absolutely necessary to fit the frames in the hive either with full sheets of comb-foundation wired (see page 70), or with strips of foundation an inch or more in depth, and known as "starters." With frames so prepared, and hives set perfectly level, the bees will build straight combs, while without such aids they might, and probably would, be built across the top bars, and so be spoiled for their purpose as movable combs. (See Comb-Foundation, Chapter XI.) If

the bee-keeper has frames of empty comb to spare, a few of them may be advantageously given, putting one comb between two frames of foundation. This giving of empty combs enables the queen to begin egg-laying at once

The frames too, besides being secured firmly in their places, require fixing at the proper distance apart, viz., a shade under 1½ inches from the septum or midrib of each pair of combs. Some advanced apiarians rely on the eye and finger alone for correctly spacing the combs, but the ordinary bee-keeper finds it necessary to have some mechanical means of spacing, and for this purpose various devices have been brought out, the three distinct types being "metal ends," "broad-shouldered frames," and "distance pins." These last are now rarely used. The others are illustrated on pages 46, 47, and 69. When the frames have been seen to, lay on the quilt — consisting of a square of "ticking" or of unbleached calico—and a light square of drugget or flannel. The day after hiving a couple or more squares of drugget may be added. In the spring and summer American cloth is also used.

The precise method followed in hiving swarms in frame hives will, of course, depend on the circumstances of the case; but as a general rule—and passing over the exceptional difficulties under which the operation of hiving is occasionally performed—two plans, which we will call respectively (*a*) and (*b*), will suffice for all ordinary purposes. The first (*a*) is where it is proposed to carry the frame-hive bodily

to the place where the swarm has settled and hive the bees directly into it; the second (*b*) where the swarm, after being hived temporarily into a skep, is —either at once or some hours later—carried to the spot where the frame-hive stands, and there the bees are thrown out in front, as shown on page 26.

Supposing plan (*a*) to be chosen: if the bees have clustered on a bush near the ground, first sprinkle

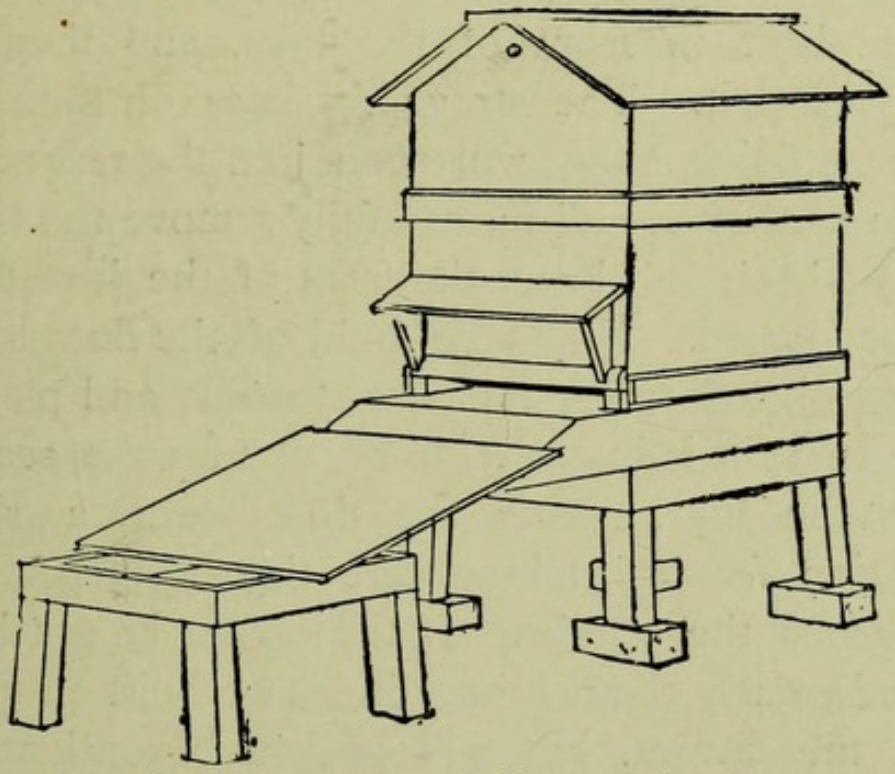


Fig. 6.—Hive prepared for receiving Swarm.

them with cold water from a garden syringe; this will cool them, and close clustering will be the result. Spread a cloth or sheet directly under the cluster, and at one end of it place a floor-board, bringing the end of the sheet over the edge of the board, and on this place the hive prepared to receive the swarm. Raise the front of the hive about 1½ inches, by means of a block of wood placed on the board under the edge of the hive. Care should

be taken to have the frames hung at right angles to the front of the hive; otherwise the weight and heat of the bees would displace the comb-foundations, and possibly they would break away from their attachments to the top bars of the frames. The front of the hive should be as near as it is possible to get it to the cluster. If the branch on which the bees have clustered is small and not valuable, cut it off, carefully avoiding all jarring; shake the bees off on to the sheet in front of the hive, and they will quickly enter it. The straggling bees on the sheet and those flying about will soon join the rest; and, as soon as they are all in, carefully remove the block and the sheet, and lower the front of the hive on to the floor-board. Now take hold of the floor-board with both hands, carry the hive steadily, and place it on the stand it is intended to occupy for the season. Adjust the hive, giving the floor-board a slight inclination forward, taking care that it is perfectly level *across* the combs. If the frames be not hung perpendicularly the combs will not be built properly within the frames, but will project beyond at the lower extremity, and there will thus be a difficulty in manipulating them. If we wish the combs to hang parallel with the entrance we can turn the hive on the board; but in this case the hive must stand perfectly level. Or, if we have decided before we hive our bees that they should be in this position, we have merely to turn the hive round on the floor-board, prop up the side with the block, and hive the bees at the side. As soon as the hive is adjusted, place a bottle of syrup over a hole in the quilt cut

out for this purpose. Put on the outer case and cover, and do not disturb the bees until the next day, when the hive may be examined. Blow a little smoke into the entrance and at the top in taking off the quilt, remove all combs not covered by bees, and contract the space by the division-board. (For further management see Feeding, pages 109-111.)

If the second plan (*b*) is preferred, and the bees have clustered on the branch of a tree too valuable or too thick to cut off, shake them first into a straw skep, held bottom upwards in one hand under the cluster; and with the other give the branch a smart shake so as to dislodge the bees into it. Invert the skep, and set it on a board as near as convenient to the spot where swarm clustered. Leave it there a short time for all the flying bees to gather in. Meantime arrange the frame-hive for getting the bees into it, according to the particular form of hive used. Fig. 6 shows one method in which the hive —though on a floor-board separable from its stand —is not removed from the latter, but left in its ordinary and permanent position. A temporary platform being made by the use of a good-sized board and a spare hive-stand. The hive front is raised an inch by using the sliding doors as wedges, and the bees are shaken from the hiving skep and allowed to run in. If they alight on the trunk of a tree, brush them gently into the skep, or, if possible, place its edge near the upper part of the cluster, and drive them up by blowing smoke under them. If in addition we can fix a piece of comb containing brood inside the skep, it will induce the bees to

take to it more readily. If they settle on the ground, the hive should be set close to them, and with a spoon, gently, put a few bees near to the entrance. The joyful hum of these as they enter the hive will entice others to follow, and in a short

Hiving Bees: Throwing out the Swarm.

time the swarm will take up their line of march for their new home.

The bees may also be hived in the evening, if preferred; and in this case it is better when they have settled in the hiving skep to place it on a stand

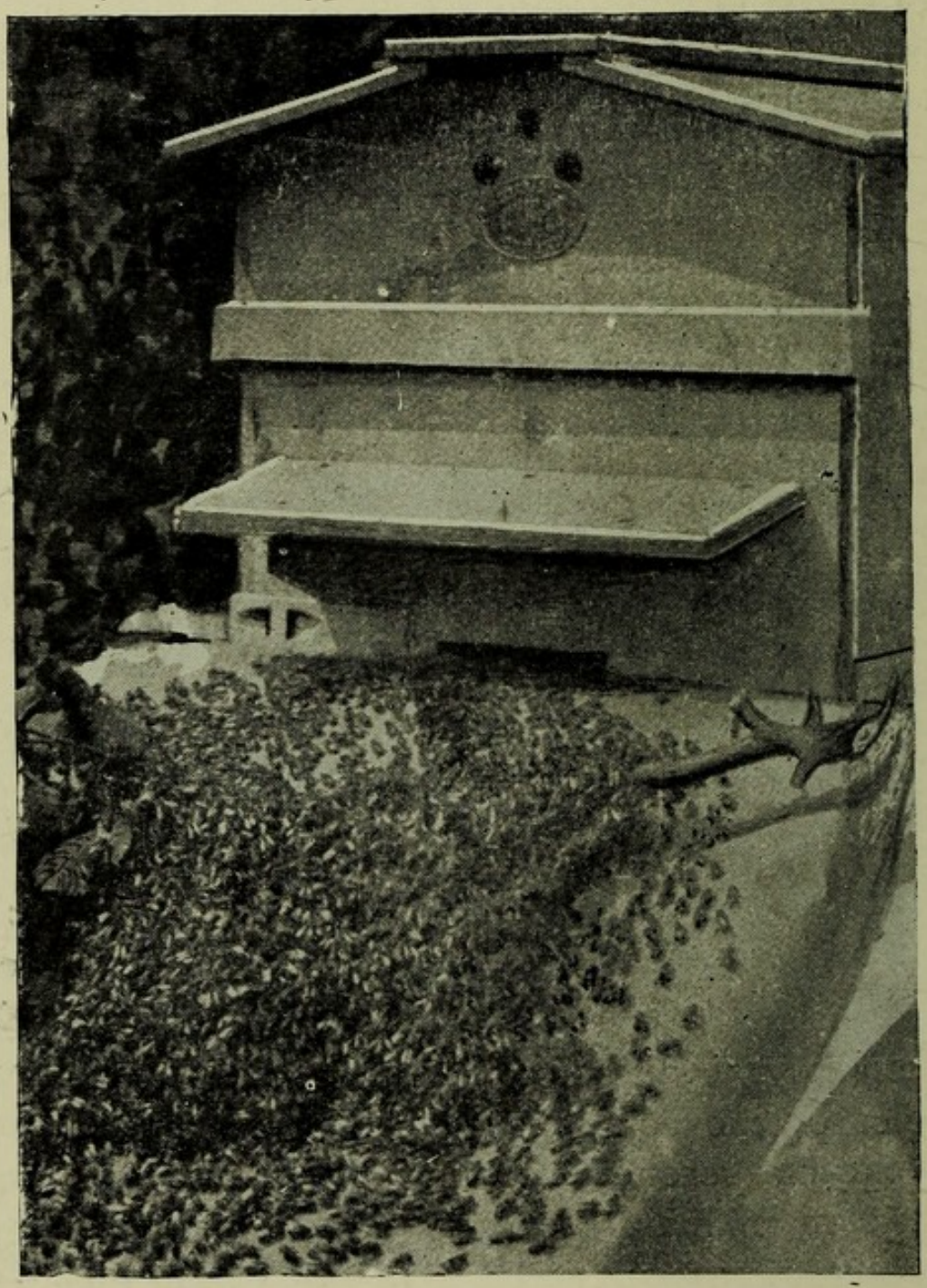
as near as possible to the hive they are intended to occupy, shading them from the heat of the sun.

When swarms are hived in very hot weather, and full sheets of foundation are used, it is advisable to only cover the tops of frames very lightly for the first twenty-four hours, and to leave entrances open full width for air. After the first day the hive may be fixed up as usual.

In the case of swarms clustering on a twig or small branch of a tree, which can be removed without damage, the branch may be carefully cut off, without dislodging the swarm, and carried to the hive, previously prepared, as in fig. 6, page 23. The bees and the twig on which they hang are then gently laid down in front of the hive, about a foot away from entrance, and if a spoonful of the bees are placed close to the doorway, the rest will soon follow them inside. The bees thus hive themselves, as seen in photo (taken from life), the swarm shown having been dealt with exactly in the manner described.

Swarms should always be placed on or close to the stands they are permanently to occupy as soon as they have clustered in the hiving-skep; if left where hived until night many bees will begin work and mark the spot, and if the position be then changed some bees will next day return to the place where the skep stood on the previous day, and finding it gone will go back to the parent hive, and thus reduce the strength of the swarm. If brought from a distance, the swarm should not be removed until the evening, when all the bees have entered the hive.

Swarms are sometimes placed on the stands occupied by the hive from which they issued, and



A Swarm of Bees hiving themselves.

the latter is taken to a fresh stand in some other part of the apiary. This frequently prevents after-

swarms. The parent stock should be fed gently for a week or ten days to make up for loss of flying bees.

Despatch in hiving is important, as bees become more difficult to handle the longer they are out of the hive, and there is a danger of their rising and flying away.

When bees swarm they are gorged with honey and thus not inclined to sting, but it is just as well for the beginner to be protected by a bee-veil and gloves, as these will give him more confidence in manipulation. Sometimes swarms will leave their hives, but if the bee-keeper can spare a frame of brood, this—placed in the hive before introducing the swarm into it—will invariably induce them to adopt their new home at once, because bees do not forsake young brood.

When swarms are hived and placed on their stands (unless they have sections on the top removed from parent stock and containing honey) commence feeding (see Feeding), and next day reduce the number of frames to the size of the cluster and close up with division-boards.

Always shade from the heat of the sun swarms while in hiving-skeps. All hives and floor-boards should be thoroughly scalded and painted over with either of the solutions, Nos. 9 or 10, described in Chapter XXXV., before using a second time.

VIII.—HIVES.

Before commencing bee-keeping it will be necessary to settle what kind of hive is to be used. This is of great importance, and should be well considered before finally deciding, because a mistake at the beginning will cause much annoyance and trouble afterwards. Bees will work in almost any sort of hive, but succeed better in those which we can from time to time adjust to their requirements. The main object in view being to secure surplus honey, the bee-keeper should arrange his hive for this purpose, and by studying the habits and instincts of the bees he can learn to control them by adapting both the hive and management to their natural requirements.

Movable combs are absolutely necessary to the intelligent management of bees, and, properly used, give us complete control over them in such hives. By their use combs and bees are readily interchanged from one hive to another; frames of brood examined and queens inspected in a few minutes. Weak stocks may be strengthened by exchanging empty combs for frames of brood taken out of strong ones; artificial swarms may be made in any of the different ways described. Queens, too, may be reared at will, and swarming in a great measure controlled by giving additional breeding-space and cutting out queen-cells, or inserting frames of comb-foundation to be worked out into comb: the particulars of which operations will be found under

their respective headings. Such hives also enable the bee-keeper to control the production of useless drones, and also to secure drones when required by introducing drone comb. Should a colony become queenless, or the queen be a drone-breeder, an examination will reveal the fact, and another queen may be inserted. If the brood-nest be filled with honey the frames may be taken out and the honey extracted; an operation which sometimes saves a colony from perishing, for in the working season the mortality among bees is so great that, unless young ones are reared in large numbers, the colony dwindles rapidly because the queen has no room to deposit her eggs. These movable frames are more particularly useful only when we adapt them to the natural instincts of the bees.

On examining a hive it is found that worker-comb is $\frac{7}{8}$ths of an inch to 1 inch thick; we therefore make our frames about $\frac{7}{8}$ths of an inch wide. The passages between the sealed brood-combs are usually about $\frac{3}{8}$ths of an inch, but those between sealed honey-combs are sometimes as narrow as $\frac{1}{4}$ inch. Practical experience has shown that if the frames are made so as to leave a full $\frac{1}{4}$ inch passage round the ends the bees will keep this space clear. But if the space between the side bars of frames and the hive side is too small for a bee-passage, they will glue it up with propolis, and if much more they will fill it with comb and honey. Below the bottom a $\frac{1}{2}$ inch space may be left. By making the frames $\frac{1}{2}$ an inch less in length than the inside of the hive, a passage-way of $\frac{1}{4}$ of an inch is left at each end

which the bees respect. If our frames are $\frac{7}{8}$ths of an inch wide, they can be placed $\frac{5}{8}$ths of an inch apart; this will make them $1\frac{1}{2}$ inches from centre to centre, although it is not indispensable that they should be exactly this distance apart; and if we wish to restrict them to the production of worker-brood only, the frames may be placed as near together as $1\frac{1}{4}$ from centre to centre.

The *outside* measurements of all frames and the *inside* measurements of all hives must be uniform. Accurate workmanship in their manufacture is of the utmost importance, as unless every frame is so made as to fit properly into any hive in the apiary, the full advantages to be derived from the movable-comb system are not secured, and great inconvenience and trouble arise.

Most bee-keepers are agreed that the best size of hive for ordinary use for producing comb-honey in sections is one which has a capacity of from 1,800 to 2,000 cubic inches. The size of the hive determines the size of the movable-comb frame; and although much difference of opinion exists in respect of them, the solution, in the main, depends on the locality and surroundings of the apiary and the fancy of the bee-keeper (see Standard Frame, page 37). Practical experience seems to indicate that frames should be shallow in proportion to their length, because with deep frames it is impossible to have all of them exactly perpendicular without the use of racks or some appliances at the bottom; and every practical bee-keeper will find that racks for bottom-bars — though theoretically beautiful — are

obstacles to lateral movement of frames, and liable to cause crushing of bees and queen. Moreover, bees do not so readily work in supers placed above deep frames.

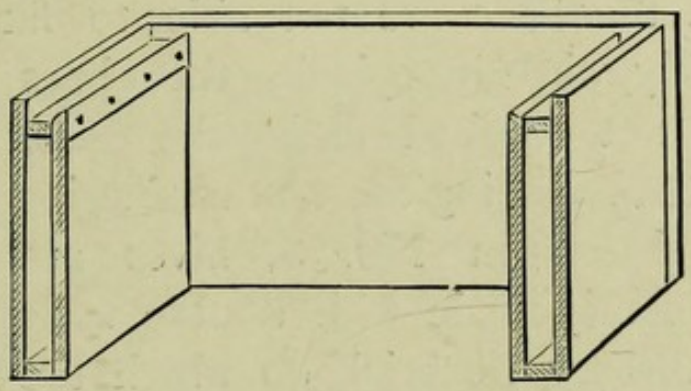


Fig. 7.—Section of Hive, showing Rabbets.

Long shallow frames are more easily handled, besides being especially suitable for extracting, seeing that the comb is much sooner finished to the bottom than in deep ones. The vacant spaces at the sides of the hives permit the cold air to enter at the ends of frames as well as at the bottom; and in deep and narrow frames this tends to check the increase of brood, because it is not so readily extended downwards as laterally.

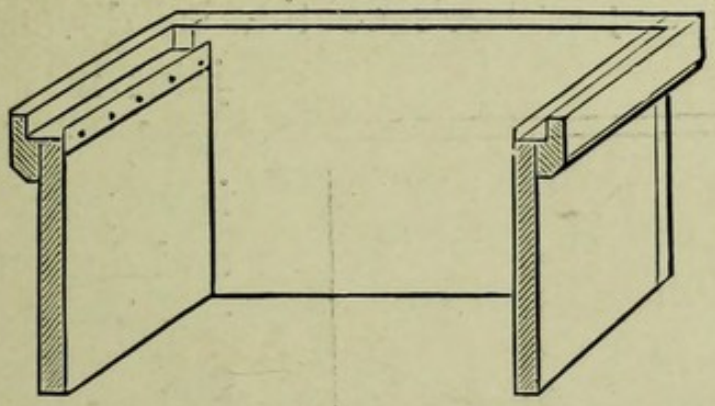


Fig. 8.—Section of Hive, with Rabbeted Strips.

The tops of the hive sides must be lowered, and rabbeted strips fitted on to receive the frame-ends, which may rest on metal runners. Strips of tin, iron, or zinc, should be sunk in even with those

sides of the hive. (See Figs. 7 and 8, on the preceding page.)

By having $\frac{3}{8}$ths of an inch space under the ends or "lugs" of frames there is room to get fingerhold, and the bees are not able to fix them down so tightly, while in replacing them bees are not crushed under the ends. Instead of using the rabbeted strips as shown in Fig. 8, hives are frequently made with double walls of thinner material, on which the frame-ends rest, as shown in Fig. 7. The sides parallel to the frames are usually single walls.

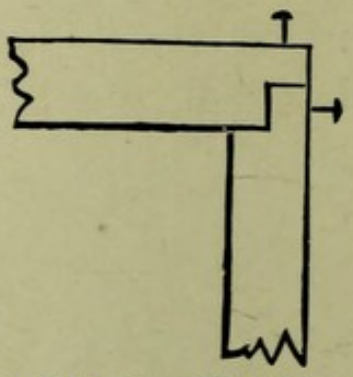


Fig. 9.—Double Rabbet-joint.

The sides of the hives should be either dove-tailed or fitted with a double rabbet, as shown in Fig. 9, and nailed at both edges, this making a much stronger joint than if only nailed on one side, and not so liable to open; or Lee's continuous dovetail-joint may be used, which is very strong and does not require nailing.

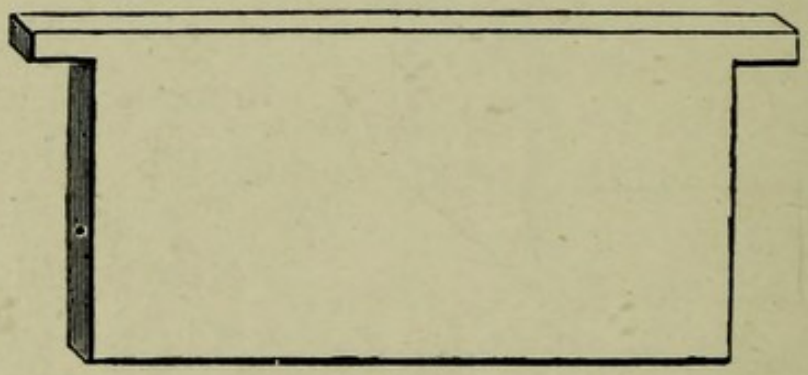


Fig. 10.—Division-board.

Movable division-boards, made to fit the sides of the hive and slide on the rabbets, should be provided, as in Fig. 10. They are used to contract hives according to the strength of population. As the colony increases, the division-boards

are easily moved laterally and an empty comb inserted by the cluster. By this means the heat of the cluster is utilised, and the population increases much more rapidly. Floor-boards (Fig. 11) should be made movable, with a passage-way sunk in them

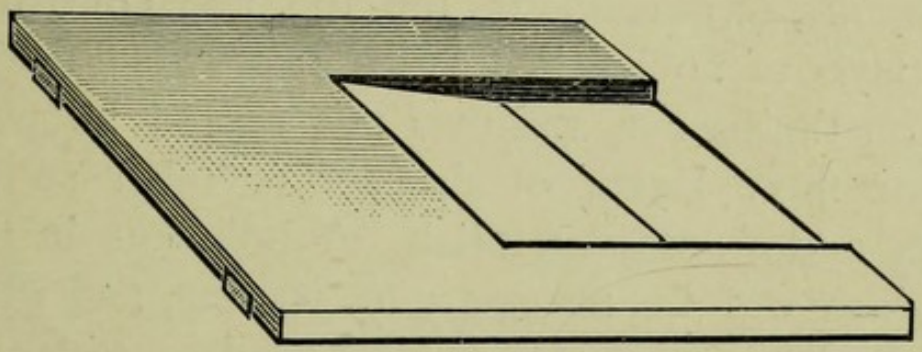


Fig. 11.—Floor-board.

about 13 inches long and $\frac{3}{8}$ths of an inch in depth. This enables the bee-keeper, if his hives are square, to place them any way he pleases; and it will be found that the loose floor-boards can be moved and exchanged more readily than those which are fixed to the hive. If preferred, passages may be cut in the bottom of the hive instead of in the floor-boards. The entrances should be closed more or less, as needed, by means of slides or blocks. In front of the entrance an alighting-board should extend to some considerable distance, and slope towards the ground.

If intended for out-of-doors, an outer casing and roof will be required, which may be so arranged as to form double walls to the hive with dead-air space between them; or the space between the hive and the outer casing may be filled with chaff (see Fig. 14). Pine or yellow deal, an inch thick, ought to be used, and should be planed on both sides.

This will reduce it to $\frac{7}{8}$ths of an inch. The same boards are just right to make the strips for frames. These latter should be $\frac{7}{8}$ths of an inch wide, and about $\frac{3}{8}$ths of an inch thick for the top, $\frac{1}{4}$ of an inch for the sides, and $\frac{1}{8}$th of an inch for the bottom. The quilts, or covering on the top, may consist first of a layer of unbleached calico or of "bed-ticking" laid on the frames, and over this should be placed two or three layers of drugget or other suitable, warm, and porous material. A hole cut in these coverings will be necessary for feeding, and can be closed, when not wanted for this purpose, with pieces of the same material a little larger than the hole.

In offering these remarks, no particular hive has been described, and my aim has been merely to discuss the principles and advantages of a movable-comb hive, so that any one can readily, from the management he intends to pursue, procure for himself a hive that combines with simplicity a ready adaptability to any kind of treatment he desires, whether for increase of bees, comb-honey, extracted honey, queen-rearing, and any or all combined. There are so many different styles of movable-comb hives in the market, that the limit of this work will not permit of a description of all of them. A few will be noticed, as embodying the requirements stated above. One point must be insisted upon, and that is, whatever hive the bee-keeper decides to adopt, only *one size of frame* be used throughout the apiary, except for experiment.

STANDARD FRAME.—The British Bee-keepers' Association has adopted a Standard frame, and now

all hives, with very few exceptions, are made the proper size to contain such frames. The *outside* dimensions of the "Standard frame"—including thickness of top bar—are 14″ long by 8½″ deep, the top bar being 17″ long, ⅜″ thick, the bottom bar ⅛″, and the side bars ¼″ thick; the width of all being ⅞″. The hive can be extended to take any number of these frames, but usually ten or eleven are used. There is an obvious advantage in having a uniform-sized frame throughout the country, and it is recommended that the B. B. K. A. "Standard" be used by all.

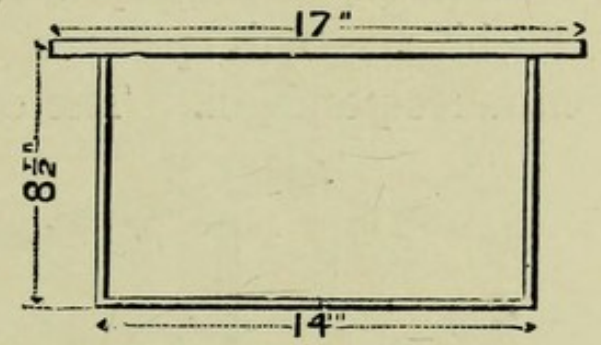


Fig. 12.—Standard Frame.

COWAN HIVE.—Fig. 13 shows a section of this hive arranged for summer use. It consists of a body-box, A, made of 1-inch pine, and arranged to take ten to thirteen frames. It is 14½ inches from front to back and 8⅞ inches high, inside measurement. The front and back are reduced to 8⅛ inches high, and are fitted with rabbeted pieces of wood to enclose frame ends. The inner edges are fitted with tin strips for the projecting ends of the frames to rest upon. The latter are of the Association Standard size. The inside length of a hive to take ten frames is 16½ inches, and this leaves ample room for a division board. B is the floor board, made out of 1¼-inch pine, and strengthened on the under

side by means of two wedged ledges let into the wood, C, in Figs. 13 and 14. A passage, D, $\frac{3}{8}$ inch deep and 10 to 12 inches wide, is cut out of the floor-board, sloping upwards towards the centre of the hive. This passage communicates with the entrance-porch, E. The outer case, F, is made of

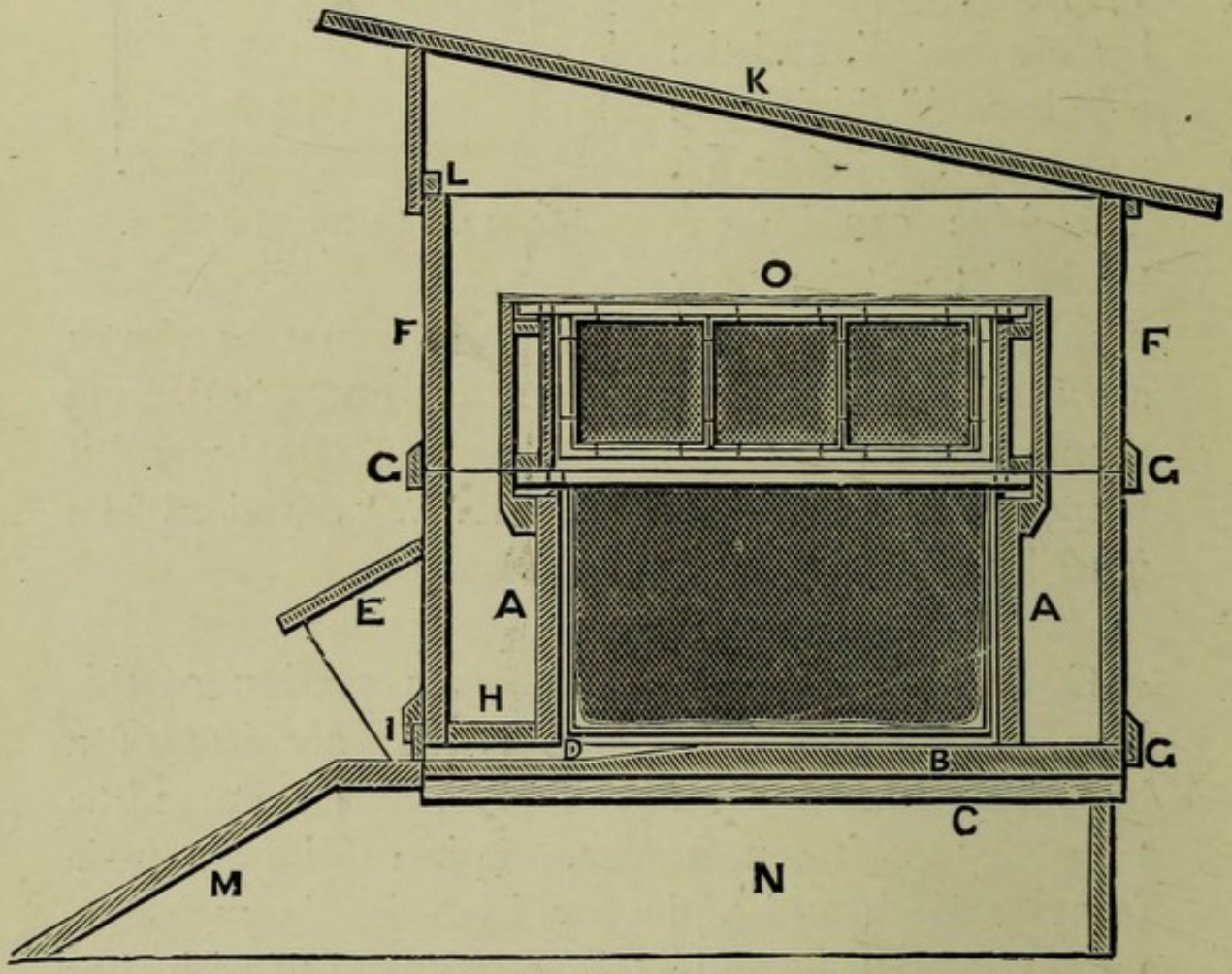


Fig. 13.—Longitudinal section of Hive, showing Rack of Sections.

$\frac{5}{8}$-inch deal 9 inches high, and rests on the floor-board, B. To prevent rain getting in at the junction between the outer covering and the floor-board plinths of wood, G, are nailed on, as shown in Fig. 13. Between the outer case and the front of the body, A, is laid a block of wood, H, which covers the passage, D, and prevents the bees getting

inside the outer case. This block is loose, so that it may be removed for ventilation, or the hive can be brought close to the outer casing when required. Beneath the porch roof, E, which is fixed to the outer case, is secured a block of wood, I, provided with a groove to allow two shutters to slide, for the purpose of contracting or enlarging the entrance. The upper part of case, F, is similar in every way, except that it has no porch or sliding shutters. The roof, K, fits loosely over F, having an inclination towards the back, to allow rain to run off. It is covered with paper-felt or calico, and painted to make it waterproof. A piece of wood, L, is nailed on to keep it in position. The alighting-board, M, 15 inches long, slopes to the ground, and is fixed to the stand, N, which is 6 inches high, and consists of two pieces of board, 6 inches wide, kept the right distance apart by a piece the same width nailed at the back. O is the section-rack in position over the frames. The hive is shown in elevation on title-page.

Fig. 14 is a transverse section of the same hive prepared for winter, the frames being reduced to six, and the space contracted by the division-boards, P, P. The outer spaces, R, R, are filled with chaff. In wintering, the strip of wood, H, must be put in position, as shown in Fig. 13, to give the requisite space for the chaff and to keep the passage clear. Across the top of the frames is seen one of the strips of wood to allow of a passage for the bees over the combs. On this is placed a piece of unbleached calico, and over all the chaff covers.

(See Wintering). In the illustration a shallow frame super is utilised for this purpose.

As in this hive there are no notches for the frames to rest in, distance-pins or broad shoulders to keep

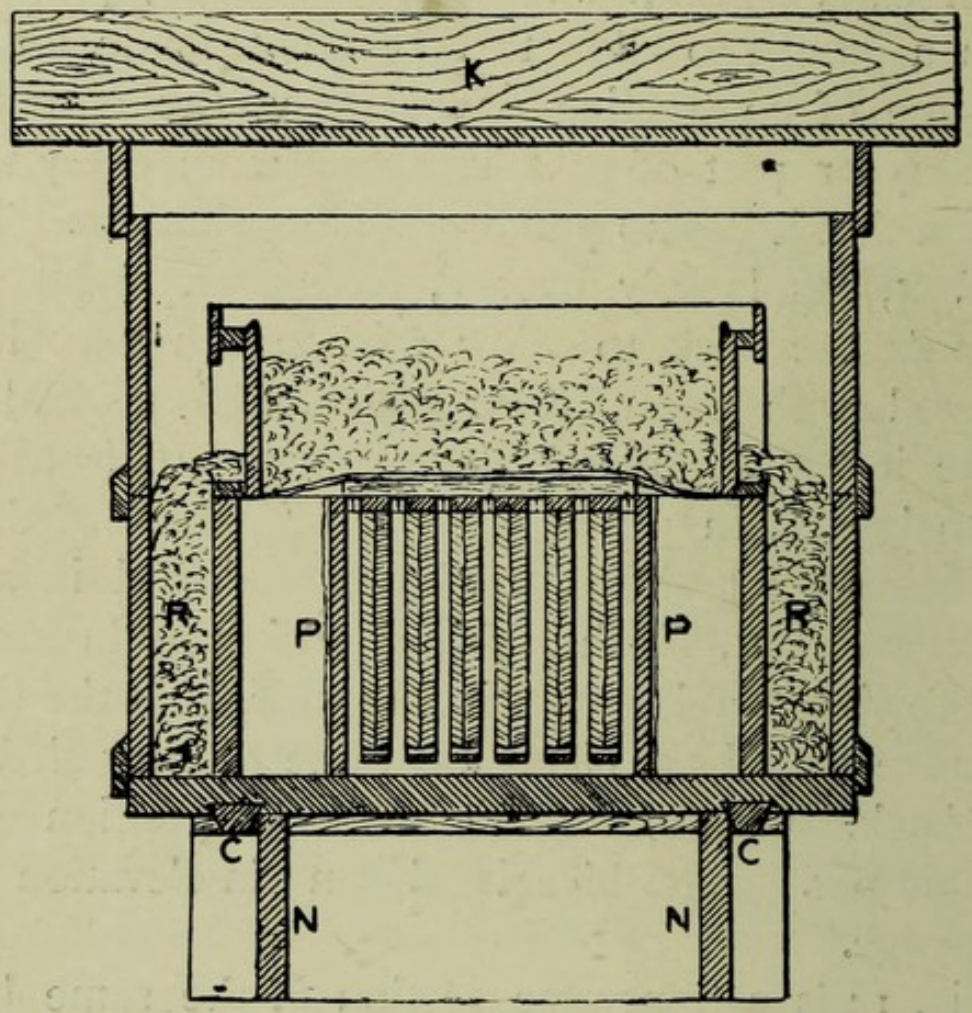


Fig. 14.—Transverse section through Hive prepared for Wintering.

them the right distance apart, when a swarm is being introduced, two racks (Fig. 15) are used. These will keep the frames in position, and the racks may be removed the next day by merely raising the edge of the quilt. If there is any difficulty during manipulations in regulating the distance the frames should be kept apart by the eye, the edge of the hive can be marked to correspond

with the notches in the racks, or the "W.B.C." ends described on page 44 can be used. In this case two strips of wood $\frac{3}{8}$-inch deep and $\frac{3}{16}$ inches wide will be required, one at each end, to increase the distance between the face of comb and hive sides in the outer frames.

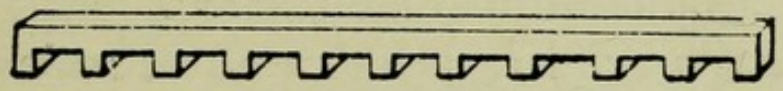


Fig. 15.—Distance Racks.

The division-boards, P, are made to fit the hive at the sides, and have projecting pieces at the top (see Fig. 10) to enable them to hang and slide on the metal runners. A space of $\frac{1}{4}$ of an inch is allowed at the bottom to allow bees to pass back into the hive during the summer months. In winter they are made to fit tight by having strips of cloth tacked round the edges on the outside. This enables us to contract the space without loss of heat.

All the parts being separable, the hive can be easily moved or examined, the floor-board cleaned and exchanged, and the hive turned in any direction on the floor-board. The frames not having any distance-pins or guides, enable them to be manipulated with rapidity. They have also the advantage of being able to be brought closer together, if we wish to restrict the combs to worker-brood only, and can be placed farther apart to enable the bees to cluster more compactly in winter. The outer case being in two storeys, there is ample room for doubling. It is also a great protection to the bees when we wish to examine the frames in windy

weather. When used for extracting, a third and even a fourth storey can be added, if more room is needed. The low stand, and the alighting-board reaching to the ground, saves many bees, which would otherwise be lost if blown down by high winds when returning to their hives. All parts exposed to the weather are painted.

Figures 13 and 14 are drawn to a scale of 1-inch to the foot; those, therefore, wishing to make such a hive can readily do so, the principal dimensions having been already given.

MEADOWS' "ROYAL" BIRMINGHAM HIVE.—Fig. 17 illustrates Mr. Meadows' hive, shown at Birmingham in 1898, as a non-swarming hive. This particular advantage is secured by an arrangement, seen in the illustration, converting the hive-stand

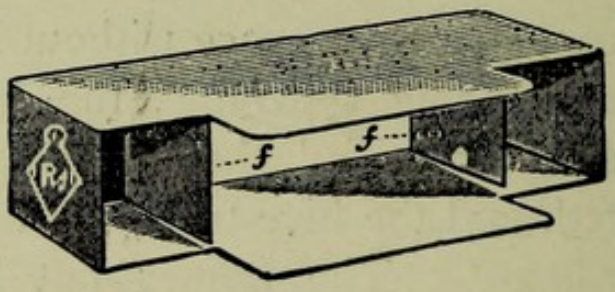


Fig. 16.—"W.B.C." Metal End.

into a receptacle for a shallow body holding ten frames, fitted with narrow strips of foundation, and metal ends, shown in Fig. 16. When in use the top-bars of the frames in lower box form the floor-board of the hive proper, and thus the cluster of bees extends downwards naturally as the brood-chamber becomes crowded. When the bees have started

well on the new combs, the box (bees and all) is withdrawn and set above the brood-nest, with queen-excluder between, a second shallow body taking its place. Ample room is thus given above and below, and swarming prevented.

The space below brood-chamber can also be utilised for giving air-space beneath the frames of brood-chamber in winter, or for hanging a feeder in, giving food below without disturbing bees or quilts, as when feeding overhead. This is done by using a special feeder, capable of being withdrawn for refilling without risk of stings.

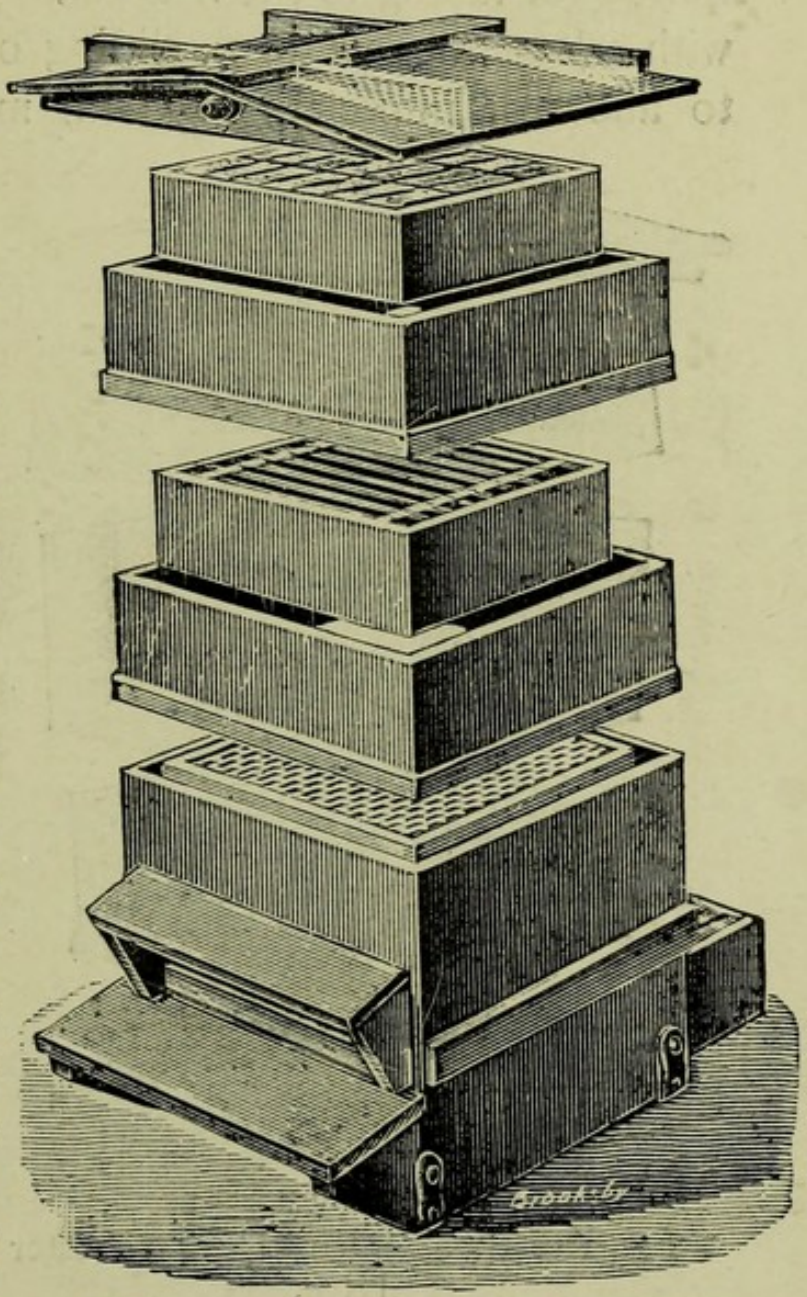


Fig. 17.—Meadows' "Royal" Birmingham Hive.

The roof is of new pattern, being made to form a flat table, by means of four wedge-shaped pieces of wood fastened to the sloping sides of roof, as seen in Fig. 17. The advantage thus gained is obvious.

LEE'S "ROYAL" MANCHESTER HIVE.—Messrs. Lee & Son have designed this hive (Fig. 18) as suitable for general use, including the best features required for taking to the heather. The stand is fitted with a loose floor, C to D, sliding out from the back, to allow of interchanging with movable ventilating tray, E, and thus insure free ventilation in hot weather, and prevent swarming. By withdrawing floor the bees can be instantly secured, while allowing a space of $2\frac{3}{4}$ inches below underside of frames, with ample ventilation for taking to the moors. For autumn, feeding can be carried out in a special feeder, placed in the space below floor-board, and the slide, B, enables this to be done without crushing bees or danger from stings. Air-space can also be secured below frames, in winter, with no disturbance of bees and a minimum of trouble, by sliding out the floor-board, C D, and slipping it in again on the lower level.

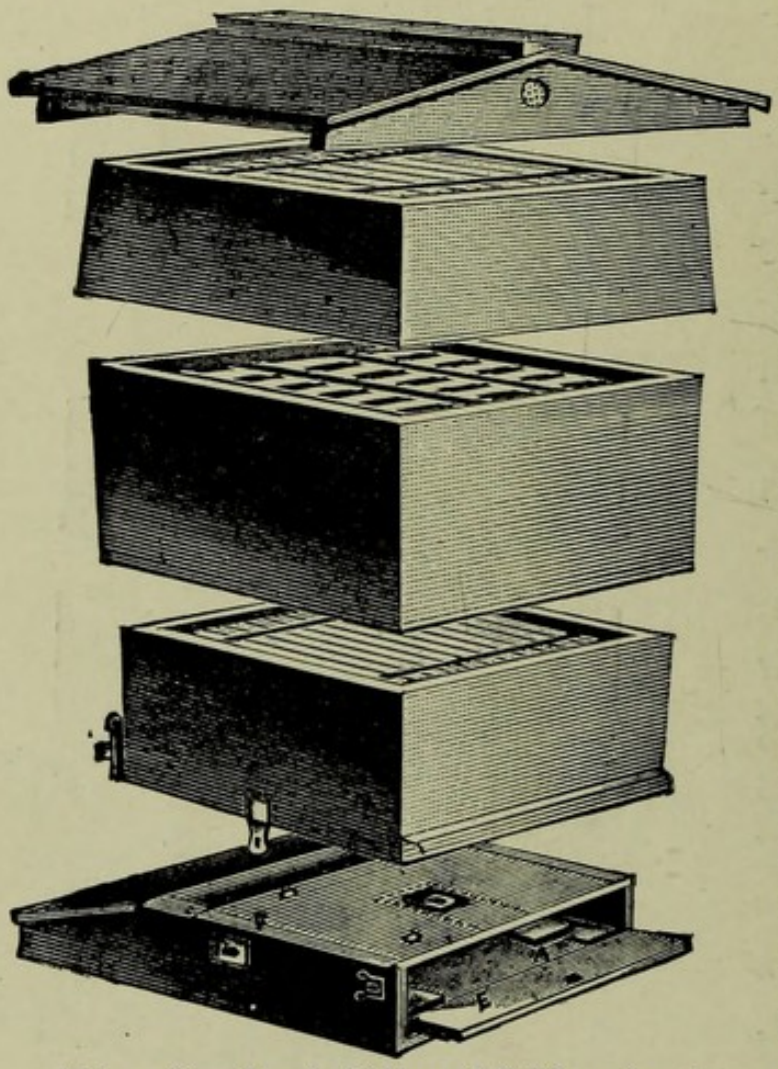


Fig. 18.—Lee's "Royal" Manchester Hive.

THE "W. B. C." HIVE.—This hive has been introduced by Mr. W. Broughton Carr. Fig. 19 gives a good idea of the different parts comprising it,

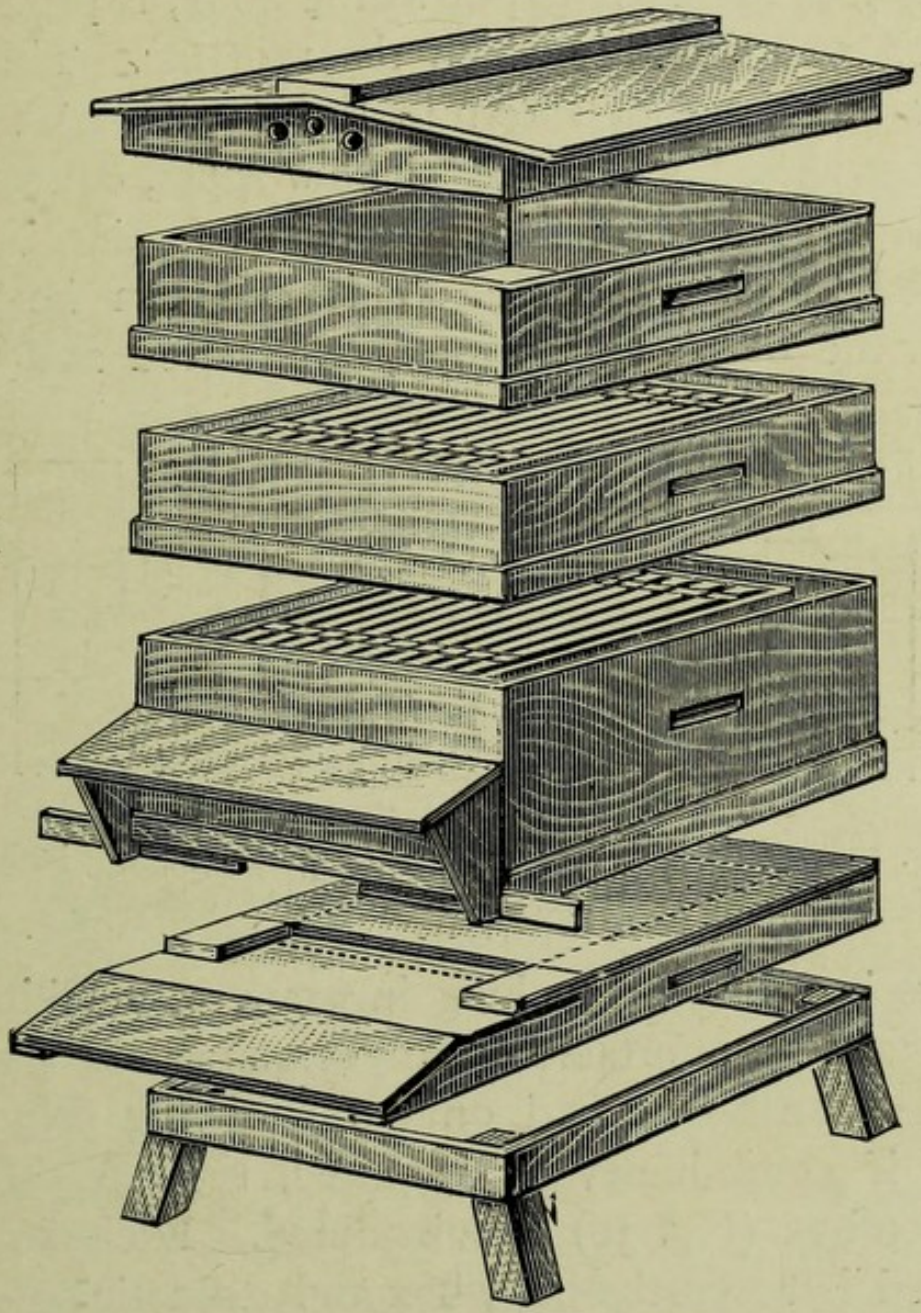


Fig. 19.—The "W.B.C." Hive.

and which can all be separated. It consists of a loose floor-board with a wide sunk entrance on a stand having splayed legs. There is also a sloping alighting board. The body-box is provided with ten standard frames and division-board, and over

this is worked a super the same size as the body-box, but only 6 inches deep, with shallow frames $5\frac{5}{8}$ inches deep, used for extracting. A detached outer case, the same depth as the body, is provided, as well as a lift on to which the roof fits. There is also an "eke" (not shown in the engraving), which can be placed under the shallow super, converting this into a body-box taking standard frames, if it is desired to employ these. This eke can be used below the body-box in winter, or inverted and used

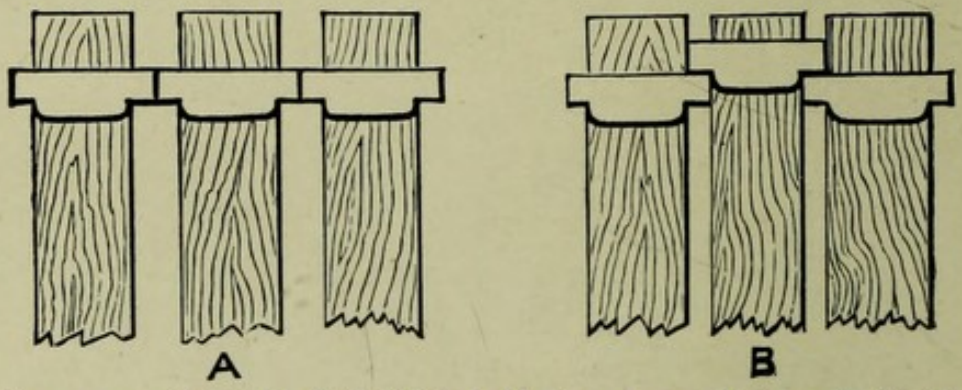


Fig. 20.—"W.B.C." Metal Ends, spaced at $1\frac{9}{20}$ inch and $1\frac{1}{4}$ inch respectively, from centre to centre.

above in spring for tucking in wraps and making all snug and comfortable. Any number of shallow supers can be worked on the storifying principle, and if comb-honey is required, the "W. B. C." section-box (Fig. 30) is substituted. Excluder zinc is used between the body-box and extracting supers. The frames are fitted with what are known as "Carr's or 'W. B. C.' metal ends" (Fig. 16), made from a single piece of tin, and are both light and strong. These ends remove a great objection to the use of such appliances, as they enable the bee-keeper to regulate, to a certain extent, the distance of the frames from each other. In Fig. 20, A, they

are placed the usual distance, so that the frames are $1\frac{9}{20}$ inch from centre to centre; but if it is desired to prevent the production of drone-brood, the ends of every other frame are slipped back as shown at B, and a distance of $1\frac{1}{4}$ inch from centre to centre may be maintained. Great care, however, must be taken to return to the wider spacing when brood-production has ended before wintering.

ABBOTT'S "GAYTON" HIVE.—This hive is illustrated at Fig. 22, and may be taken as a type of hives, containing broad shouldered frames, of which

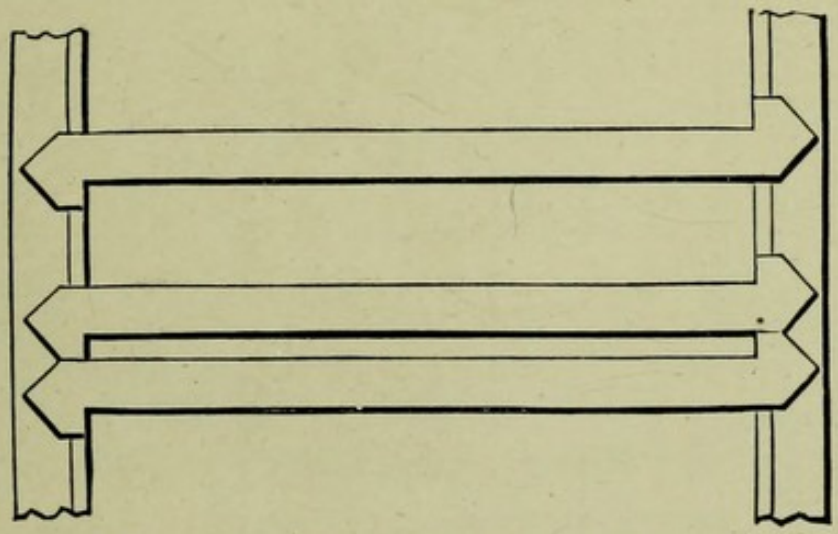


Fig. 21.—Broad-shouldered Frames.

the late Mr. C. N. Abbott was all along an earnest advocate. Its chief feature consists in the frames, of which there are ten of the Association Standard size, running across the entrance parallel with the hive-front, instead of at right angles to it. The frames are 1 inch wide and have broad shoulders, as shown in Fig. 21, to keep them $1\frac{1}{2}$ inches from centre to centre. The sides of inner casing of the hive are chamfered off on the outside, and form a narrow

runner on which the frames slide, and offer little opportunity for crushing bees. The projecting shoulders to the frames ensure accuracy in the distance between them, so that it is impossible for them to be misplaced, and as they project beyond the inner hive sides, they enable the operator to

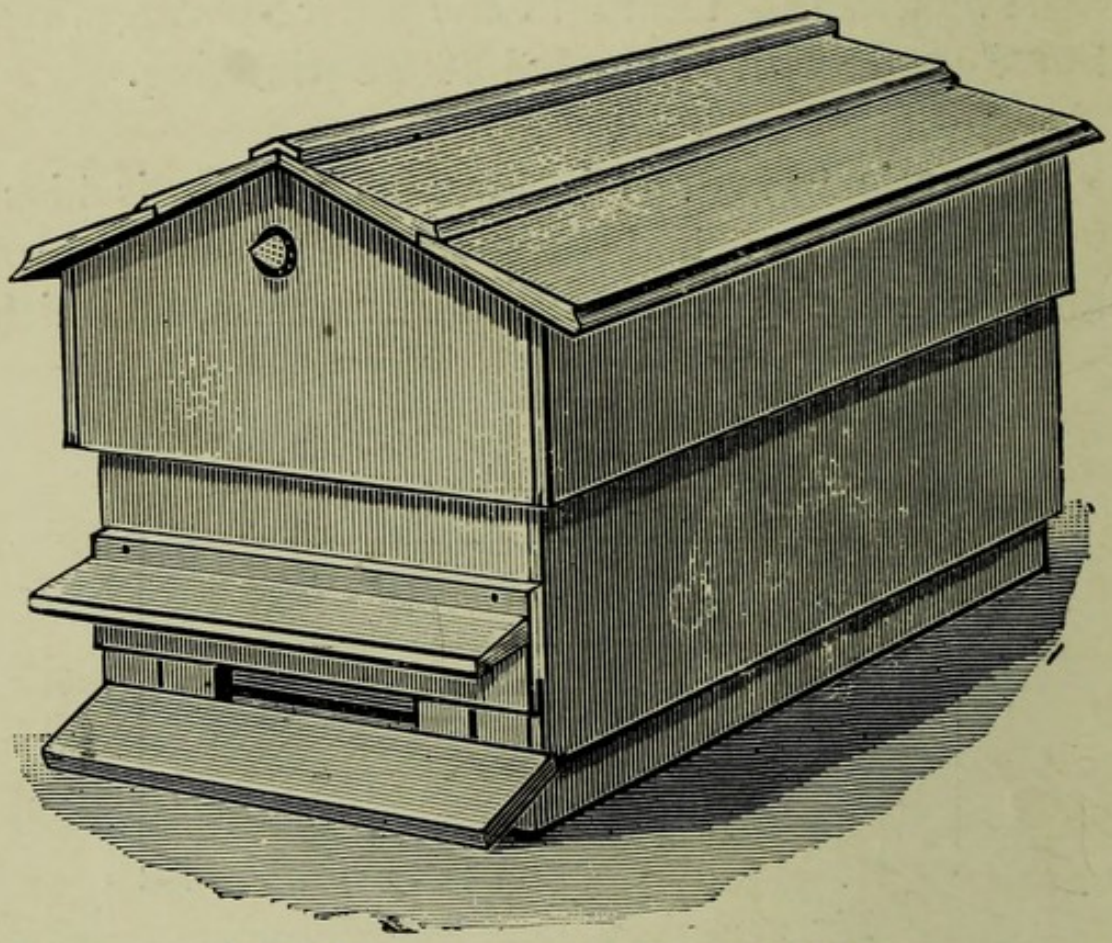


Fig. 22.—Abbott's "Gayton" Hive.

handle them without putting his fingers among the bees. It is also provided with a division-board for contracting the size of hive to the number of frames required. A porch is provided, with slides for regulating the size of entrance, and it has a roof of sufficient capacity to cover the supers worked over brood-nest, and is also fitted with a perforated brass cone for the escape of bees left in the roof after

manipulations. This may be taken as a type of economical but efficient hive for general use.

REDSHAW'S ROYAL NOTTINGHAM HIVE.—This hive, first exhibited at Nottingham in 1888, has undergone considerable improvements since that time, and appears now as shown in Fig. 23. The stand and legs are framed together and are separate from the floor-board, which is at a convenient height from the ground for manipulating when a second storey is on. The body-box contains ten standard frames running at right angles to the entrance, and two clamped air-tight division-boards. It has a movable porch and entrance shutter combined, which can be used on any body-box or lift that may be required at the bottom. By an ingenious contrivance the entrance shutter is so arranged that by raising it the whole width of the hive can be used as an entrance, and when it is put down the entrance can be completely closed or opened any width up to 8 inches. Over this body is placed framed

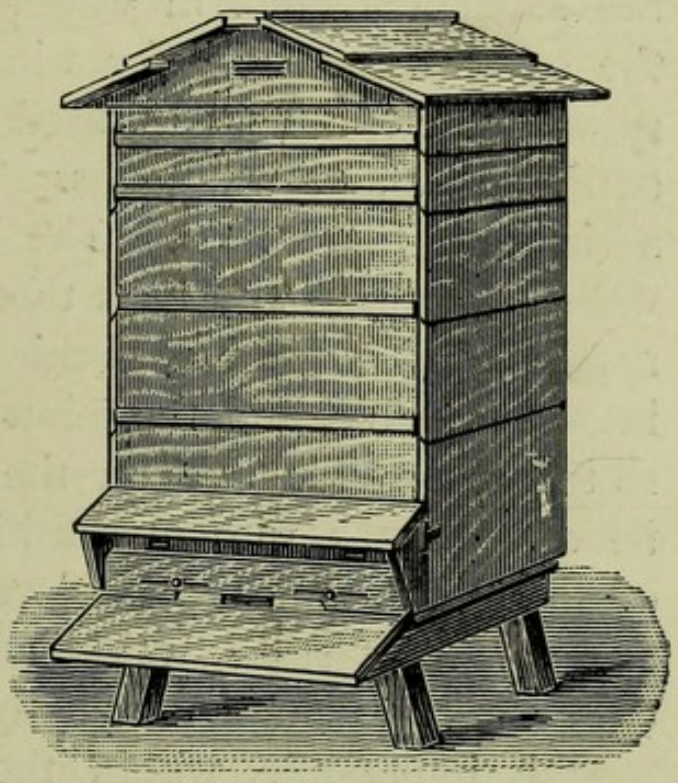


Fig. 23.—Redshaw's "Royal Nottingham" Hive.

excluder zinc, and above it are two shallow-frame bodies for extracting. The section-rack is made to contain either seven, fourteen, or twenty-one sections at a time, and the three rows can be worked together, or each one separately. The lift is the same depth as a shallow-frame box, but in two parts, so that one of them can be used beneath the stock body-box in winter for ventilation, and the other on the top for winter packing, &c. In summer the two parts are used together, and contain section-rack and wrappings. The roof going over all is shallow and light. The bodies are all double-walled. In front and back there are dead-air spaces, making the walls 2 inches thick. All the boxes are interchangeable, and the joints being bevel rebated, so that they slide one on the other, they can thus be drawn back without crushing a bee. The top edges of back and sides are level with tops of frames, and the front stands up $\frac{3}{8}$ths of an inch above to close the entrance of next body-box when storified.

It is impossible, within the narrow limits of a small treatise like this, to describe all the examples of different hives in use; but there are some excellent and cheap ones made by Messrs. Taylor, Dixon, Greenhill, Howard, Raitt, Rose, Steele, Baldwin, and others, which embody some of the principal features of the hives already described.

IX.—SURPLUS COMB-HONEY.

No hive can be considered complete unless it has some arrangement for securing pure honey in the comb, and his ability to produce it in quantities

and in the most attractive form shows the skill of the bee-keeper. Large supers and glasses placed on the tops of hives were once used for the purpose of getting bees to store their surplus in, but these receptacles have given way to what are now known as sections. These generally contain from 1 lb. to 2 lbs. of honey, are clean and nice to handle, and can be transported from place to place without incurring the same risk of breakage as when the honey-comb is in large boxes. The retailer can also sell it without cutting the combs, which always causes a mess and a waste of the running honey. For this reason honey in sections will always realise a higher price in the market.

The sections are small boxes (Fig. 24) made generally of white wood, $\frac{1}{8}$ inch thick, $4\frac{1}{4}$ inches by $4\frac{1}{4}$ inches, and 2 inches wide. The top and bottom are only $1\frac{3}{4}$ inches wide, so that when the sections are put together on the top of a hive there is sufficient room for the bees to pass up into them. These just hold 1 lb. of honey-comb when filled, and those to contain 2 lbs. are $6\frac{1}{4}$ inches by $5\frac{1}{4}$ inches by 2 inches, and have only the bottom made $1\frac{3}{4}$ inches wide to allow the bees a passage into them.

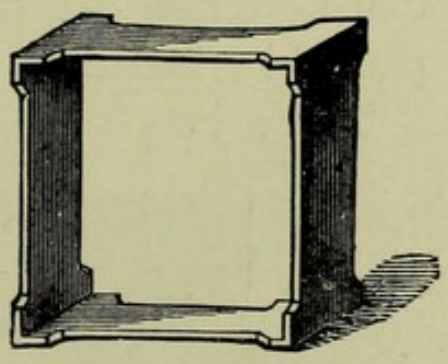


Fig. 24 —Section.

Sections are generally made all in one piece (Fig. 25). Each piece of wood to form the section has a mortise and tenon arrangement at the ends, A, B, and V-shaped grooves cut nearly through

across the wood, as shown at *c*, *d*, *e*. If the strip is folded up so that A and B are made to unite and fit

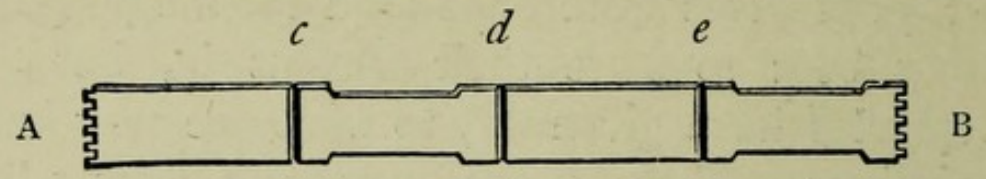


Fig. 25.—One-piece Section.

into each other, we have the section made and ready for use. If a little thin glue is brushed into the grooves the sections are much stronger, but the bees will generally glue the joints together with propolis, and make them sufficiently firm.

Fig. 26.—Four-way Section.

Lately what are called four-way sections (Fig. 26) have been introduced. These are so constructed that bees may pass freely from one section to another placed by its side.

These boxes are furnished with very thin comb-

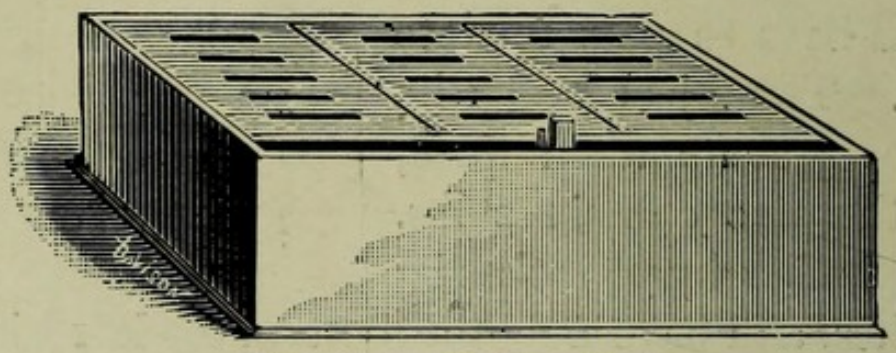


Fig. 27.—Section Rack.

foundation, and are placed together in a rack. For ordinary sections a close-sided rack (Fig. 27) may be used. On the bottom a frame of wood $\frac{3}{8}$ths of an inch thick is fixed in such a way that when the

sections are placed in position there will be room for the bees to run freely between them and the tops of the frames. On this frame are fixed zinc bars (Fig. 28), which enable the sections to slide freely, and also serve to support the separators. These are strips of tin, wood, or perforated zinc, reaching to within ½ inch of the top and bottom of the sections, and are placed between each of the little boxes. This ensures the flatness and even thickness of every comb, so that they can be packed or covered with glass without any difficulty.

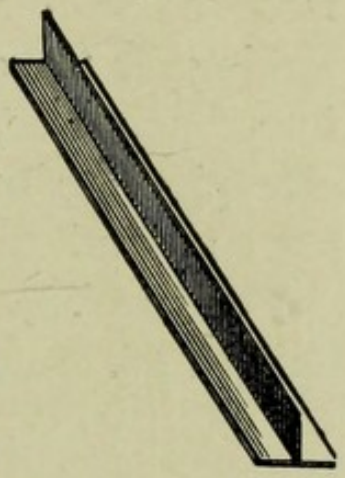


Fig. 28.—Zinc Bar.

Never use sections without separators, for, although it is sometimes possible to get a few of them just right, the annoyance and trouble of having some

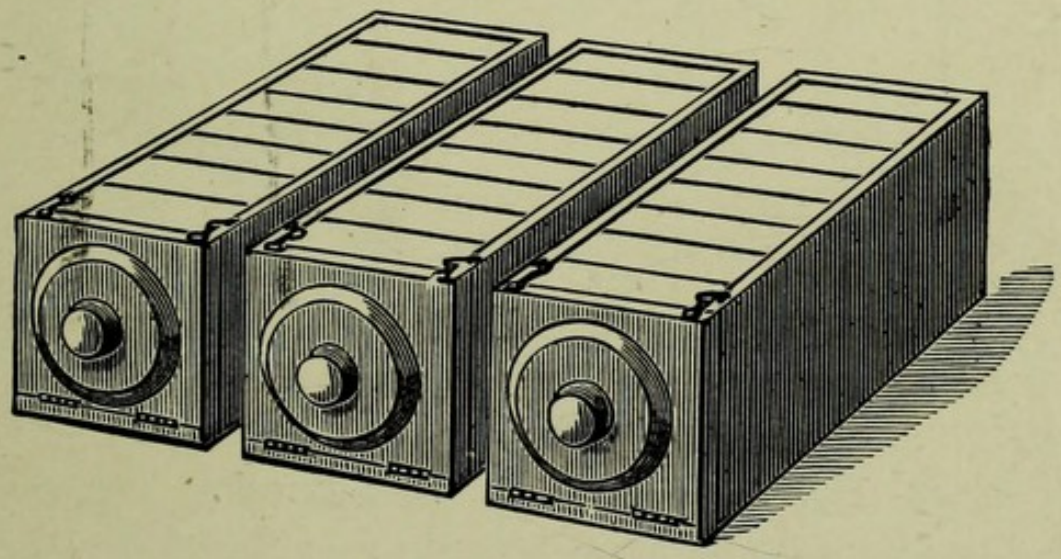


Fig. 29.—Raynor Divisional Section Rack.

of the combs broken before the sections can be separated is very great, and certainly would not occur if separators were used. A piece of board,

called a *follower*, and a spring at the end keep the sections wedged together firmly.

Many use the Rev. G. Raynor's divisional section-racks (Fig. 29), as these enable the bee-keeper to remove one row of sections when finished, instead of waiting for the completion of them all. Being also interchangeable, the centre one, when finished, can give place to one of those on the outside which is not so far advanced.

The "W. B. C." section-rack (Fig. 30) devised by Mr. W. Broughton Carr, contains seven frames

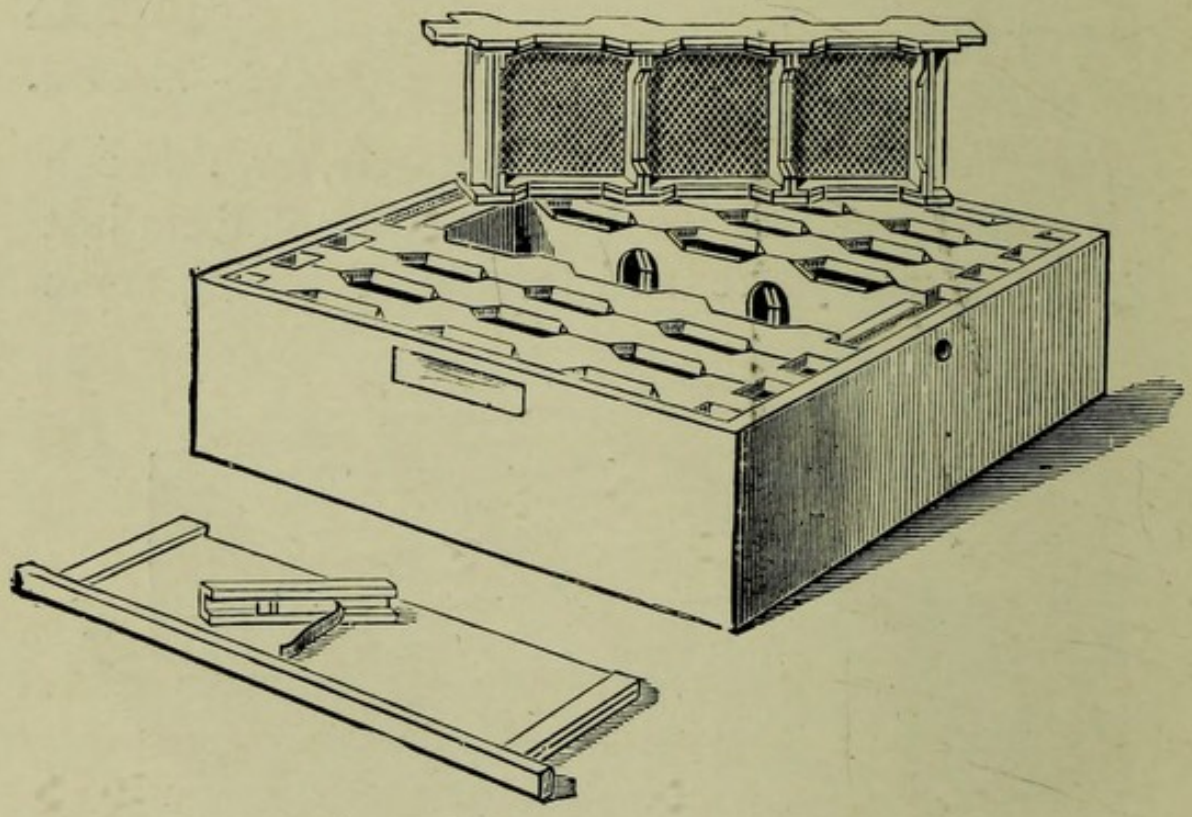


Fig. 30.—"W. B. C." Section-rack.

the width of section, with passage-ways on top and bottom bars, and on one side of each is fixed a wooden slotted separator. There is the usual bee-space below the frames, and the follower has a full bee-space on face next to separator, to prevent

crushing bees when closing up. There is also a free passage between the sections on all four sides. A wedge cut so as to be capable of easy removal is inserted on the right of each frame and presses the sections close up together. When ready for removal, this wedge is withdrawn, a thin-bladed knife passed round the outside of the sections, and when they are turned face down the frame may be gently lifted up, as they will come out by their own weight. The ends of top-bars are reduced for convenience of lifting, and a small circular hole seen on the right is to allow of the escape of bees which might get into the space when the boxes are storified. Working sections in such frames keep them clean and free from propolis.

Usually three storeys of sections are used at one time on the storifying system. When the honey-flow commences a rack of sections, fitted with thin foundation, is placed on the top of the hive, carefully watched, and when the sections are about two-thirds full of comb the rack should be raised, and one with empty sections placed beneath it on the top of the hive. These, too, are in turn raised, and a third placed below. If the honey-flow is good the top rack will soon be completed, when it should be removed, the remaining two being again raised to give place to another rack below them. This operation should be continued so long as the honey-flow lasts, but as soon as this shows signs of declining no more sections should be given, but the bees must be allowed to complete those already on the hive. When the sections in the top rack are sealed over

this should be taken off (see "Subduing Bees," page 97), for if left on too long the appearance of the comb will be spoilt.

The most convenient way of getting bees out of these sections is by the use of a super clearer with "Porter" Bee Escape, of which an enlarged illustration is shown in Fig. 36. The rack of sections is raised and placed on the board with the circular opening of the escape upwards, then replace the super with the "clearer" below it on the hive. After a few hours the entire rack may be removed, generally clear of bees, which have passed below. It is advisable to put on the clearer at night and remove the sections in the morning.

When removed, the sections should be placed in a storing-crate (Fig. 31); this may be made to hold two or four dozen, and, being glazed on both sides, will protect them from dust and robbers. Or the sections may be sorted, cleaned, and placed into the travelling-crate (Fig. 67) as they are removed from the racks. All unfinished sections can be placed together in a rack, which, when filled, may be put on the top of others for completion.

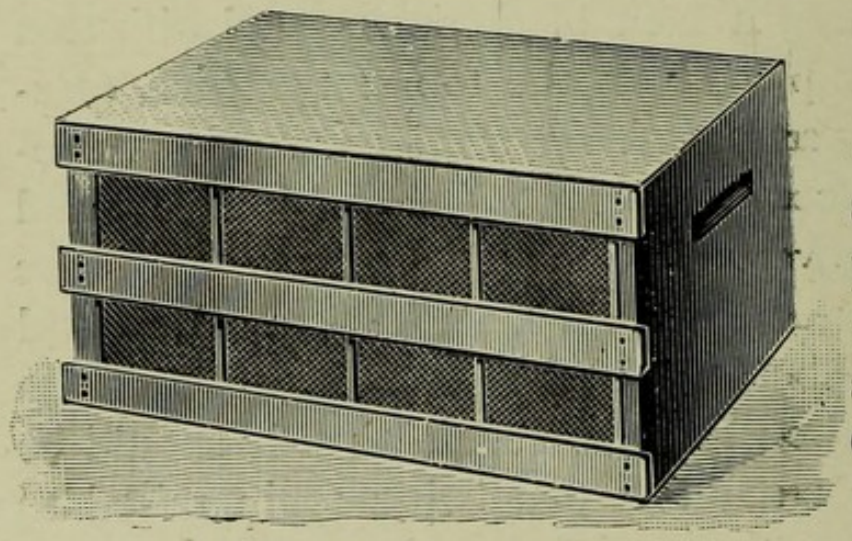


Fig. 31.—Storing-crate.

Bees, being at times unwilling to enter sections, may be forced to start work in them by removing some of the frames from the hive, and contracting the brood-nest by means of division-boards to eight frames. Being cramped for room below, they run up into the sections, more particularly if these are already provided with a few partially-built combs.

In order to overcome the unwillingness of bees to enter sections, some experienced bee-keepers dispense with excluder zinc between hive-bodies and racks of sections. They contend—rightly enough, no doubt—that allowing a free passage-way reduces the objection of the bees to take possession of sections, and, when the judgment of the bee-keeper can be relied on, it is fairly safe to follow the plan. But for the less experienced it will be found more satisfactory in the long run, and less productive of disappointment, to make sure that their sections will not be spoiled by being filled with brood, and this desideratum can only be safely ensured by the use of excluder zinc. It may also be said that once the bees get accustomed to the zinc they will work as freely through it as without.

It will also assist in getting bees to pass through the perforations if the zinc is laid close on the top bars, allowing no bee-space between, as is sometimes recommended, with the idea of improving the free passage-way.

To remove sections rapidly from racks, get three blocks of wood 2 inches square and just the length of a row of sections. Place these blocks on a table the right distance apart, so that when the rack of

sections is laid upon them the blocks will go between the bars which support the sections. Then press down the sides of the rack, and the sections being forced upward will stand above the top, and can be easily removed. This is preferable to forcing them quite out, as the sections are less liable to be damaged by slipping off.

Sections when being filled should be well protected with some warm covering, otherwise they, being so thin and cold, are likely to be deserted by the bees leaving them for the warmth of the hive below during a cold night.

X.—DOUBLING AND STORIFYING.

When the extractor is mainly relied on for a harvest of honey the following method may be adopted:—Select two strong stocks, and from one of them remove all combs containing brood, shaking and brushing the bees back into the hive. Place these combs into an empty hive, and fill the hive from which they were taken with empty combs or comb-foundation. The hive containing the brood-combs is now placed on the top of the other stock, forming a second storey. Thus a double set of combs is given, the hive full of comb is soon full of bees by the hatching above and below; and this immense population will quickly fill with honey the emptied combs of the upper storey, which, as fast as filled, may be emptied by the extractor, and returned to be refilled. By this means strong colonies have the

swarming propensities checked, are kept at work, and a very large harvest of honey is obtained.

Another plan, which with me has yielded very excellent results, is to work three, and even four hives, one upon the top of the other (Fig. 34). As

Fig. 32.—Removing Surplus from Storified Hive.
(Using the Super-Clearer.)

soon as the stock-hive is well filled with bees, and before the bees swarm, place a second hive, filled with empty combs upon it. These are at once utilised by the workers in storing honey, and by the

queen in depositing eggs. When these two storeys are crowded add a third, also filled with empty combs, and then a fourth. The two lower storeys can be kept for breeding purposes, and the two upper ones for extracting.

The frames in the two lower storeys should be placed $1\frac{1}{4}$ inches from centre to centre, which will prevent the rearing of drone-brood, and those in the upper storeys may be placed $1\frac{1}{2}$ to $1\frac{3}{4}$ inches from centre to centre. To prevent the queen from going up into the honey-chamber, a piece of enamel-cloth may be placed over the frames, leaving $1\frac{1}{2}$ inches space at the sides for the bees to go up into the honey-chambers: or a sheet of excluder zinc may be used. This has long perforations (Fig. 33), just large enough to allow the workers to pass through freely, while it prevents the queen from doing so. It is important to have it just right, for a small variation in the size of opening defeats its object. Experience has also shown that when whole sheets of zinc are used the spacing between the slots should not be too narrow, as it not only weakens the zinc, but, as this metal is very liable to buckle, the openings are frequently so enlarged as to allow queens to pass, rendering this sort of excluder useless for the

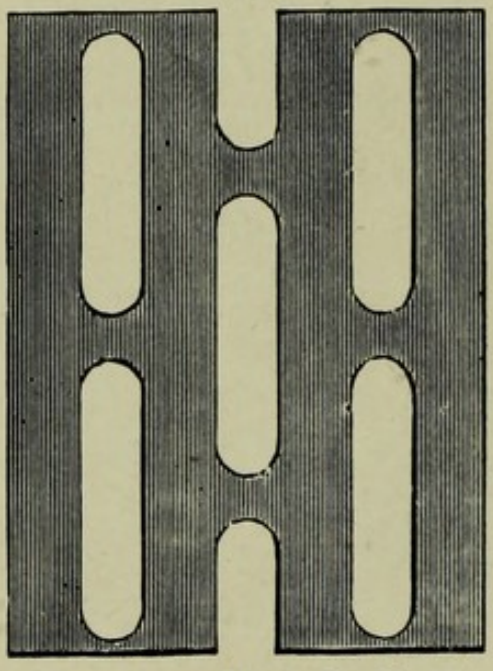


Fig. 33.—The *B. B. J.* Excluder Zinc.

purpose for which it was intended. The best excluder zinc is that known as the *B. B. J.* pattern (Fig. 33). It has a spacing of $\frac{3}{16}$ths of an inch between the perforations, and is perforated in such

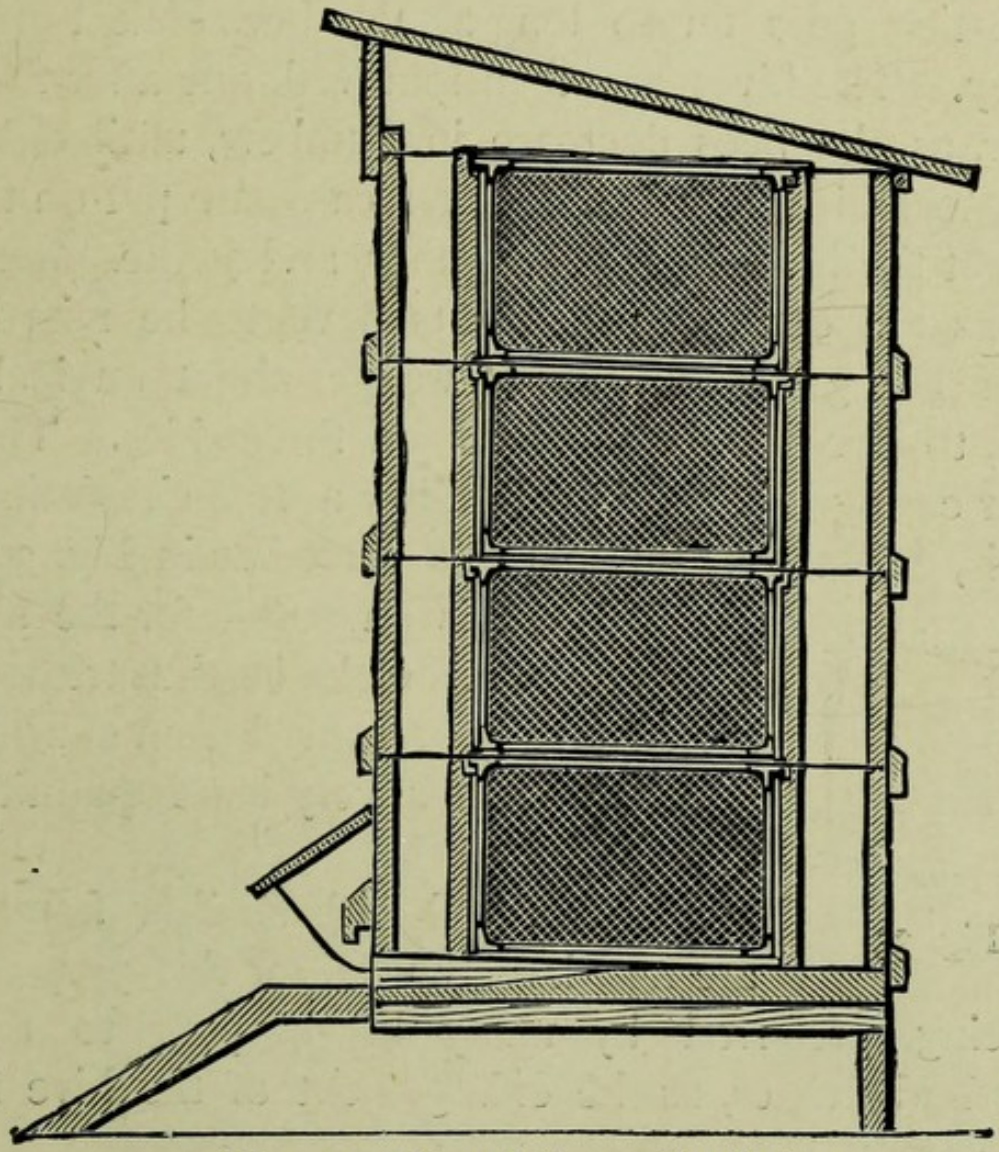


Fig. 34.—Four Hives : Storifying.

a way that it can be cut into 16 inch squares with a plain margin all round, just covering a hive of ten Standard frames. It is placed on the frames with the slots running at right angles to them.

The combs will be ready for extracting first at the top, and when they are done the hive containing the extracted combs is made to take the place of

the one below it, and this one is put on the top, and as soon as the combs are ready they are extracted. This hive then takes the place of the one below it, which is again brought to the top, and extracting goes on so long as the bees collect any honey. The hives are then removed, one after the other, as the bees decrease in numbers, until only the stock-hive remains. Outer cases are put on to protect the hives from the weather, and as the populations are enormous the fronts have to be raised, as in Fig. 34, by means of wedges about an inch high, to give the bees access on three sides. The outer casing is also raised to allow a free circulation of air, and the separate cases placed as in Fig. 35, so that there is an outlet for the air between them. Colonies thus treated are effectually prevented from swarming, and yield a very large quantity of honey.

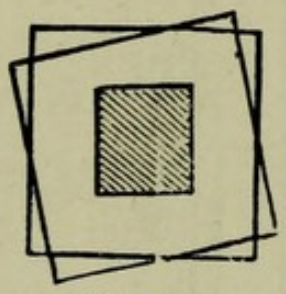


Fig. 35.

Supers fitted with shallow frames are now largely used for this purpose —being preferred by many bee-keepers to the Standard frames, as the enlargement of the hive is more gradual.

The supers shown in section in Fig. 37 are of the same size as the hive, but only 6 inches deep, the frames being $5\frac{1}{2}$ inches deep. These are fitted with sheets of comb-foundation, and two or three storeys are worked in the same way as that described for sections on page 55. It is advisable to have excluder zinc placed between the hive and these supers to prevent the queen from going up

into them. In removing, place a super-clearer (Fig. 36) between the same, as recommended for

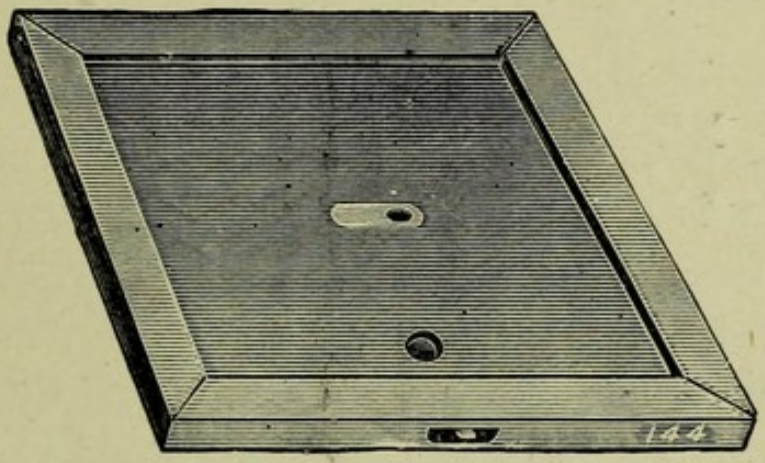


Fig. 36.—Super-clearer.

removing sections. When the frames are all extracted the super is replaced on the clearer, and if the slide introduced by Mr. Meadows is drawn aside at night the bees have access to the super to

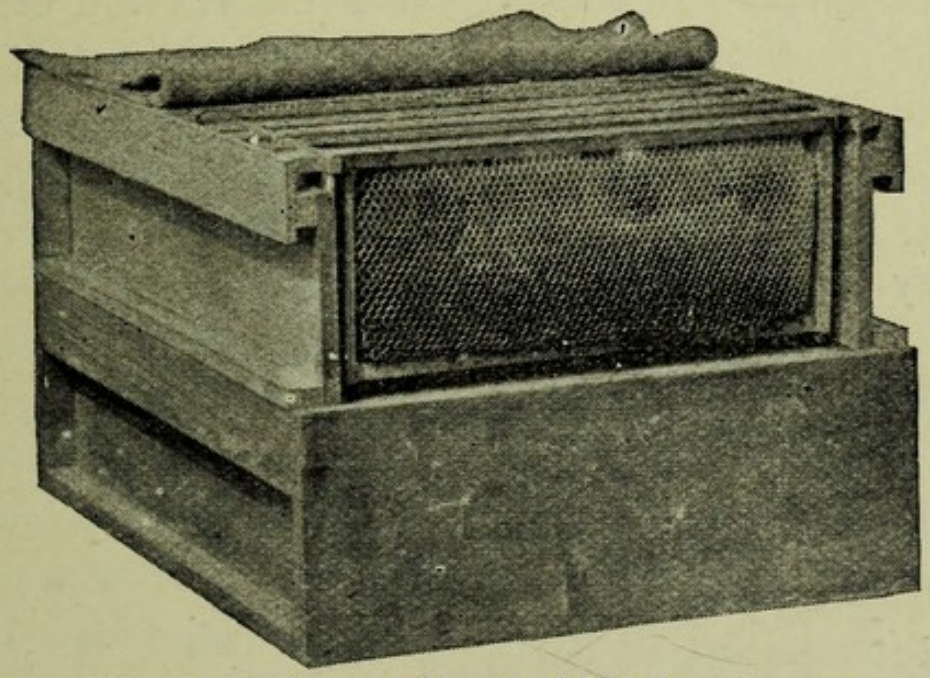


Fig. 37.—Surplus boxes of Shallow-frames.

clean up the honey-combs, and in the morning the slide can be replaced, when the bees will find their way into the hive through the escape.

The best results are obtained by giving empty combs, and the bee-keeper should always have a large stock of these on hand ready for immediate use

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XI.—COMB-FOUNDATION.

A hive is only a movable-comb hive so long as all the combs are built straight and evenly within the frames, so that these can be removed from one part of the hive to another with a certainty of their fitting, and also secure complete interchangeability throughout the apiary.

If the bees are put into a movable-comb hive, and left to themselves, they will, as stated on page 21, probably build their combs across the hive or in any direction but that in which the bee-keeper desires them. If, however, the under side of the top-bar of the frame is provided with a strip or "starter" of comb-foundation, they at once accept this as a guide to work out their combs in a perpendicular line from the starters given them.

Very great improvements have been made in comb-foundation in the last few years; it is quite a different thing now from what it was when we began using it thirty years ago. Then it was used only in narrow strips, and made by simply pressing a sheet of wax between two

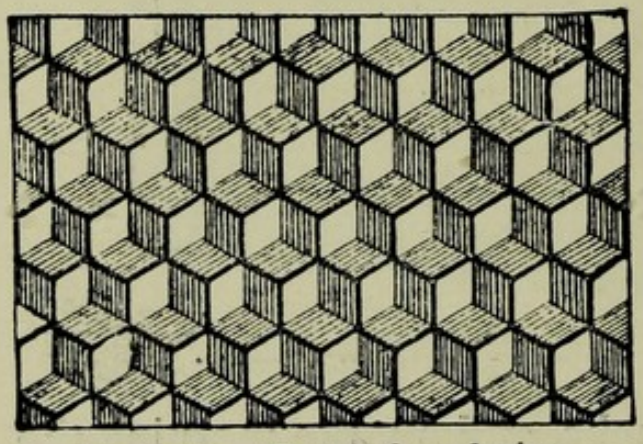


Fig. 38.—Comb-foundation.

metal plates. These sheets contained only the impression of the bases of the cells; but the comb-foundation, which is now made between rollers, has not only the bases of the cells, but also, as represented by the black lines in Fig. 38, sufficient wax in the projecting walls to completely lengthen out the cells, so that the bees have only to provide the wax for the coverings.

For brood-frames a much heavier foundation is used than for sections, the latter kind being very thin and transparent, averaging about 14 square feet to the pound.

Care should be taken to get foundation made from pure beeswax. Much of that sold is adulterated, and bees will often refuse to work upon it when thus made, and valuable time is thus lost at the most critical part of the honey season.

The greatest advance by far, however, in the production of foundation during the past few years, is the invention, by Mr. E. B. Weed, of a method of sheeting wax which bids fair to supersede all others. By means of the "new process," as it is termed, a tougher and more transparent article is obtained, in long belt-like sheets, by passing through rollers exercising a pressure of several hundreds of pounds to the square inch; and when these sheets are put through the milling or embossing process, the result is a foundation with the thinnest possible midrib and higher side walls than by the former methods of production.

The A. I. Root Co. are sole makers of the "Weed" foundation machinery, and themselves manufacture

the product largely for export, but Mr. J. H. Howard has secured, along with the necessary machinery from Messrs. Root, the exclusive right to manufacture "Weed" foundation in this country, and has named his make "British Weed" foundation, in order to distinguish it from the American product.

The sheets of foundation for standard frames should be cut 13¼ inches long and 7½ inches wide, or, if to be inserted in a saw-cut, 7¾ inches, so that when the foundation is fixed to the top bar it will allow half an inch at the bottom in the event of its stretching, but if the frames are wired the foundation may fill them their full depth.

There are different methods of fixing foundation in our frames; and if whole sheets are used, any of the following plans are recommended: Procure a piece of wood ⅜ths of an inch thick, and cut it to fit into the frame. On the back nail two strips of wood projecting an inch beyond each end of the board, see Fig. 39. Lay the frames on these projections, place the foundation on the board, allowing its upper edge to touch the under side of the top bar, which must be held in an inverted position, and at an angle of about 45 degrees. Now run a little molten wax with a spoon or ladle at the highest point in the angle formed by the wax-foundation and the wooden frame, and allow it to run down by its

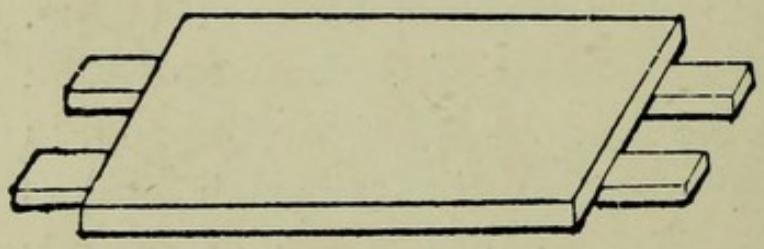


Fig. 39.—Guide for fixing Foundation.

own gravity to the other end. If the wax is sufficiently heated the foundation will be perfectly fixed. The wax should not be over-heated, and the best apparatus to use for the purpose is the smelter, shown in Fig. 40. The outer vessel is for water, and the inner one for wax. In this the wax is kept at a temperature of boiling water, and cannot be burnt.

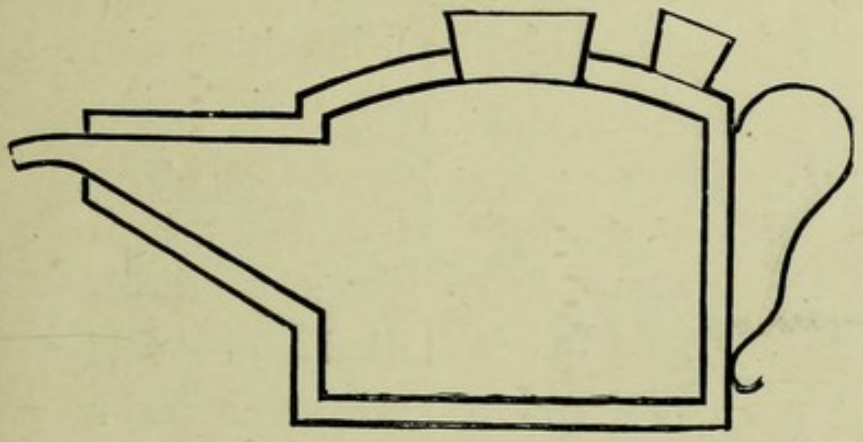


Fig. 40.—Wax Smelter.

Another plan is to have a saw scarf sawn through nearly from end to end of the top bar. Two screws are driven into a board about 14 inches apart and filed down to wedge-shape. By pushing top bar over these, the opening is widened; the foundation is then inserted, and on lifting frame the wood closes and holds it securely.

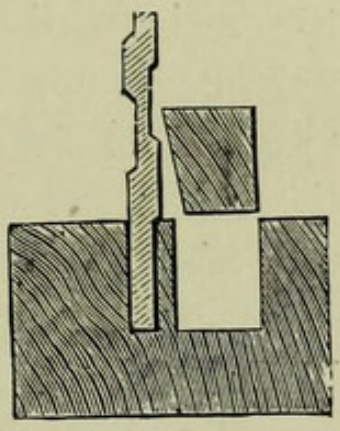


Fig. 41.—Wedge. Abbott's method.

Among many other methods devised for the purpose of fixing sheets of foundation in frames may be mentioned the following:—

1. Messrs. Abbott Bros. patent improved top-bar, a section of which is here shown (Fig. 41). In this the bar, instead of being split right through, is sawn rather more than half-way on the underside with a wider groove close to it, into which a wedge-

shaped piece can be driven. After inserting foundation in narrow groove, the wedge is tightly pressed into the wider one, with the effect of forcing the thin partition against the foundation and holding it firmly in its place. The wedge can be secured, if desired, by small tacks or brads.

2. Lee's improved frame (Fig. 42), in which the principal improvement consists of a "continuous dovetailed groove," and does away with nailing. In these the foundation is fixed at the time of putting frame together. The top rail of this is in two parts, with dovetailed grooves on under side which receive the ends of bars tongued to fit these grooves. The lower ends of these bars have similar grooves to receive bottom rail, which is also in two parts.

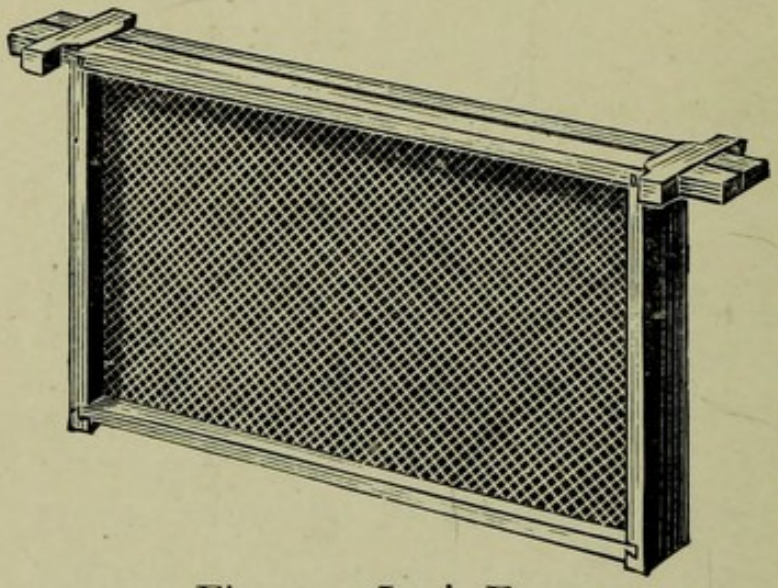


Fig. 42.—Lee's Frame.

In putting the various parts together a frame-block (Fig. 43) is used, and with it frames are readily completed, and foundation fixed very rapidly. In using block one half of the top bar of frame is dropped into a groove made to receive it; the sides are next added by pressing down the dovetails as far as they will go. One of the halves of bottom-rail is then slipped into the groove at

bottom of each side bar and pushed down. The foundation is then laid on, covering the half top bar, and passing half over the bottom-rail. The second

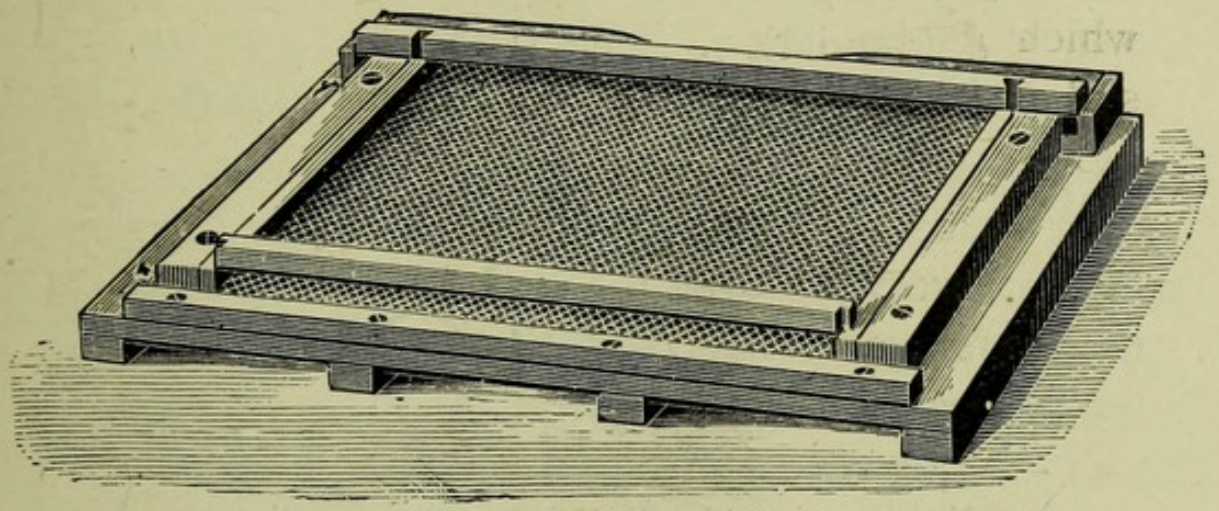


Fig. 43.—Frame-block.

half of the top bar is then pushed down and pressed tightly on to, and securely fixes, the foundation. The other half of the bottom-rail is also put in its place, but allows the foundation to hang loosely, to allow of stretching, there being a space of $\frac{3}{16}$ inch full between, and also to prevent bulging. The top bars are also slightly convex on their inner edges, so that they give an equal grip throughout when pressed tightly home. The illustration shows the top and bottom half-bars just in position for driving down into their places.

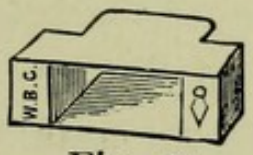


Fig. 52.

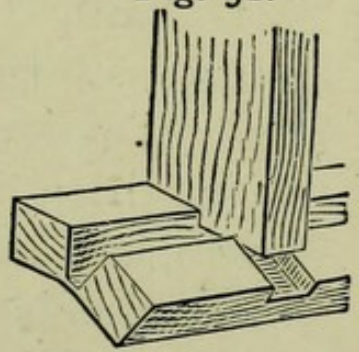


Fig. 44.—Meadows' Frame.

3. Meadows' Frame (Fig. 44). In this frame the under side of top bar is sawn through sufficiently to allow of its opening out for inserting the foundation. It

is then pressed back and kept in its place by means of the metal ends shown on page 69 (Fig. 52).

4. Mr. Howard, in addition to a saw-cut on under side of top bar, has grooves in the side bars into which the foundation, being cut large enough, is slid, and held in position by running molten wax along top groove.

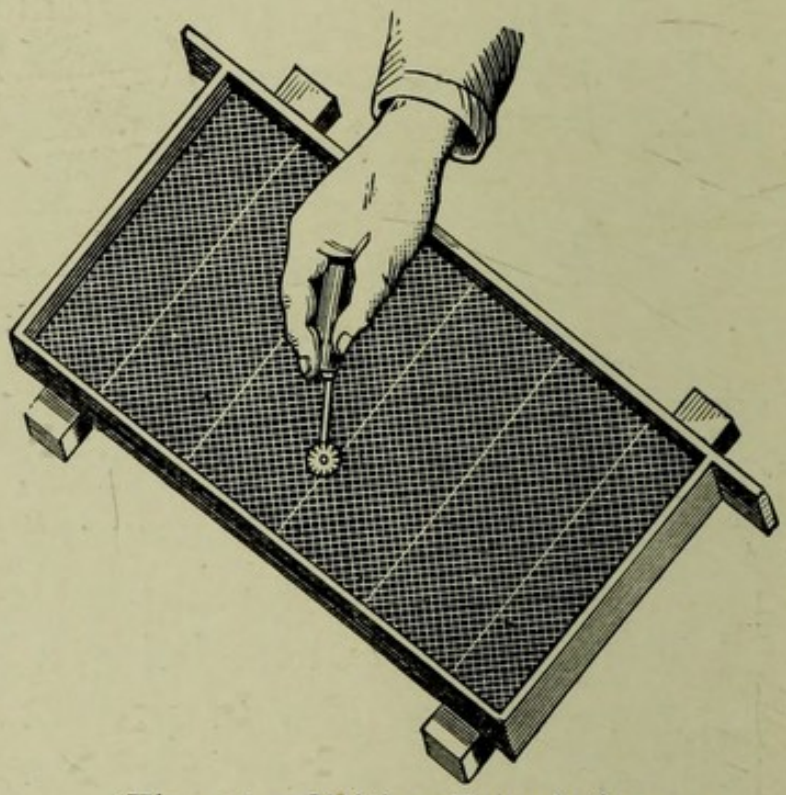


Fig. 45.—Wiring Foundation.

When stocks are not very strong or forage abundant, some comb-foundation is liable to twist and buckle, because of the bees not thinning it out evenly all over, and one part of the sheet is stretched more than another. This usually happens if the foundation be thin and not strong enough to support the clustering bees. To overcome this difficulty wired foundation has been introduced. This can be purchased ready made and inserted by any of the methods above described, or the bee-keeper can wire his own frames and fix ordinary foundation in them. For this purpose No. 30 tinned wire is used. After piercing top and bottom bars with small holes, the frame is placed over "guide" (Fig. 39),

which must fit the frame. Pass the wire through the holes as shown in Fig. 45, and draw pretty tightly. Turn down the ends and secure them by means of pegs of wood driven into the holes. Lay the guide (Fig. 39) down, place a sheet of foundation on it, and over this put the wired frame, so that foundation touches the top bar. Have a lighted spirit-lamp by your side; in the flame heat the wheel of the "Woiblet spur-embedder" (Fig. 46) and then place the V-groove of this on wire.

Fig. 46.—Woiblet Spur-embedder.

Run the wheel along wire from one end to the other, as shown in Fig. 45. The heat melts the wax at each point, which cools as fast as the wheel travels forward; the wire will be found covered with wax, and foundation firmly fixed, with no possibility of its stretching.

Another method of wiring is shown in Fig. 47, and here the strain falls on the side bars through which four fine iron nails are driven and bent at the points. Or, better still, small staples are used which are partly driven into the bars. The wire is fastened to the one on right hand top, passed through that on the left side, then to the one below. It is

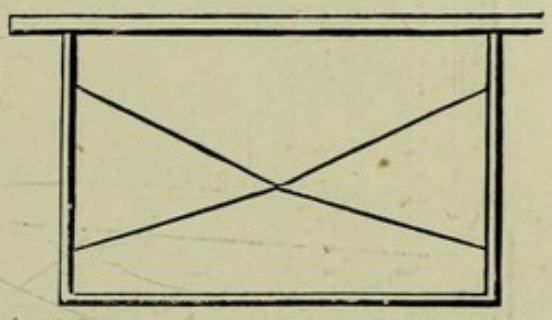


Fig. 47.—Wired Frame.

now passed over the first stretch of wire, drawn into position, as shown in illustration, and fastened off at the bottom staple on right hand side. The staples are then driven into the wood and the wire is stretched perfectly tight. The top bar should have a saw-scarf and foundation be fixed in this as previously described on page 71 before the wire is embedded.

A good way of fixing the thin foundation in sections is with the wax-smelter and block as described above, the sheets being allowed to nearly fill the sections. (See Fig. 48.)

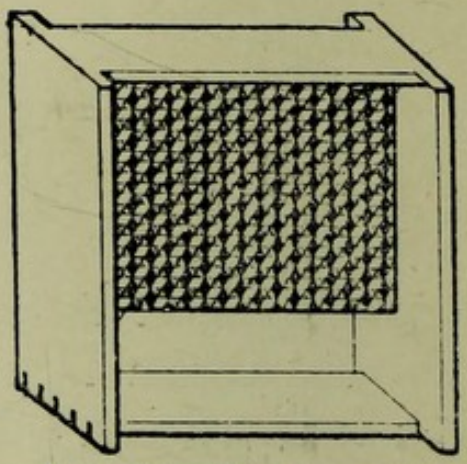


Fig. 48.—Section with Foundation fixed.

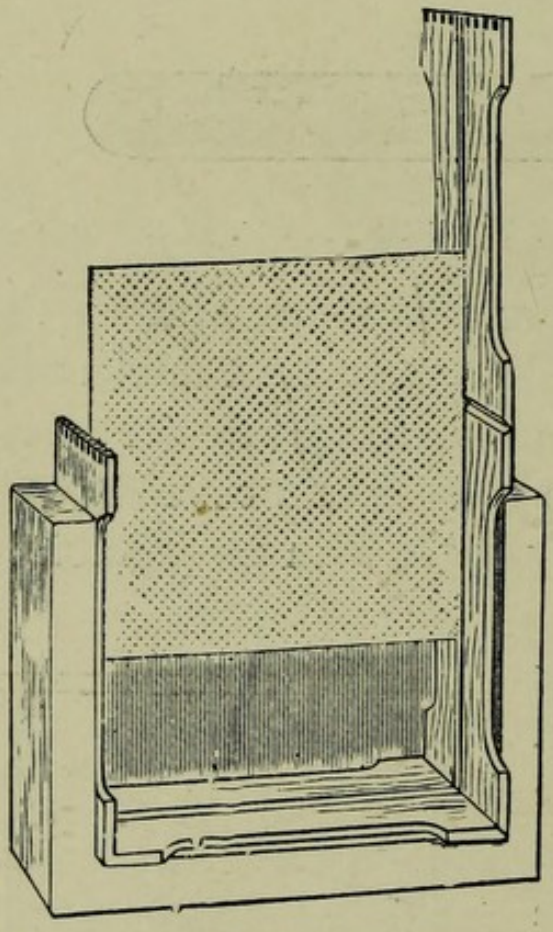


Fig. 49.—Taylor's Section and Block.

Another way is just to dip the edge of the foundation in melted glue and insert it into the slit sawn for the purpose. A very small quantity of glue should be used, or it will show in the comb when this is cut out of the section.

Mr. Taylor and others make sections with a groove all round. The foundation, cut large enough, is inserted into this groove as shown in Fig. 49; the section is then closed ready for use (see page 171).

Most appliance manufacturers also in addition to the groove on the sides, now have the top sides of sections sawn through. In using Mr. Howard's block (Fig. 50) a section is first placed therein,

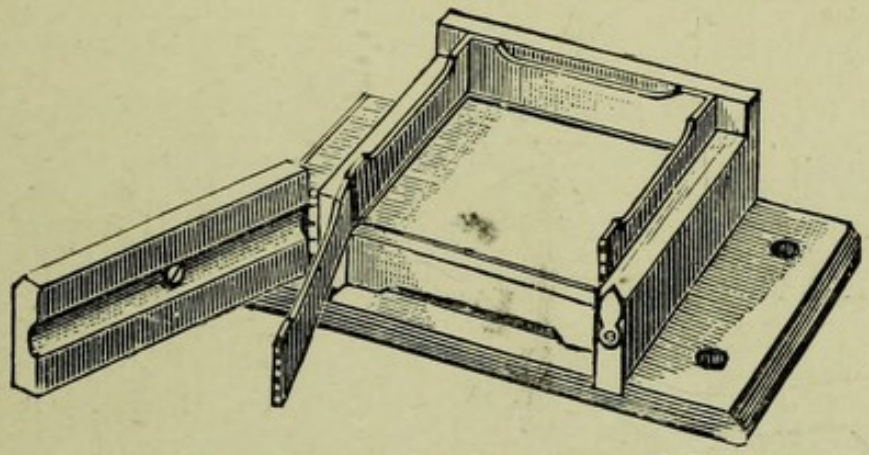


Fig. 50.—Howard's Section and Block.

after which the foundation is inserted in grooves, and on closing to top, is firmly and securely held.

Among the recent devices, intended as improvements on the one-piece sections (Figs. 25 and 26), the latest is the "No-bee-way" or plain-section

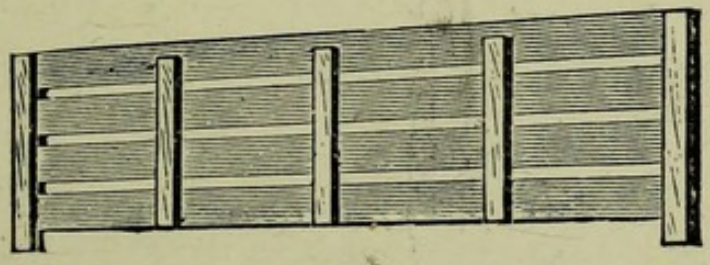


Fig. 51.—Cleated Separator.

introduced in America by the A. I. Root Co. In this the projecting shoulders are dispensed with, the section being plain on all sides. The necessary bee-

space is secured by means of a separator (or "fence," so named by Messrs. Root), which consists of four slats of thin wood let into the upright end-pieces flush with top edge, but allowing a bee-space below the fourth or lowest slat (see Fig. 51). These slats are so placed as to afford a bee-passage between them, and when the cleats are glued to both faces of the "fence," the bees pass freely from one to the other of all sections in the rack.

It is claimed, for this method, that the accuracy with which the spacing is gauged removes all difficulty in "glassing" sections for market.

Mr. W. R. Garner, too, has registered a tin divider designed to secure the same object.

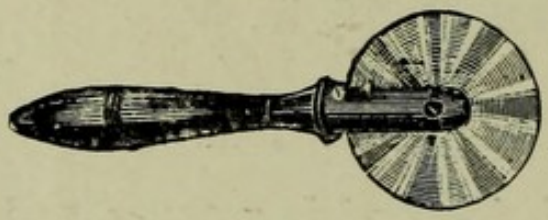


Fig. 53.—The Carlin Cutter.

For cutting sheets of comb-foundation to size we require them, nothing is better than the Carlin cutter (Fig. 53), which is a disc of steel or tin with a sharp cutting edge, revolving in a wooden handle.

XII.—THE HONEY EXTRACTOR.

By the use of this machine honey may be removed from combs, leaving them uninjured, and they can be returned to the bees to be refilled. When we bear in mind how much honey bees consume to produce one pound of wax, we can realise the advantages of a machine which enables us to give them empty comb, and thus save all the labour of comb-building. Nor is this saving of labour to

the bees the only advantage of the extractor. In some seasons the brood-chamber often gets so filled with honey that the queen can find no empty cells in which to lay, and as the production of brood ceases, the bees rapidly decrease in numbers. By extracting the honey from brood-combs we are able to give the queen more breeding space, and stimulate the bees to greater activity. The same machine also enables us to secure a large quantity

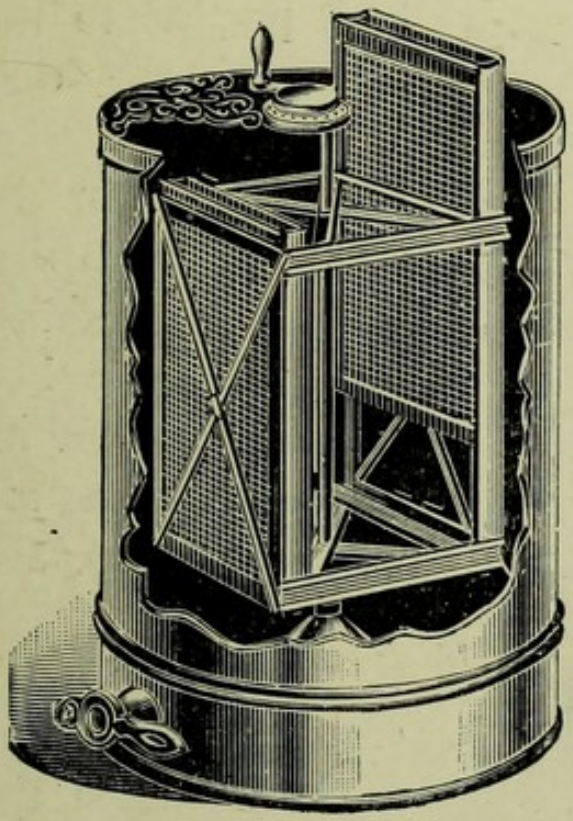


Fig. 54.—"Cowan" Amateur Extractor.

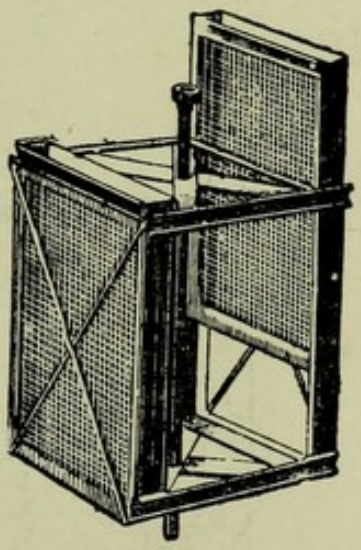


Fig. 55.—Revolving Cage of "Cowan" Extractor

of honey at times when bees cannot be induced to work in sections.

Combs from which the honey is to be emptied are first uncapped with a knife, and inserted in the revolving cage of machine; and when one side is emptied by centrifugal force, caused by the revolving motion, the combs are reversed and the

other side emptied in like manner. Fig. 54 represents Cowan's Amateur Extractor, first introduced in 1875. It consists of a tinned iron can, 18 inches in diameter and 24 inches high, having a conical bottom and a valve which acts as an outlet for drawing off the honey. Inside the can is a framework (Fig. 55), fixed to a vertical spindle, which is set in motion by gearing on the top. In this framework are two cages, which slide in grooves and are kept parallel to the sides of the can. When drawn out, the cages can be opened, so that combs containing honey may be laid in them without injury. The cages are wide enough to take sections, of which eight of 1 lb. each can be extracted at a time. When the honey from one side of the comb is extracted, the cages are drawn out, reversed, and replaced in the grooves for the extraction of the honey from the other side. The cross-wire braces prevent any bulging, so that there is no danger of the combs breaking out of the frames. This is a cheap form

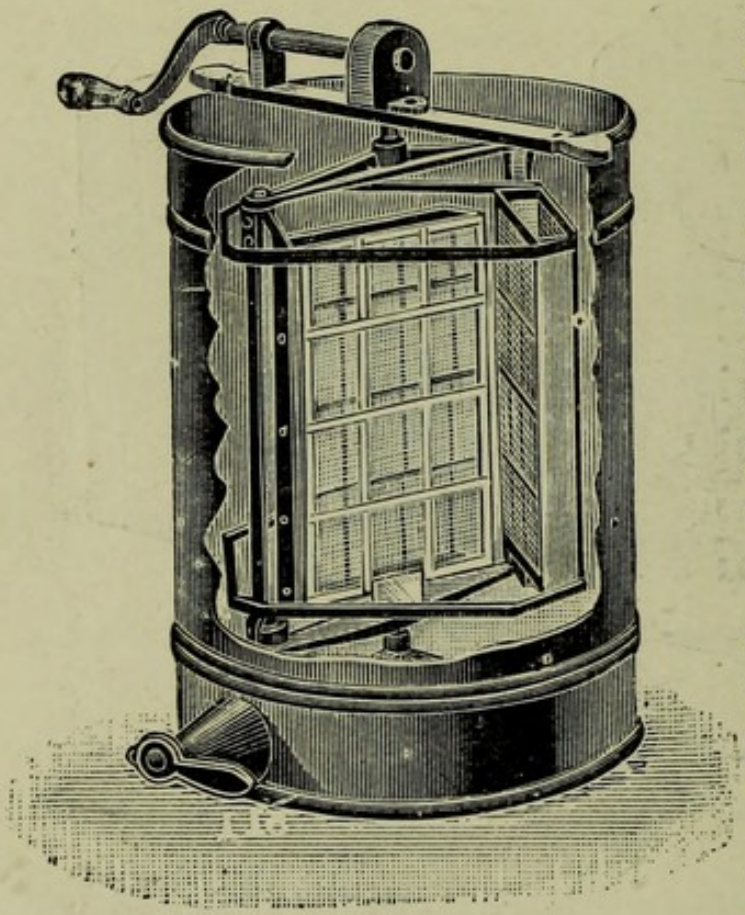


Fig. 56.—The "Cowan" Rapid Extractor.

of honey extractor, very simple and efficient, and adapted for general use.

Fig. 56 is Cowan's Rapid Extractor, introduced in 1875, and now extensively used in this country and in America. The can is similar to Fig. 54, but the internal arrangement is different. In this machine the cages have not to be taken out for the purpose of reversing the combs, as they are suspended on pivots at opposite corners, so that when one side is extracted the cages swing round on these pivots, and place the combs in position for extracting the other side. A great saving of time is thus effected.

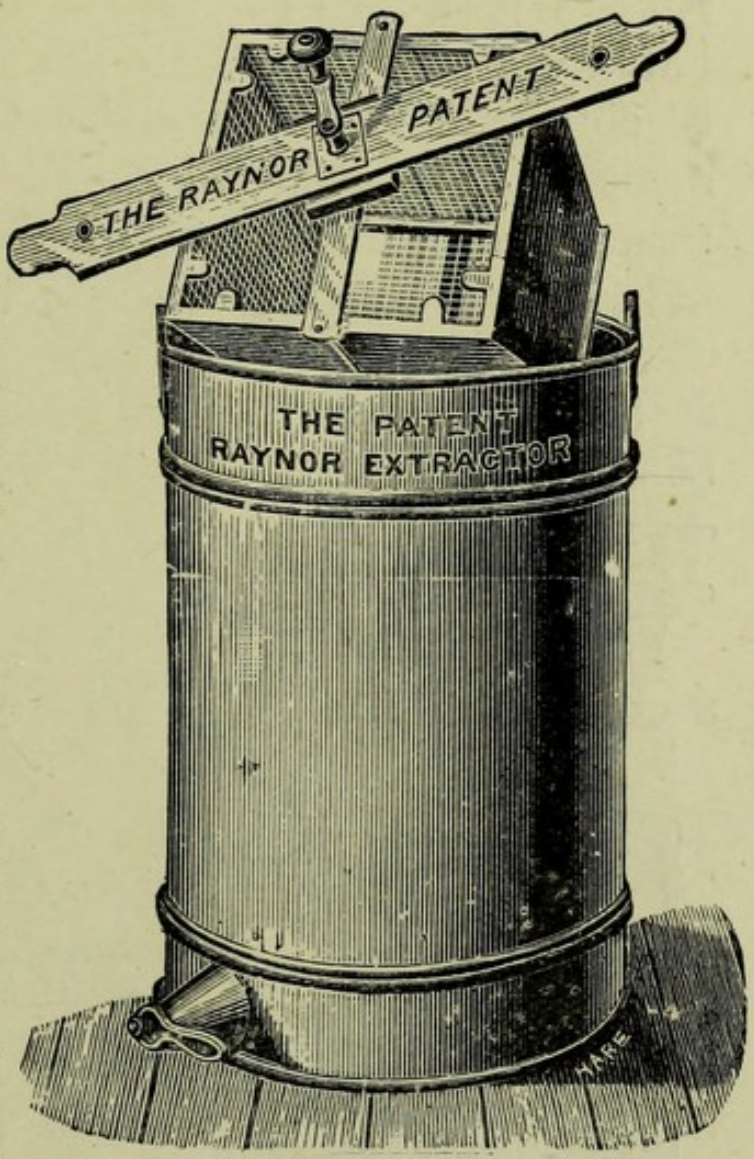


Fig. 57.—Meadows' "Raynor" Extractor.

Fig. 57 represents a machine now well known as Meadows' Patent "Raynor" Extractor. The peculiar feature of this is its having a square cage placed inside a bottomless tin receptacle of similar shape, which revolves with the cage in a

cylinder and upon its conical base. On the inner side of this tin-backing, narrow strips of tin are fixed edgeways, forming a strong support to the wire framework of the cage, and thus preventing bulging of the combs during the process of extracting. Thin wire, $\frac{1}{30}$ inch in diameter, woven into three meshes to the inch, is used, and resting upon the strips a perfectly rigid surface of network, offering little or no resistance to the outflow of honey, is obtained. Even newly-built combs or fragile sections can be extracted without danger of bulging, fracture, or separation from the frames. The reversal of frames is accomplished by turning them from one side of the square cage to the other, and, at the highest speed attainable, splashing of the honey is impossible. By removal of two nuts the cage, with its tin backing, can be withdrawn for cleaning.

Fig. 58 illustrates Mr. J. H. Howard's Section Extractor, which is made to take two or four sections at one time for extracting as being more handy and effectual for such work than larger machines. The construction is made plain by the engraving, Fig. 58, and Mr. Howard has named it the "Cowan," because of the combs being reversible, on the same principle as in the larger machine shown on page 76, Fig. 56.

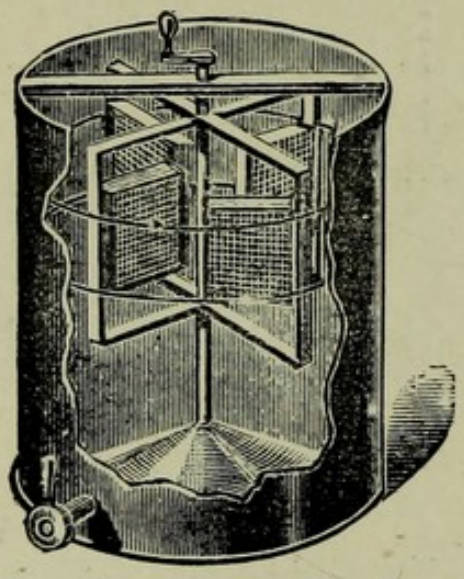


Fig. 58.—Howard's Section Extractor, the "Cowan."

Where the bee-keeper is not afraid of a little more labour, the machine, first introduced by Mr. Abbott in 1875, and known as the "Little Wonder," will do the work by extracting one comb at a time, and the cost is about half that of any of the others.

There are several other forms of extractors in the market, some of them having very serious objections.

It is important that the combs should stand parallel to the sides of the can, because if they are inclined, as in some machines, the upper part of the comb describes a larger circle when revolving than the lower part, consequently the machine has to be driven at a greater velocity to extract the lower portion of the comb than it does the upper. In doing this there is danger of breaking the combs. The cages should be at a sufficient and proper distance from the central spindle; if too near, as in machines constructed without a knowledge of the principles of mechanics, only the centre cells are entirely extracted, leaving the outer ones partially filled with honey. For the same reason machines made to take frames in the same position as they hang in the hives are to be avoided. If the frames are long, such a machine to be efficient should have a very large diameter, which would make it too large for convenient handling. Extractors should be made of metal, and all parts coming into contact with honey must be tinned. Zinc or galvanised iron should on no account be used, as the acid in the honey acts upon zinc to the detriment of honey. Wood is objectionable, as it absorbs honey,

setting up fermentation, besides being difficult to kept clean.

REMOVING SURPLUS FOR EXTRACTING.—Within the last few years it was the general custom among

Fig. 59.—Manipulating in Bee-dress and Veil.

advanced bee-keepers to use the standard frame in both brood and surplus chambers. When this plan prevailed the rule was to go round the apiary at intervals during the honey season and remove two or more frames from every hive, in which sealed

combs were found, for removal and extracting indoors. The frequent disturbance, caused by opening hives, and the subsequent replacing of wet combs for refilling, however, entailed much labour and care as well as skill on the part of the operator in order to avoid starting "robbing" and its attendant evils; besides the risk of spreading foul brood in the apiary through promiscuous interchanges of combs from different hives. With ordinary or less experienced bee-keepers considerable mischief, and sometimes disaster, arose from want of the necessary skill in management, and in consequence it has led to the general adoption of the shallow-frame box (Fig. 37) for surplus when working for extracted honey. Not only so, but it is found advantageous to leave surplus-chambers undisturbed till the combs are sealed over, then removing the full super instead of lifting out a few frames at a time, as in the former method.

The removal of surplus honey is now rendered comparatively simple and easy by means of the super-clearer (see page 59), which has almost entirely done away with the trouble formerly experienced owing to bad management in taking honey from hives. It therefore only needs a careful observance of the following details in using the super-clearer (Fig. 36) to prevent the mischief and annoyance formerly complained of.

After quietly removing hive-roof "lifts" and quilts, gently raise the corner of surplus-chamber with the point of a screwdriver sufficiently high to allow of inserting a small wedge (made by sharpening

a bit of broken section); after raising each corner in the same way, blow in a puff of smoke on each side of the opening so made; then, with a screwing motion, at once lift off the super and set it on the "clearer," previously placed on a stool ready at hand; if the bees are seen crowding on the uncovered frame tops, drive them down with a puff of

Fig. 60.—Uncapping Combs.

smoke before lifting the super, with the clearer on its under-side, and replacing it on the hive. The "screwing motion" used when lifting supers is necessary because of severing brace-combs, if any, attached to the frames below.

The illustration (Fig 60) shows the method of

holding the comb while uncapping a shallow-frame for extracting with an ordinary honey-knife. If a "W.B.C." uncapping knife (Fig. 61)—which is one of the best for the purpose—be used, just withdrawn from the hot-water bath on the right-hand side, and wiped dry, a whole sheet of wax-capping may, with a little practice, be removed at one cutting.

Fig. 61.—"W.B.C." Uncapping Knife.

The uncapped combs are then placed in the cages of the extractor, and a few turns of the handle will throw out all the honey from one side; the cages are then reversed, and the honey extracted from the other side. Be careful to turn only just fast enough to throw out the honey. A little practice will soon enable the bee-keeper to judge the proper speed. It is not recommended as a rule to extract from brood-combs, and beginners should not make the attempt, but it may be expedient sometimes to do so.

Heather honey is much more difficult to extract; for this purpose the "Garstang" Honey-press, introduced by Mr. R. Barton, has been found the most perfect. By referring to Fig. 62, it will be seen that the press has two end and one central plate grooved vertically. The combs are cut out of the frames and, without uncapping, are wrapped in one thickness of straining calico, on one side of which, against the grooves of the plate, is placed a

piece of woven wire, eleven to twelve meshes to the inch, the same size as the grooved plates. This wire prevents the combs being forced into the grooves when they are squeezed up. When the handles are turned and the plates drawn together by the screw, the pressure forces the honey through

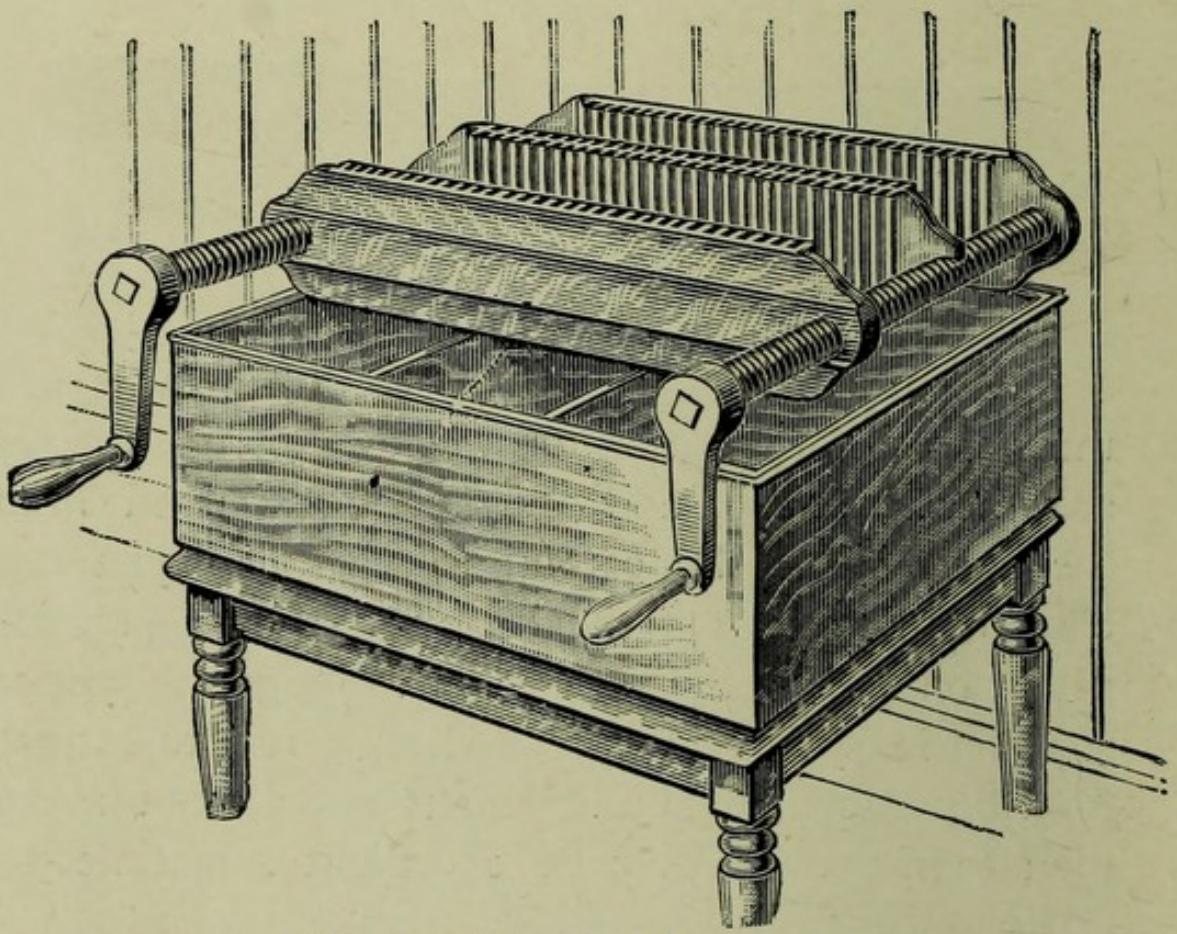


Fig. 62.—Heather Honey-press.

the straining calico into the vertical grooves, from which it runs down, quite clear, into the receptacle below. The pressure is so even that every particle of honey is extracted, and nothing remains but a nearly dry sheet of wax.

As already said, it is not advisable to extract from brood-chambers, but apart from this, when honey has been closely extracted from supers, if a time of

scarcity follows, when bees are unable to collect food, they may require to be fed.

After a quantity of honey has been extracted, strain it by means of the appliance shown (Fig. 63). If the extractor can be raised high enough to allow of the honey running from the usual treacle-valve at bottom into the flannel "strainer," seen raised up in Fig. 63, it will pass through into the can below. It may then be allowed to settle and ripen. If kept in a warm place, at a temperature above 80° Fahrenheit, in a few days it will be fit for putting into jars, and can be drawn off by means of the valve at the bottom of the can. The thin, liquid portion of honey which floats on the top, may be used for feeding bees, as it is liable to ferment in the jars after a time.

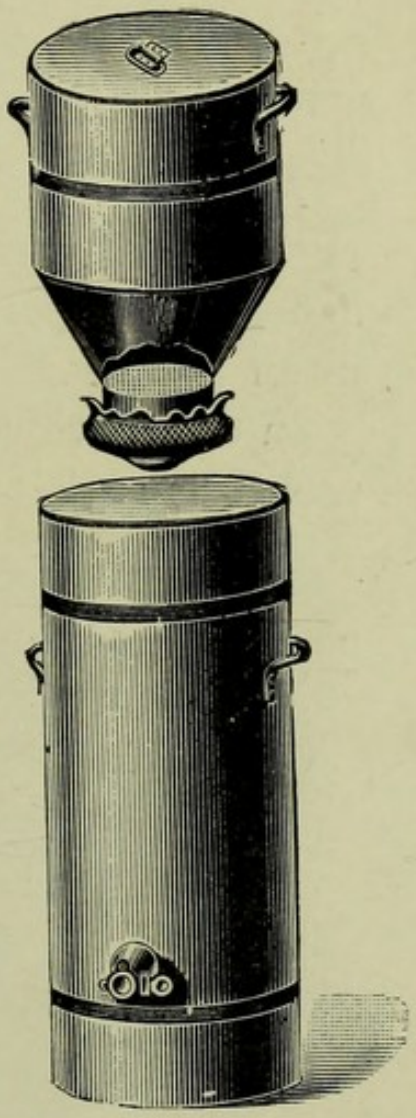


Fig. 63.—Honey-ripener.

Although the inside gearing of an extractor is generally made to take out, it is not necessary to do so for cleaning. Revolve it, and from a kettle pour boiling water on to every part of the inside; pour this off and rinse, and the machine will be found perfectly free from honey.

Extracting should almost always be done indoors to prevent robbing. It can only take place outside

when honey is very abundant. Nor should combs ever be removed for extracting if robbers are troublesome, robbing being a sure sign that the yield of honey is failing.

XIII.—WAX-EXTRACTING.

Although by the use of comb-foundation we secure good straight combs, there will always be in a large apiary some combs and scraps of comb only fit for melting.

In transferring we may have old crooked combs, useless as such, together with superfluous drone-comb

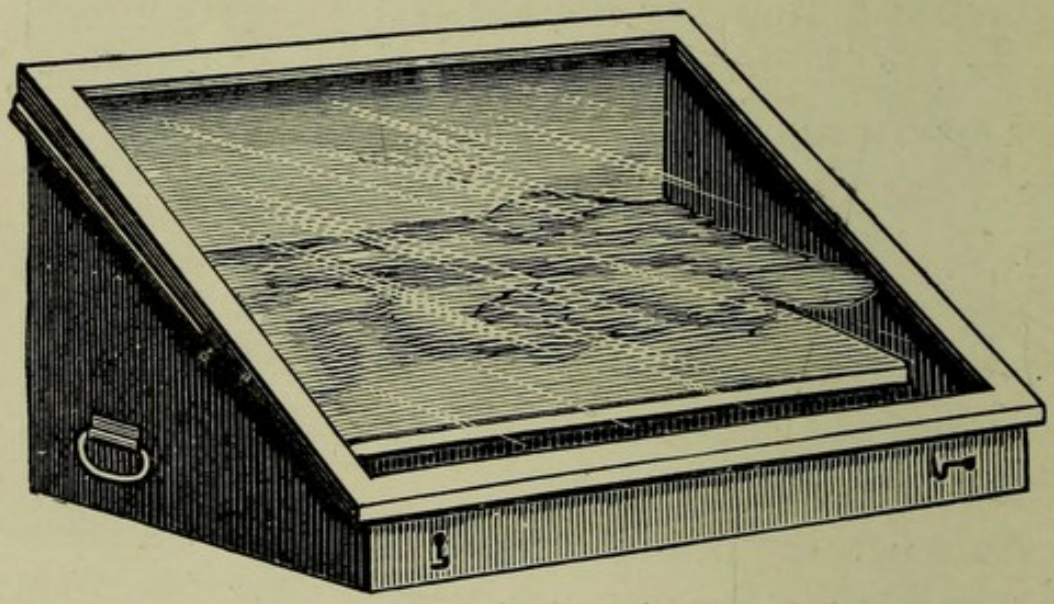


Fig. 64.—Solar Wax-extractor.

cut out of frames. These scraps should be melted down into wax as soon as possible and not allowed to lie about, as they would afford a harbour for the wax-moth. The simplest apparatus for this purpose is the Solar Wax-extractor (Fig. 64), but in our climate it is only available during the summer months when

the sun shines. It consists of a wooden box with a double glazed frame sloping from back to front. A slightly inclined tin tray is fastened to the sides and back, $\frac{1}{4}$ of an inch above which is fixed a fine tinned wire gauze; on this the combs or pieces of wax are laid. If the apparatus is now placed in the sun, so that the rays strike the sloping glass, the wax will melt and run quite pure into the receptacle in front of the tray, leaving nothing but the residue behind on the wire gauze. Another method is by using the wax-extractor devised by Professor Gerster, and improved by D. A. Jones, shown at Fig 65. It consists of an outer tin cylinder, A, having a dish, D, inside, communicating with the outlet, C. Between this dish and the outer cylinder, there is a space to allow the steam to pass up to the basket. There is also a tube up the centre of basket for the same purpose. The perforated tin basket, B, is supported on three pieces of metal, about an inch from the bottom of the dish. To set it to work, the basket, B, is filled with comb, and inserted in cylinder, A. The lid is put on top, and the whole placed over a pan containing water on the fire. When the water boils, steam passes through the openings in the direction shown by arrows, and

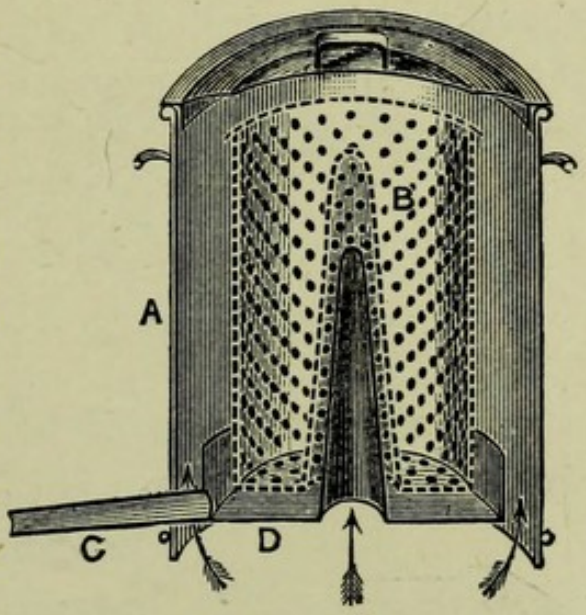


Fig. 65.—Gerster's Wax-extractor.

melts the wax, which oozes through the perforations in the basket into the dish, and then runs from spout, C, into a basin of water, leaving the refuse in basket, B. Wax extracted by this method is free from impurities, and of a beautiful colour. This extractor can also be used for putting in cappings from the combs when we are extracting; the honey is drained from them, and when the basket is full the wax may be melted. The machine, when not in use, should be kept covered, with the outlet corked, and every scrap of comb put therein as it accumulates.

Where only a small quantity of wax has to be melted the combs may be placed in a fine sieve over a pan of water and put into the oven. The heat of the oven melts the wax, which drops into the water, and it can be taken off in a cake when cold.

XIV.—MARKETING HONEY.

The market value of honey depends largely upon the manner in which it is offered for sale; that which presents the neatest and most attractive appearance will sell most readily at the highest market price.

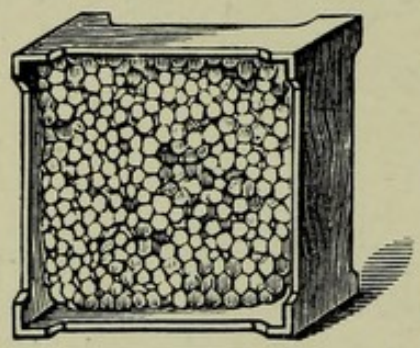


Fig. 66.—Completed Section.

As soon as completed sections, Fig. 66, are removed from a hive, they should be placed in a storing crate, as shown in illustration, Fig. 31.

When preparing for market sections should be

examined and sorted into three classes. Those of the first class should be the very best, clear, even, light-coloured, and free from any defects. One inferior section of honey would lower the price of the whole lot. It is also important that the wood of the sections be clean and free from propolis, as this makes them more attractive in appearance. These can be put into marketing crates and neatly labelled with the name of the producer, and, if known, the source from which the honey was derived should be stated. Second and third qualities must also each be put into separate crates, and sold at a lower price.

The best marketing crates have springs at top and

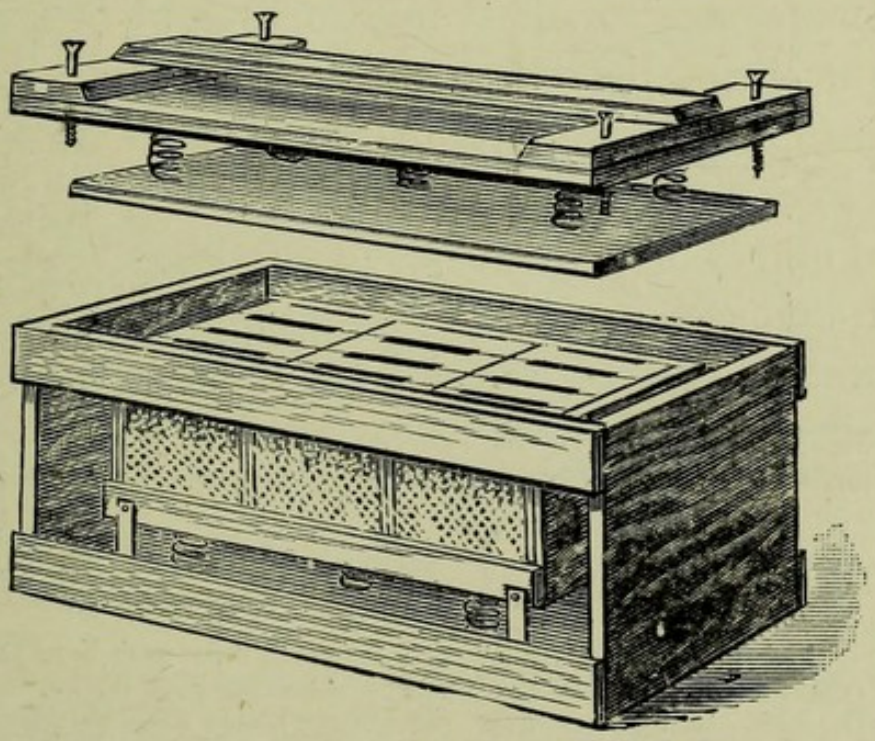


Fig. 67.—Honey Marketing Crate

bottom to prevent the combs from being damaged by the jarring during travelling, Fig. 67, and are made to hold one dozen sections. They are glazed on two sides, and the contents being visible ensures careful handling. When filled with neatly-finished sections

they have an attractive appearance, show off to the best advantage, and can be thus preserved for a great length of time if kept in a warm room. Extracted honey should be put up in neat jars of 1 lb. or 2 lbs., Fig. 68, with ornamental labels. It is important that the glass be clear, otherwise it spoils the appearance of the honey. Pure extracted honey will usually granulate if kept at a low temperature. The labels on the jars should draw the purchaser's attention to this important fact; and when the public have learned to understand that granulation is a test of its purity, English honey must have the preference to that imported, and which is often mixed with glucose, ostensibly to prevent its granulation. Cut-comb honey in jars is frequently adulterated in this manner—a piece of comb-honey being placed in the centre and surrounded with glucose. The following is a full-sized specimen of label recommended :—

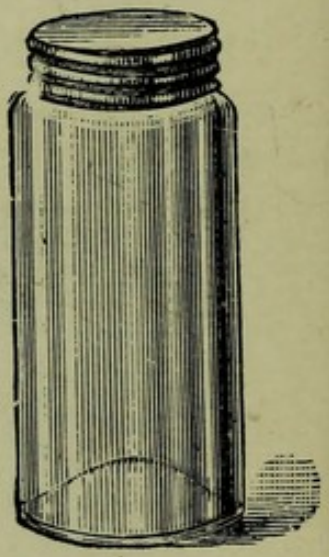


Fig. 68.

TAKE NOTICE

This honey will candy, or become white and hard, as soon as cold weather begins, and this candying is, in fact, the best proof of its purity. To restore honey to liquid form, immerse the jars (after removing the caps or covers) in a vessel partly filled with water; then heat gradually till the finger cannot be comfortably held in the water. When thoroughly melted and clear, remove the honey and cover down while quite hot. If this be done, it will usually not candy again for a long time. The jars, while heating, should stand on strips of wood, thus allowing the water to pass below and round the jars.

If the jars are corked, and the corks covered with metal capsules, their appearance is improved.

Jars with white metal screw-caps (Fig. 68) are in great favour, and if the pieces of cork used with these are first dipped in molten wax, and the top screwed down upon them, there is no danger of leakage. In addition there should be a label giving the producer's name, and stating the source from which the honey was gathered.

The best crate for packing honey is shown in Fig. 69. It is in compartments, with a layer of cor-

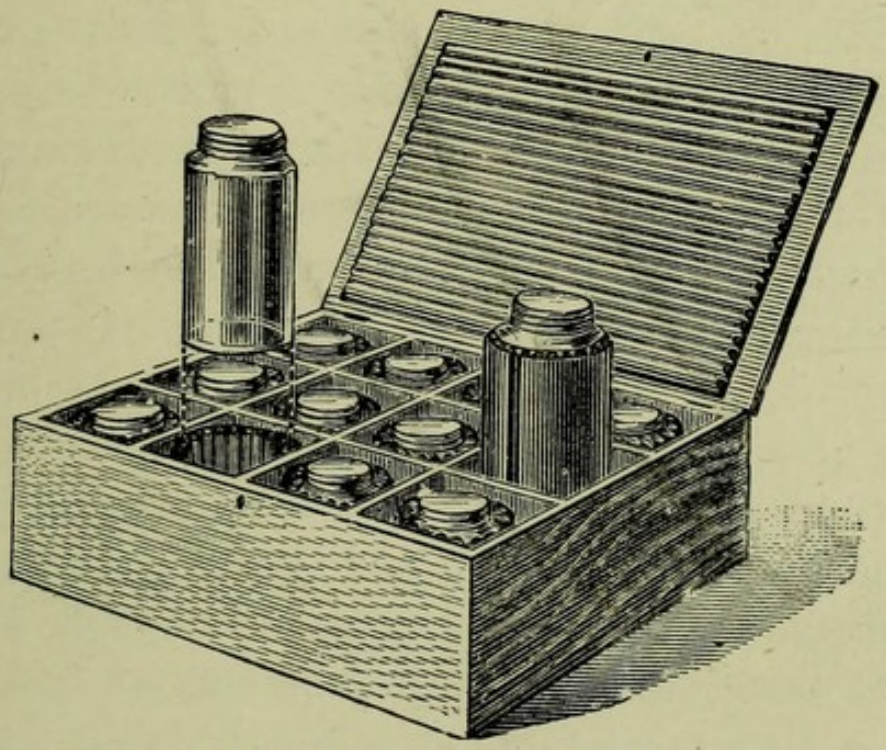


Fig. 69.—Packing-crate.

rugated paper at the bottom and on the top; also surrounding each jar. None but the best honey should be sent to market, all of inferior quality or unripe being utilised in the apiary. The retail value varies from 10*d.* to 1*s.* a pound in sections, and from 7*d.* to 10*d.* a pound for extracted honey. But no fixed prices can be given, for, as a rule, the prices depend upon the supply and demand.

The demand for English honey is rapidly increasing, and at shows that which has the neatest appearance readily finds a sale. None but the very best-looking honey should be exhibited in competition; the British Bee-keepers' Association and most County Associations requiring that sections be sent to shows in marketing crates.

At many exhibitions the sections are placed in coloured cardboard boxes (Fig. 70) having glass in front and at the back, so that both sides of the comb may be examined. A narrow lace-paper border adds considerably to their neat appearance. Fancy tin cases have also been introduced, coloured of different tints, with glass on both sides and $\frac{1}{4}$-inch borders.

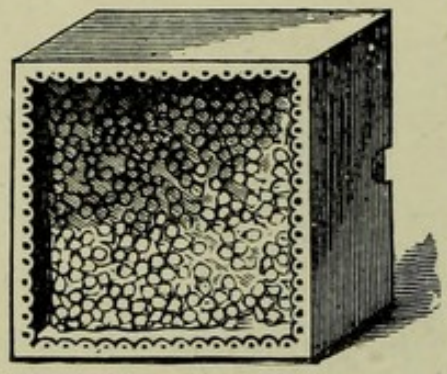


Fig. 70.

In connection with many of the County Associations, depots have been established for the purpose of assisting bee-keepers to dispose of their honey. Several Associations also provide special labels for attaching to the honey of members, thus guaranteeing its genuineness. The British Bee-keepers' Association have issued a leaflet entitled "Honey as Food," which has had a wide circulation, and may be procured from Mr. Edwin H. Young, Secretary, 12, Hanover-square, London, W. The demand for British honey having, as stated, largely increased, it may now be seen in the windows of all respectable grocers. Bee-keepers have, therefore, no difficulty in disposing of their honey. It is encouraging to

the British bee-keeper to know that, notwithstanding the larger amount of honey produced in the United Kingdom and the large importations from abroad, the demand for British honey is such that all we can produce in these islands will find ready sale.

XV.—ARTIFICIAL SWARMING.

The uncertainties of natural swarming in our variable climate are so great, that the surer and safer method of artificial swarming has been adopted by most advanced bee-keepers.

It has been stated that bees on the point of swarming are frequently prevented from doing so by the state of the weather, and that sometimes they do not swarm at all. During all this time they are in an unsettled state, doing little and wasting much valuable time.

The saving of time to the bee-keeper is an important item in favour of artificial swarming, as with the movable-comb hive an artificial swarm can be made in a few minutes with a certainty of its doing well if the necessary conditions and rules are strictly observed.

As soon as a stock-hive is crowded with bees and contains drones, and honey is being collected abundantly, it may be swarmed artificially on some fine day. Do not wait to see if the bees are likely to swarm naturally and then do it, but make an artificial swarm at once and so save time. Never delay until it is so late in the season that the bees will not have

time to fill their hives with a strong population before winter.

To make Two Colonies from One. — Take a comb of brood and bees on which the queen is found and place it into a hive, filling up the latter with empty combs or comb-foundation. Then place it on the stand where the stock stood, removing this to a new location. Cover up the hive, and all bees on the wing will return to the old stand, join the queen, and form the swarm. The old stock should have the frames brought close together, and an empty comb inserted at the side of the hive in place of the one taken out. This hive may have a laying queen introduced, or a ripe queen-cell may be given it on the second day after the operation.

To make Three Colonies from Two. — This very simple method is usually most successful, and may be practised by those who desire a large amount of honey with a moderate increase of colonies. It is impossible to get both a large quantity of honey and a large increase of swarms in the same season, except by great skill in management.

On a fine day, when most of the bees are flying, remove five frames containing brood and eggs from a strong colony and shake or brush all the bees back into the hive; place these frames into a new hive, and fill up both hives with frames containing comb-foundation or empty comb; remove another strong stock to a new stand, and place the new hive where it stood. In this manner one colony furnishes the

combs, while another supplies the bees, because those belonging to the hive removed to a new stand will return to the old spot and provide the new hive with the necessary population. These will at once commence queen-cells, but if we have a fertile queen to spare she may be caged on one of the combs and liberated in thirty-six hours. (See Introducing Queens.)

ANOTHER METHOD.—If the bee-keeper has five moderately strong colonies he may select four stocks, take two combs from each, and brush all the bees back into their hives: insert two frames of comb-foundation in each hive to fill the vacancies, placing them near the middle, with a brood frame between. Insert the combs removed into a new hive. Now remove a fifth strong stock to a new stand, and place the hive containing the combs in its place. The bees returning to their old stand will furnish sufficient population to protect the brood and raise a queen. If we can insert a fertile queen there is a gain of three weeks, and the careful bee-keeper will always have spare queens on hand for introduction when needed.

XVI.—NUCLEUS SWARMING.

This is by far the best system of any yet described. The queen is matured and fertilised before the final swarming is performed; there are no queenless parts, and the labour of the hive is carried on with a

rapidity only observable in hives where the presence of a young fertile queen inspires industry and prosperity; and honey is stored in sufficient quantity to repay the bee-keeper for the proper management bestowed upon them.

Examine one of the nucleus hives in which a queen has been reared (see Queen-rearing), and if she has commenced laying confine her in a queen-cage. Remove the division-boards, and fill up the hive with frames containing empty comb or comb-foundation. Now remove a strong stock to the stand occupied by the nucleus and place the latter where the stock stood. Thus the old bees from the old stock, returning to their former stand, enter the nucleus, while those from the latter, and the young bees remaining in the old stock, will take care of the brood until increased in number by the rapidly-hatching bees. After thirty-six-hours the queen in the nucleus may be liberated (see Introducing Queens). By this method the bees should be swarmed in fine weather only, when a large number are flying; otherwise, if the nucleus appears deficient in numbers, it should be strengthened by inserting frames of capped brood taken out of the parent or other hives. If the queen is not caged we run the risk of losing her, because if the supply of forage has been temporarily checked, the bees returning to the hive will not be filled with honey, and would attack the queen and probably destroy her. If the nights are cold when the swarming has been done, the heat of the hive should be economised by only allowing the bees as many frames as

they can crowd, contracting the space by division-boards. As soon as the combs are built out, add empty combs gradually until the hive is filled. In this manner the bees only have to heat the space they occupy for work.

By this system, not only a large amount of honey is obtained, but it is frequently safe to make another swarm from the same hive. The desire to swarm naturally is checked, and all the difficulties experienced with other systems are overcome by a process so easy and gradual, that a bee-keeper of intelligence can manage a large number of hives with both pleasure and profit.

SWARMS FOR SALE.—In making artificial swarms for sale, a sufficient quantity of bees are shaken from the combs into an empty hive, care being taken to secure the queen with them. The hive may then be placed for a short time on the stand occupied by the old stock, until sufficient bees have joined the swarm. The latter is then removed and the old stock returned to its place.

Artificial swarms by any of the foregoing methods should only be made when stocks are very strong, honey abundant, weather fine, and drones present Weak stocks should never be swarmed.

XVII.

SUBDUING AND HANDLING BEES.

Many persons would be glad to commence bee keeping were it not for a natural dread of being

stung. The stings of bees are given them as weapons of defence for the protection of their stores, and they are seldom disposed to use these weapons unless danger threatens. Bees under any circumstances cannot resist the temptation to fill themselves with liquid sweets, and with their honey-sacs full rarely sting unless hurt. They also, on being alarmed, immediately begin to fill themselves with honey from their combs. It will, therefore, be seen that to make bees harmless it is simply necessary to frighten them into gorging themselves with honey, when they may be handled with comparative impunity. This may be effected in various ways; one of which is to blow into the hive a few puffs of smoke. Brown paper, rags, old fustian, corduroy, or decayed wood, answer the purpose; but care should be taken not to stupefy the bees by giving too much. A good bee-smoker is indispensable, and one of the best for this purpose is that known as the "Bingham," Fig. 71. In it the fuel will burn for hours without going out if fed at intervals with the materials above described, and will eject a large volume of smoke to a distance of a couple of feet. After allowing the bees a few seconds to fill themselves from their stores the hive may be opened and a few puffs of smoke blown in under the

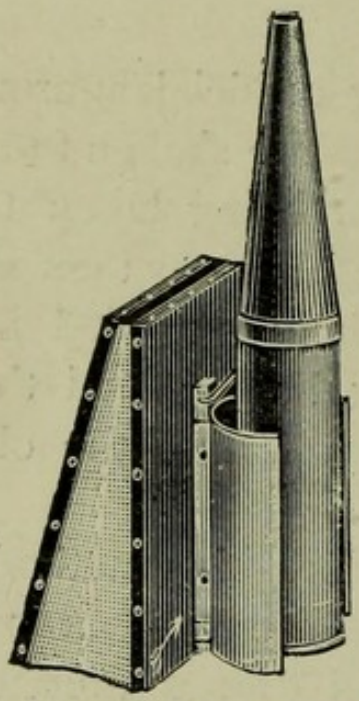
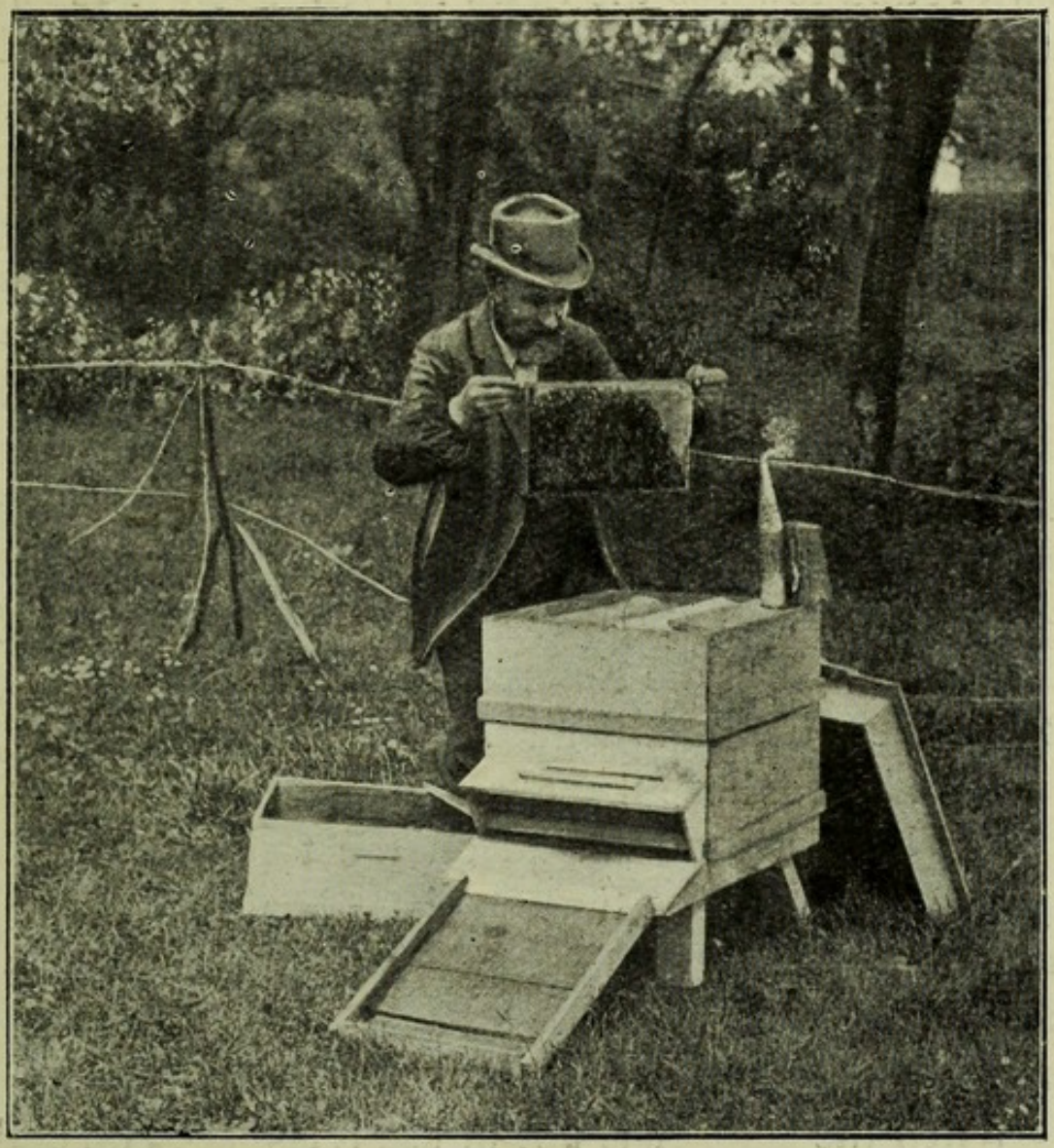


Fig. 71.—Bingham Smoker.

quilt. If there is no honey in the hive with which the bees can fill themselves, on removing the quilt, sprinkle them with a little very thin syrup before commencing operations.



Examining Combs in Frame-hive.

Push the division-board on one side, to give room for moving frames laterally. Take hold of first frame by the projecting shoulders, and carefully lift it out of the hive without crushing a bee. Raise it

to the level of your face and examine it. When reversing comb to examine the other side, lower your right hand and raise the left until top-bar of frame is perpendicular; now give the frame a half turn round towards the right, lower the left hand and raise the right so as to bring the top-bar to a horizontal position. Care should be taken to keep the comb perpendicular, or it is liable from its weight to fall out of the frame (see page 103). With wired combs such accidents are, of course, not likely to happen. (See methods of wiring foundation, pages 70 and 71.) When both sides are examined, reverse the operation and bring the comb to its original position. It can now be hung on the comb-stand (Fig. 80, page 129), and the other frames examined in like manner. In replacing frames do it slowly, so as to allow any bee upon feeling the slightest pressure to creep from under them before it is hurt. When the frames and division-board have been returned to their proper places blow a little smoke on the top and replace quilts, one layer at a time so that the bees may get away amongst the combs. During the examination give the bees more smoke occasionally to keep them under subjection.

When the smoker is not in use it is placed on end, as Fig. 71; the tube, acting as a chimney, causes sufficient draught to keep the fuel smouldering. When done with, it is laid horizontally, the nozzle stopped with a wooden plug, and it will then go out.

Carbolic acid, introduced by the late Rev. G. Raynor is, from its easy application, frequently used

It has its advantages as a bee-quieter, causing less disturbance than smoke, and is equally as effective. It is also a powerful disinfectant and preventive of foul brood. Being a most powerful poison, and easily blistering the skin, extreme care is required when dealing with it, in the following way :—Put 1 oz. of Calvert's No. 5 carbolic acid and 2 oz. of water into a medium bottle. Into this fit a cork with a groove cut length-ways along the side so that after the bottle is shaken and inverted the contents will come out in drops. Cut a piece of calico to cover the hive (18 inches square) sprinkle it with the solution, just to damp it, roll it up, place in a tin and keep covered until wanted for use. When about to examine bees, gently strip off the quilt and at same time pull the carbolic cloth over the frames. After a few seconds the bees will go down and the cloth can be folded back while the combs are examined. Should the bees come up and appear troublesome, draw the cloth over the frames again.

When bees swarm naturally, they are filled with honey, and this is why they are not inclined to sting at such times

Bees may be easily removed from the frames by shaking them off the combs. Only strong combs, however, admit of this treatment. Take hold of projecting ends of the frame and hold the latter in a perpendicular position (see page 99) ; now bring it down with both hands quickly, and when within a couple of inches of the top of the hive, stop suddenly. This jerk precipitates the bees into the hive. Combs

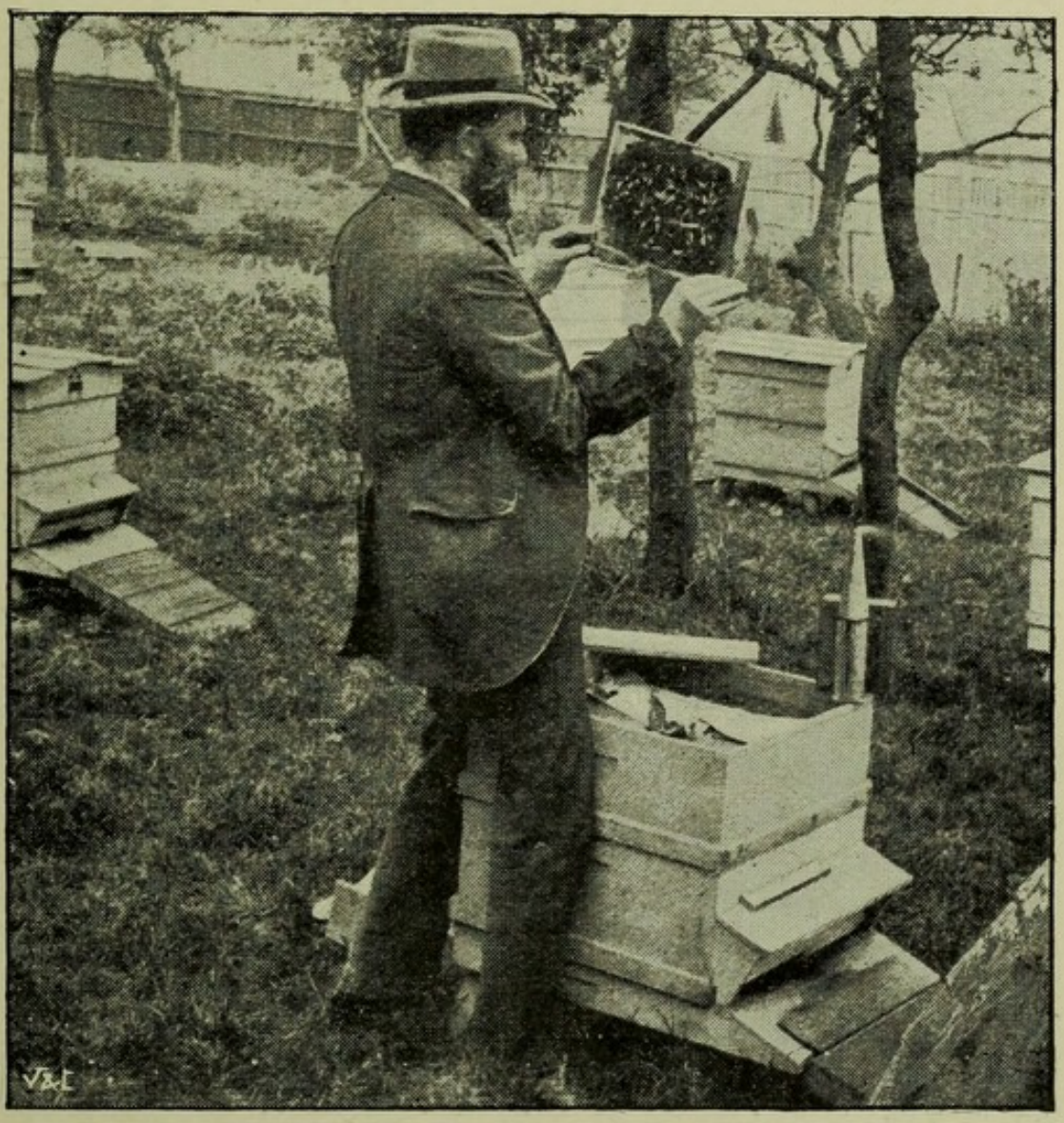
containing queen-cells should never be shaken in this way, as the royal occupants are likely to become injured by so doing.

Bees may also be easily brushed off the combs, with a light dusting-brush ; a feather from a goose wing is also useful for this purpose. Take care to brush combs from the top downwards, as most of the bees will have their heads turned towards the top of the frames, and if brushed any other way they become very much irritated and dart at, and endeavour to sting both the brush and the hands of the operator.

As a rule bees never use their stings except in self defence, therefore in all operations it is necessary to proceed cautiously and quietly, and to take great care never to crush a bee. A bee-veil, Fig. 72, to protect the face, and india-rubber or thick woollen gloves on the hands, will often give the bee-keeper confidence ; but gloves will soon be dispensed with as clumsy in performing delicate operations. When honey is plentiful, bees in full work, and the bee-keeper has obtained courage and experience, the veil will be less frequently used. The veil should be made of coarse black net, 1 yard by 18 inches being sufficient. Fasten the ends together, run a hem round the top, insert an elastic, and draw it up until

Fig. 72.—Bee-veil.

it fits round the crown of a hat. The rim of the hat keeps the veil from the face, and the lower end can be tucked in under the coat about the neck. Those who are afraid of having their hands stung should rub on them a little of "Grimshaw's Apifuge."



Examining Combs : Bottom-bar upward.

By improper management, such as jarring the combs, brushing bees off them the wrong way, or quick motions, they are excited to anger; human breath, too, is often offensive to them. The smell

of their poison also, arising from a crushed bee or from the sting inflicted in the clothing of the bee-keeper, irritates them. If stung, remove the sting as quickly as possible with the point of a pen-knife, and avoid any rubbing, as by this means the poison is diffused. Various remedies have been recommended, but in many instances they are worse than the sting, and as no two constitutions are alike, what will alleviate the pain in one case very often produces a contrary effect in another. Tobacco, moistened and rubbed on the affected part, a little honey, or "Apifuge," also stop the irritation. While some persons suffer more from the stings of bees than others, those who have been stung a number of times feel little or no pain.

XVIII.—UNITING.

A large cluster of bees is able to maintain the proper degree of warmth in cold weather better than when divided into two or more small clusters, and the consumption of food is less. If weak colonies are found in the apiary, they should, if healthy, be strengthened by helping them with comb, brood, or honey taken from strong colonies which can spare it, or two of them may be joined together.

Established colonies in movable-comb hives can be united without removing the bees from the combs. Bring the hives close to each other (see Moving Bees), and induce the bees to fill themselves with honey from their stores by any of the methods recommended (see Subduing Bees). Open the hives

and place the combs with the adhering bees alternately into one hive If there are more combs than one hive can receive, insert those containing brood in the centre, and fill up the hive with combs containing honey. Should there be any choice of queens,

Uniting Swarms.

remove the inferior one. Cover them over, and all the bees being filled with sweets, and so completely mixed, they will generally unite peaceably.

Swarms issuing the same day may be united by shaking them together on a sheet; or, if one has

already been hived, in the evening shake out the swarm from the hiving-skep on to a sheet in front of the hive containing the first swarm to which it is desired to unite it, as shown on preceding page.

As success in uniting depends on the bees having the same scent and being filled with sweets, if it is found when the hives are opened that they contain no honey, the bees should be sprinkled with very thin syrup, which may be scented with a few drops of essence of peppermint or of aniseed, otherwise fighting might result. For this purpose a scent-diffuser, Fig. 73, is useful, and as each frame is lifted out of the hive, the bees on both sides of comb can be sprayed with the syrup. Both hives should be treated in the same manner, and as all the bees will now have the same scent the success of the union will be insured. This should always be done in uniting a queenless colony to one having a fertile queen; and if the queen be a choice one, we should take the additional precaution of caging her on one of the combs for twenty-four hours (see Introducing Queens).

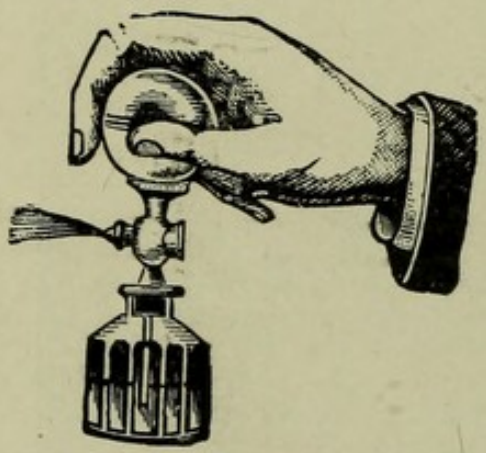


Fig. 73.—Scent-diffuser.

Another way is to make an artificial swarm of all the bees in the queenless stock by brushing them off the combs into an empty hive. Sprinkle the other stock with scented syrup, set the hive on a sheet, and raise its front edge. The other bees may now be sprinkled with the scented syrup and shaken

on the sheet in front of the stock-hive, which they will readily enter. If it is desired to join a swarm to a full stock we may proceed in the same manner, except that one of the queens must be removed to prevent their fighting. If we wish to retain the queen in the stock-hive, while the bees from the swarm are entering the hive, look for the queen, and if seen she must be taken away; for if allowed to enter, a combat will ensue between the queens, and if the one in the stock be fertile she usually falls a victim, and the bee-keeper must run the risk of losing the other queen, if not yet fertilised (which would be the case with after-swarms), while out to meet the drones.

Should we wish to unite driven bees with an established stock, great care is needed to prevent fighting. Place an empty hive by the stock, from which take half the combs, and after jerking off the bees, put these combs into the empty hive, spacing them well apart. Then throw the bees into the space between the combs and replace the quilts. In a couple of days they may be joined like established stocks.

Common flour used from a dredger may replace the syrup in all these operations, provided the bees are thoroughly dusted over with it. This is by far the quickest method of uniting, and has the advantage of not inducing robbing.

XIX.—FEEDERS AND FEEDING.

The time and method of feeding, as well as the food employed, vary according to the object the bee-keeper may have in view. In spring and summer bees are fed for the purpose of stimulating and preserving. Some bee-keepers consider it superfluous to feed when there are sufficient stores within the hive, and tell us that nature prompts the bees to use honey as they need it. This is true, and under such circumstances their development is sufficiently rapid for their own preservation, and they may be able to lay up for themselves a sufficient store for their own use; but the object of the bee-keeper is to ensure beyond this a large surplus, which he may appropriate to himself. To secure this he must stimulate to activity early in the season, and the cost of the food employed at this time will be repaid by greatly increasing the honey-harvest. The great secret of successful bee-keeping lies in having strong colonies always ready to gather surplus whenever a good honey flow comes. When bees are bringing in honey and pollen for feeding the brood, the queens commence laying rapidly. It sometimes happens that in early spring and summer the supply of honey left over winter is quickly consumed in raising young bees. The early flowers furnish honey and encourage this development; but when this first pasturage fails, there is perhaps very little honey in the hive and much maturing brood. A little gentle feeding will

keep such a colony prosperous, in default of which it might be thrown back in its development in a few days more than it could regain in as many weeks; because, when a colony rapidly rearing brood finds that honey is scarce both within and without, the queen stops laying and the bees destroy the larvæ and eggs.

SPRING FEEDING.—The object of feeding in spring is either to induce breeding or to preserve the lives of the bees when stores are running short, or both. Rapid development may be encouraged in spring, if honey is plentiful in the hive, by uncapping some of the sealed cells every few days with a knife, and allowing the bees to help themselves as they require it.

Should they be short of food in the hive, and the bee keeper wish to get full advantage in stimulating brood-rearing early in the season, he must commence about the end of March, or when the bees fly freely to supply liquid food (see Recipe No. 6, p. 167), and regulate his feeder in such a way that only a small amount of food can be taken down at a time. One of the simplest feeders for the purpose is the bottle-feeder, Fig. 74. The stage is a square piece of wood having a hole in the centre, over which is placed the feeding-bottle with its

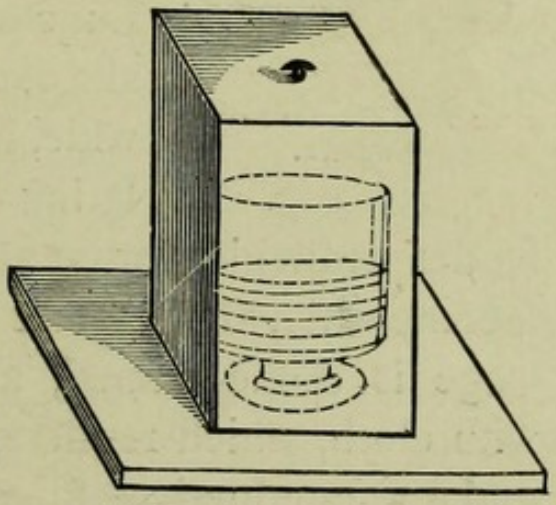


Fig. 74.—Stage and Cover for Feeding-bottle.

mouth covered with thick twilled calico. A piece of tin is inserted below the mouth of the bottle when removing the latter for refilling to prevent the bees from escaping.

Flour-candy (page 166), placed under the quilt on top of frames over the cluster, may be used instead of syrup if the weather be very cold and bees not inclined to take liquid food.

A very convenient feeder, introduced by the Rev. G. Raynor, and which avoids many objections to this form of feeder, is shown at Fig. 75. The bottle, which holds about a pint and a half, is fitted with a screw metal cap, coated inside with cork, so that when screwed on tight no leakage can by any possibility take place. The cap has a semi-circular piercing of twelve small punctures, corresponding with a slit in the stand or "stage," $\frac{1}{8}$ inch wide, and an index finger for regulating the supply, rendering the feeder available for gentle stimulation, or copious feeding when all the holes are turned on. The feeding-stage is dome-shaped, and the underside is lined with cloth, which renders it impervious to moisture, and non-conductive of heat; its diameter is $6\frac{1}{2}$ inches, depth $1\frac{1}{2}$ inches, and admitting the bees from five frames. The stand shown in Fig. 75, besides being dome-shaped, is provided with a projection in the centre to which the bees extend the cluster from the combs beneath. It is entirely of wood, and

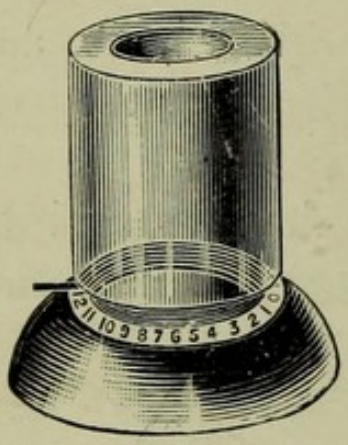


Fig. 75.—"Raynor" Feeder.

the bees come into contact with no metal. The advantages are, that when placed on the frames, over the centre of the cluster of bees, the heat, ascending, renders the interior of the dome the warmest part of the hive, and the bees can feed in the coldest weather, when unable to extend themselves laterally over the combs.

The bee-keeper is cautioned against using beet sugar for syrup, as being injurious to bees; especially as winter food. Pure cane sugar (refined) is wholesome; and being sweeter, is more economical. Raw or moist sugars are unsuitable for syrup-making; often causing dysentery in bees.

Sometimes what is known as "Scholtz candy," or, as it is commonly called, "Good's candy," is used. It is made by mixing together liquid honey and finely-powdered loaf-sugar until the consistency of dough or stiff putty is reached. Lay the paste on the frames over the cluster, and cover with the quilt.

SUMMER FEEDING.—Swarms, unless they have partially-filled sections on them, should always be fed, more especially if the weather be cold and rainy, giving them not more than half a pint of syrup a day; whenever there is a check in the flow of honey, and the bees are short of food, it should be given to them. In many places bees do little between the time the fruit trees have done blooming to the time clover appears, and again from the end of clover bloom to middle of August. If they are fed and kept strong at these times they will not fail to repay the loan with interest, and enable the bee-keeper to secure a larger harvest than he other-

wise would do. At such times it is better to feed with diluted honey, or the thin extracted honey that floats on the top of the ripening-can, Fig. 63, because if we use the extractor we then run no risk of having syrup stored instead of honey.

At the close of the honey harvest it is frequently advantageous to resort to "stimulative feeding," the object being to raise young bees. The food should be given slowly and regularly to the amount of quarter of a pint every evening. By this means the queen is encouraged in egg-laying, resulting in the raising of a large number of young bees. These will keep the stock strong until those hatched in the spring take their place.

AUTUMN FEEDING.—This should be commenced not later than the middle of September. If, after

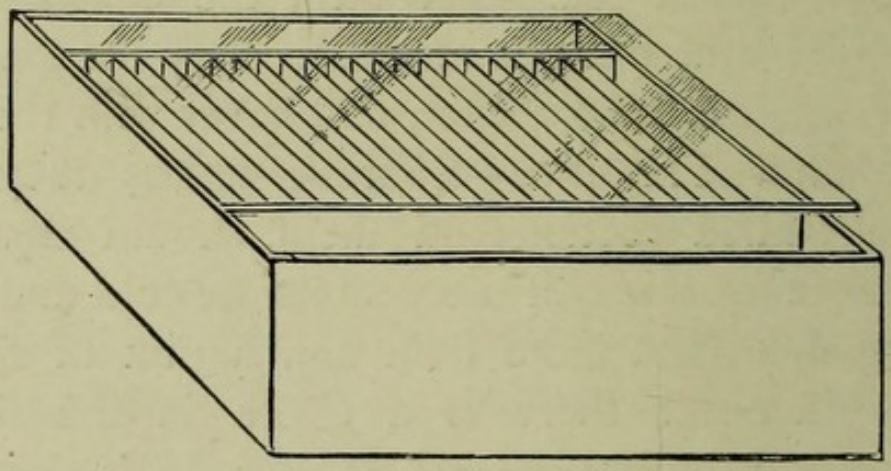


Fig. 76.—Rapid Feeder.

the honey harvest, we have kept the bees breeding by stimulative feeding, it should be discontinued now, and the stocks fed up as rapidly as possible every night with warm syrup of a thicker consistency than that used for stimulative feeding (see Recipe No. 7, page 167).

Fig. 76 shows a rapid feeder used for this purpose, which holds from 10 to 20 lbs. of syrup.

When our hives contain about 30 lbs. of sealed stores, feeding must be discontinued, and all uncapped syrup extracted (see Wintering).

The hives should have about two superficial feet of sealed honey, which will last the bees well through the winter and early spring.

WINTER FEEDING.—When supplies run short in winter there is nothing better than candy. This can be placed on the top of the frames under the quilt, and the bees will consume it as fast as they need it (see Recipe No. 2, page 165), or frames prepared and filled with candy may be inserted in the hive, at the sides of the cluster.

FEEDING TO PRODUCE COMBS.—At times when forage is scarce bees may be profitably employed in drawing out comb-foundation. Frames filled with full sheets are placed in the centre of the brood-nest, and by gentle feeding the bees work them out; and if no eggs are deposited in them they can be removed. If, however, breeding has been already commenced, remove the outside combs or those containing no brood, and store them away for future use. Empty combs are always useful, and a large supply of these should always be on hand when working for extracted honey on the storifying principle. Empty combs given to swarms give them several days' advantage over those not thus provided. Some drone as well as worker-combs should be worked out, as these may be wanted for rearing drones.

ANOTHER PLAN OF RAPID FEEDING.—Instead of feeding each hive separately, and keeping all the colonies in commotion, the idea occurred to me that one hive might be made to store syrup for all the hives in the apiary. For this purpose I had a paraffin stove fitted so that one hive could be kept at a high temperature day and night. A large feeder (Fig. 77), holding about half a gallon of warm syrup, is placed on the top of the hive, and replenished as fast as the bees take the syrup down. In this way they very quickly fill and seal their combs from top to bottom. As fast as the combs are completed they are removed and distributed amongst those hives requiring stores, giving the hive empty combs to fill. By adopting this method a large number of combs may be filled and sealed in a very short time. Fig. 77 illustrates the feeder used for this purpose. The stove may be dispensed with if one stock is fed up rapidly, commencing in September.

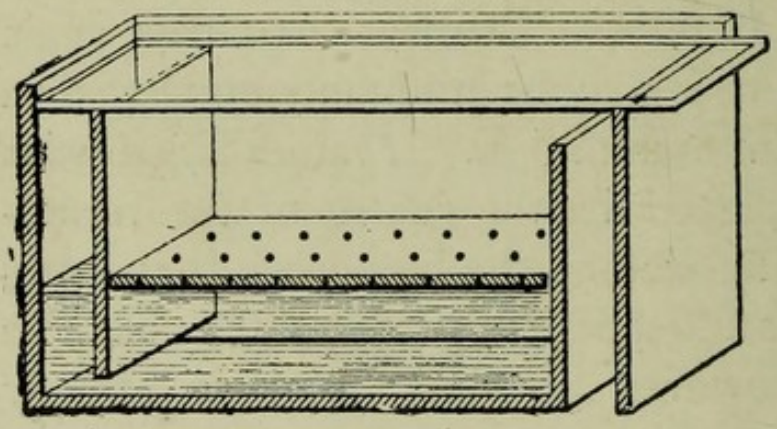


Fig. 77.—Half-gallon Feeder.

POLLEN.—Besides syrup, pollen is required in rearing young bees. As soon as the bees begin to fly in spring, if they do not gather pollen in abundance naturally, they should be furnished with it. Pea, lentil, and wheat flour or oatmeal, will answer the purpose. This should be placed in a sunny

corner sheltered from the wind. Chaff or sawdust mixed with it will enable the bees to gather it better, as it gives a foothold, and prevents them from being smothered in the flour. A little piece of comb containing honey placed on the floor will attract the bees. This artificial pollen should be supplied so long as they will take it. When natural pollen is abundant the artificial substitute is disregarded.

WATER.—Bees need water constantly. If there is not a natural supply in the vicinity of the apiary we can give them what they want by filling a glass jar with water and inverting it on a plate, so that a small amount of liquid escapes round the mouth, and the bees will help themselves to what they require without any danger of being drowned. A teaspoonful of salt can be added to every pint of water.

Among other extemporised "watering-places" may be mentioned :—A small barrel with a tiny hole bored in its lower edge, which allows a constant drip to fall on to an inclined board reared up to receive it.

Some bee keepers use an open water-tub with a number of corks floating on the water. These form good resting-places, and save the bees from drowning. Others, again, use spent tea-leaves, kept moist by constant wetting, as needed.

CAUTION !—One general caution is necessary in feeding. Always contract the entrance, and make quite sure that no bees can get at the food-bottle from the *outside*. Should the roof or other movable parts of the hive not be perfectly bee-tight, the bottle

must have its lower edge wrapped round with a roll of such material as will keep robber-bees from reaching the syrup from outside (see Robbing, page 155). A convenient form of cover is shown at Fig. 74. This, placed on the stage over the food-bottle, will exclude all robbers.

XX.—MOVING BEES.

When either newly-hived swarms or stocks are placed on the stands, the bees, on leaving the hive, mark the locality. If, therefore, it becomes necessary to remove stocks at a time of the year when the bees are flying, they must be taken a distance of two miles or more, otherwise many of them will return to their old stands, and be lost.

PACKING BEES FOR TRANSIT.—When preparing stocks of bees for travelling long distances by rail or otherwise, much care is necessary in order to save them from damage at the hands of porters or others unaccustomed to handle such things. If in skeps, a rough, lidless box should be procured sufficiently large to hold the skep—when inverted—and allow its mouth to be below the top of box. Some very open material, such as coarse net or cheese-cloth, should be used as a covering, stretching it tightly and securely across the skep. A few shavings will make it stand upright in box, and with a stout cord to carry by and a label "*Live bees with care*," it should be pretty safe—with ordinary usage. There are, of course, times and conditions when only an

experienced person can judge whether or not it is safe to send bees by rail.

Stocks in frame-hives can be made more safe in transit because of the facility for giving ventilation *above* and *below*. With tough combs in weather not too hot for travelling in, all will go safely for long distances by packing as follows:—Supposing the frames to have metal ends or broad-shoulders, a rack fixed to the floor-board will keep them from swinging, and a light frame of wood 1 inch square —having its upper side covered with perforated zinc or coarse net—is made of such a size that its sides rest on the metal ends and on the hive sides. When screwed down this frame not only keeps the combs steady, but allows a full inch of space above the tops of frames, into which the bees may pass for air. Air-space is got—also in increased quantity—below by setting an eke 3 inches deep on floor-board, lifting the hive on to it, and screwing all down securely to floor-board by means of a couple of angle-plates.

A piece of perforated zinc made fast over the entrance completes the packing; but if the journey be an especially trying one, and in hot weather, a hole 4 inches square may be cut in the floor-board, and a piece of perforated metal nailed on its upper side.

In sending stocks by rail they should have old and tough combs, by preference in wired frames, as new combs are too brittle to travel with safety.

Swarms, if coming from another apiary, should be moved in the evening of the day on which they issue. In this case, if conveyed by hand, the skeps being combless may be carried bottom downwards.

Arrived at their destination, the hives should be at once placed where they are to stand for the season, and the bees allowed to fly; all packings being carefully removed next day and a quilt put over the top of frames.

If stocks have to be moved but a short distance, or to a different part of the apiary, as in bringing together for "uniting," they should not be moved more than two or three feet each day, not reckoning those on which bees are not flying.

XXI.—LOSS OF QUEENS.

The loss of the queen-bee often occurs through accident or deformity, and unless remedied in time the entire colony perishes. In the act of swarming, too, the queen is sometimes lost through some accidental injury to her wings, subsequent to her first flight. In such a case she falls to the ground, perhaps into grass, and if the bees are unable to find her, she is usually lost, as although they may cluster on some branch for a few minutes, they will eventually return to the parent hive. Young queens are not seldom lost while out to meet the drones, while some are born with wings so imperfect that they cannot return to the hives; others are caught in the air by birds. The larger number are, however, lost in attempting to return to their hives. Although a young queen, when starting forth on her marital flight, endeavours to mark well the spot on which her hive stands by flying with head towards it for

several minutes before rising high into the air, yet sometimes, on returning, she misses her mark and attempts to enter the wrong hive, and is at once seized and killed by the workers guarding the entrance. This risk is increased when the hives are alike of equal size, shape, and colour, crowded close together, and all facing in one direction.

Losses from this cause may be avoided by painting the front of the hives different colours. A queen lost in this manner from a second or after-swarm, or from a swarmed stock is a serious loss, as the brood is too far advanced to raise a queen, while after-swarms are, of course, broodless.

The workers soon give evidence of the loss of their queen. They rush from one part of the hive to another, in and out, and up and down outside, the commotion continuing for about three days, usually in the morning when other colonies are quiet. They then settle down quietly and sometimes begin to work; but a dissatisfied appearance is noticeable; when returning home, instead of entering in haste as usual, they linger on the alighting-board as if undecided whether to enter or not. Drones are tolerated while other colonies have killed or excluded them; the population is reduced by continual losses, and if not re-queened the colony dwindles away, and eventually dies out.

Colonies that have swarmed, and all after-swarms, should be occasionally examined until the safe mating of the young queen is assured by the presence of eggs and brood. Failing which, steps should be at once taken to either introduce a queen (see

Introducing Queens), give a queen-cell, or a comb of brood containing worker eggs or very young larvæ, from which the bees can raise a queen. If the colony is too weak to do this, unite it with another stock. (See Uniting.)

Queens are occasionally crushed by carelessly raising frames without first spacing the combs apart to get the necessary room for lifting them out easily. In hives badly protected in winter cases occur where—without any harm happening to the bees—the queen becomes chilled, so as to destroy her fertility. Queens will also become unfertile if subjected to partial starvation for want of food. In the latter case the colony, though not queenless, gradually dwindles away—through no brood being raised—and is eventually lost.

Queens also die of old age, when from four to five years old. As soon as the fertility of the queen begins to fail, the workers usually supersede her by raising another; yet, if her loss should occur at a time when no brood is found in the hive, or there are no drones to impregnate the young queen—should they succeed in raising one—the colony will become queenless, or the unimpregnated queen a drone-breeder. In this case the queen is removed, and her place supplied with a young fertile one.

If the loss of the queen is detected in early spring, or late in the autumn, when no drones are present and a fertile queen cannot be given, unite the bees to another colony, for it would be useless to give them brood to rear a queen, as she could not be fertilised.

The careful bee-keeper will never allow queens to become old, but remove them after the second season, introducing instead young fertile ones. Occasionally, when a hive loses its queen, a fertile worker will lay eggs which only produce drones. The most effective way to get rid of a fertile worker is to break up the colony, dividing it among strong colonies having fertile queens. If a stock of bees in spring does not carry in large quantities of pollen while other colonies are very industrious, queenlessness may reasonably be suspected; no time should therefore be lost in examining the hive. A stock of bees retaining its drones alive in winter may also be noted as queenless.

XXII.—QUEEN-REARING.

As the successful management of bees depends upon having every colony strong, the practical bee-keeper will never allow any hives to be without a fertile and prolific queen. When a hive swarms or loses its queen, a period of nearly three weeks generally elapses before eggs can be laid (except by a fertile worker), and as the mortality among bees during the summer months is very great, the colony rapidly declines in numbers. But if a fertile queen be given to a queenless colony, no time is lost, and the population is kept up in sufficient numbers to insure its prosperity. To secure the best results, it is therefore advisable always to have on hand a supply of fertile queens to meet contingencies.

Some queens, too, are not so prolific as we could wish, or are, perhaps, deficient in the good points possessed by others. All inferior queens should, therefore, be removed and replaced by selected ones chosen for their good qualities from those on hand. Remember that success in honey-getting will be in direct ratio to the vigour and capacity of our queen, and the hardiness and number of her offspring.

We should endeavour to perpetuate the distinguishing characteristics of desirable stocks; therefore in selecting mothers for future queens choose such as are two summers old and have been prolific, and whose worker progeny were hardy, vigorous, and industrious. Bear in mind also that, as a general rule, queens transmit working qualities and constitution, while disposition comes from the drone.

Young queens are, as farmers say, "in full profit" the second season, and should not be kept longer unless their qualities are such as to make it desirable to perpetuate them. Preparation must be made for commencing queen-rearing early in the spring. Select your best colony, and make it strong by stimulative feeding. This hive should be furnished with worker-combs and kept for raising queens only. For drone-raising another equally good colony must be chosen, and stimulated early; when strong enough introduce drone-comb into the centre of brood-nest, and by feeding more rapidly the queen fills these cells with eggs, which in due course produce drones, ready to fly by the time they are required for fertilising queens.

In this way, by a judicious selection of stocks, we not only prevent that close in-breeding which results if queens and drones are raised in the same hive, but improve our race of bees by perpetuating the good qualities of our best stocks.

Bees subdued after "driving."

If we have induced early breeding, drones should be hatching out in April; when this is found to be the case, place a frame of clean worker-comb in the centre of brood-nest of the other hive being stimu-

lated, and this comb the queen will fill with eggs. Three days afterwards the queen may be removed and utilised elsewhere. All combs containing unsealed larvæ should also be removed and given to other colonies.

The bees will now commence queen-cells, and we can assist them by enlarging the mouth of any particular cell we wish them to start upon with a piece of wood in the shape of a cone, in such a way as to break down the walls of the adjoining cells, especially those beneath. It is advisable to get queen-cells built on the edges of the comb, so that they will hang down and be easily removed; the comb is, therefore, cut away close up to the cells desired for queens. Always endeavour to get queens raised from eggs and not from larvæ, as the former, having the advantage of abundant feeding from the first, produce the most desirable queens. If these directions are carried out, we shall have from ten to twenty queen-cells started under the most favourable conditions, and in eight to nine days from that time the bee-keeper will be ready to form his nuclei. The bees should be gathering both honey and pollen in quantity when the cells are started and until they are capped over, otherwise they must be supplied with food artificially. If it should be thought requisite to raise any more queens, all queen-cells in this hive may be removed to form nuclei, and we can again supply eggs from the same queen, and thus we keep the same queenless colony raising queen-cells until we have as many as required. When all the queen-cells are removed, we can build up the

stock by introducing a fertile queen and capped brood.

A word of caution is here needed regarding the care necessary when handling or manipulating combs on which queens are being reared. Such combs must not have bees removed from them in the usual manner by jerking downward to dislodge them; such a movement might damage, or even kill, the young larvæ in the queen-cells. The bees must, therefore, when necessary be brushed off the combs with a feather.

XXIII.—NUCLEUS HIVES.

A nucleus is a colony of bees on a small scale, and may be formed by removing two or three combs from a populous stock, one of which should contain honey and pollen and the others brood. These are placed in an ordinary hive, and enclosed by division-boards to economise the heat. The combs are removed along with the adhering bees, care being taken that the queen is not with them. As all the *old* bees will return to their hive, shake or brush the young ones from one or two other combs into the nucleus, so as to introduce about a quart of bees, which will stay and be sufficient to keep the nucleus at a proper temperature. Insert empty combs or frames of comb-foundation into the hive from which the full combs have been removed, in the manner described in Nucleus Swarming (page 95). Proceed in the same way, and form as many nuclei as there are queen-cells to introduce.

Cover the frames with a quilt and reduce the entrance, so that only one or two bees can go in and out at a time, to prevent robbing. The nuclei are now ready to receive queen-cells.

Remove the frames of queen-cells from the stock containing them, and carefully brush the bees off the combs, observing the caution with which the last chapter closes. Then with a sharp, thin knife cut out all queen-cells except one.

Be careful not to damage the cells, or the inmates may be injured; and do not expose them long to cold air or hot sun, or the royal occupants may be destroyed. Unless the bee-keeper is proficient at this work, it would be well to remove only one cell at a time, and return the frame from which it was taken to its position in the hive until the cell is inserted in its place in the nucleus. In cutting out the cell, leave a piece of comb attached to it above (see Fig. 5). The cell should now be placed between the combs of the nucleus point downwards, and secured on one of them by pinning it with one or two pins thrust through the cells attached to the queen-cell. Close up the space with the division-board, cover with the quilt, and feed with syrup. After all the nuclei have received their cells, they must be watched to see that sufficient bees remain. If too many leave, add more in the way before described. Three to four days later the queens will hatch, and in a week or so they will have become fertilised by selected drones (which would by this time be flying freely), since up to the present time we have none others in the apiary (see Queen-

Rearing). When queens are kept in nuclei until fertilised and laying, care must be taken lest the young queen on leaving the hive for mating purposes, is not accompanied by the whole of the bees, and so all be lost. To prevent this, a comb containing unsealed brood is, beforehand, given the bees to take care of, and this keeps them from decamping as stated. Bees very seldom desert young brood.

Should the cells not hatch or be destroyed, or if queens be lost (which is easily ascertained among so few bees), other queen-cells may be introduced to try again.

Having assured ourselves of the presence of the queens, we can ascertain if they have commenced to lay by examining the combs for eggs; and if any be found, the queens producing them are ready for utilising, but can remain in the hives until wanted.

XXIV.—INTRODUCING QUEENS.

When introducing queens some precautions are necessary or the bees are likely to destroy the stranger presented to them. If a queen is confined in a cage for a time on one of the combs and then released, she is generally accepted. Various contrivances have been devised for this purpose– the simplest being the pipe-cover cage, into which the queen to be introduced is placed, and a card slipped underneath. The cage and card are then placed on the comb, where it is to be fixed. On withdrawing the card, press the cage into the comb with a screwing

motion as far as the base of the cells, taking care not to injure the queen's legs. Selecting a central comb containing brood and honey, the queen is caged on this, so that she may find food when she requires it. The bees are then sprinkled with thin syrup, and a bottle of food placed on the top of the hive. In twenty-four hours the hive is then opened, and the cage removed. Watch the queen for a few seconds,

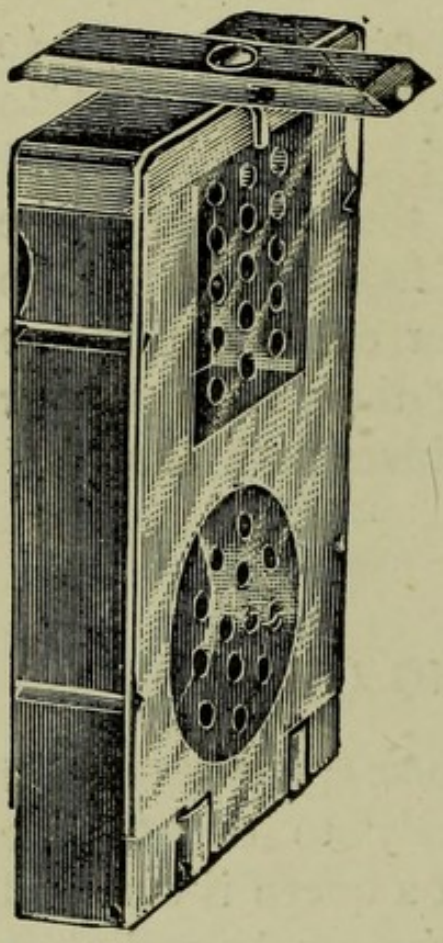


Fig. 78.—Meadows' Queen Cage.

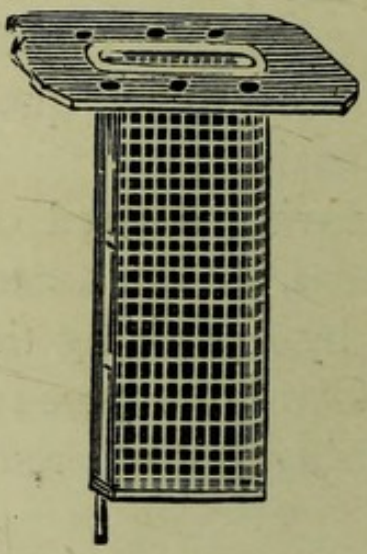


Fig. 79.—Abbott's Queen cage.

and if the bees do not attack her the comb may be replaced; but if, on the other hand, she is seized by the legs or wings, cage her again and release in the same way next day.

Other cages have been introduced which permit of liberating the queen without disturbance to the bees, the latest being Mr. Meadows' combined travelling and introducing cage made from a square block of wood (Fig. 78). In this the queen and a few bees

are confined during transit. When received, a small slide is withdrawn from bottom of cage, and the circular hole which it covers is then filled with soft candy. The cage is then suspended in the hive, and the bees themselves release the queen, by consuming the candy, and thus allowing her to pass out. A full view of the alien queen is obtained, before introducing, through the transparent celluloid which covers one side of the cage.

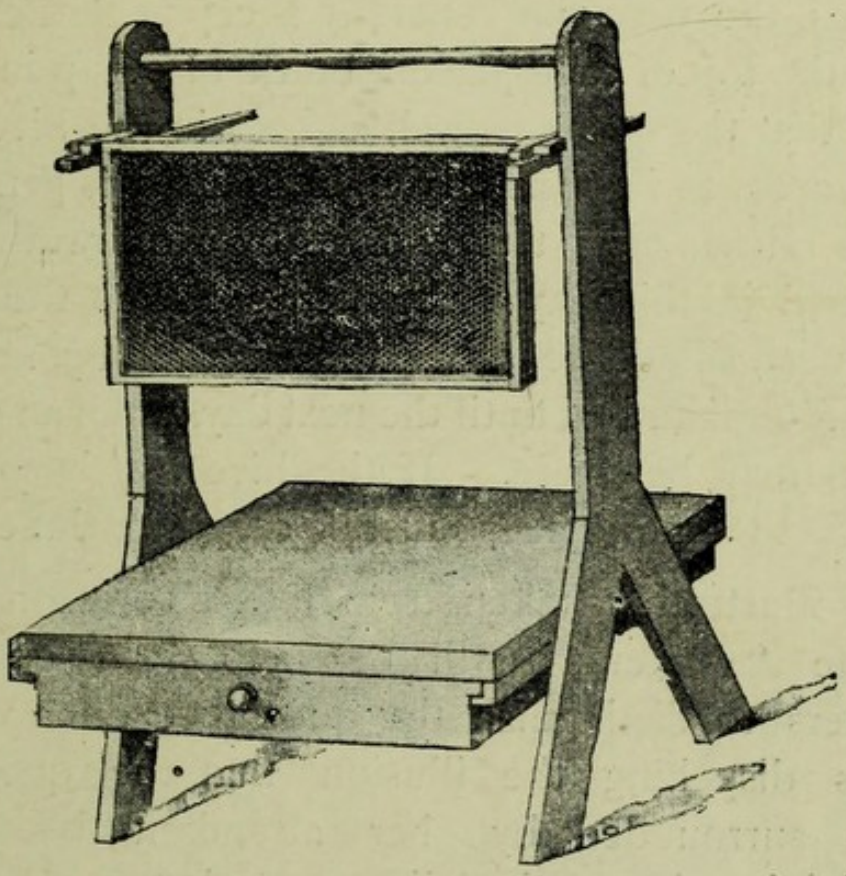


Fig. 80.—Comb stand.

In Mr. Abbott's cage, Fig. 79, on drawing out the wire at the top, the queen is allowed to escape at the side, and enter the hive without disturbance.

In changing a queen, and using the Abbott cage, she must first be removed from the hive. In order to find her most easily, open the hive on a fine day when many bees are away from home. Take out

the central comb first and examine both sides, and, if the queen is not found, hang it on the comb-stand, Fig. 80. Examine the remainder of combs until the queen is seen ; then, seizing her gently by the wings (see page 135), place her at once in the cage.

After the queen is caged, replace combs, and through a hole in the quilt introduce the cage between two of the combs. It is also advisable to cut out all queen-cells, for with no means of raising a queen, the bees will generally accept a fertile one.

On the top of cage place a bottle of syrup in such a way that the queen as well as bees in the hive may have access to it. In forty-eight hours it is generally safe to release her ; this is done by withdrawing the wire, and in this way giving her access to the hive. The queen should be released in the evening, and the hive left undisturbed until the next day, when an examination may be made. If the hive has been long queenless the new queen must be caged for three days.

The illustration (taken from life) shown on page opposite "contents" will be helpful in enabling beginners to distinguish the queen-bee on a comb; besides dispelling the illusion that the queen is always surrounded by her attendant bees. It also plainly shows the difference between sealed honey—seen right across the top portion of comb —and sealed cells containing brood ; a small patch of the latter being clearly visible just below where the queen is standing. Immediately in her rear are also seen a few open cells in which, on close inspection, the crescent-shaped larvæ may be observed lying at the bottom of the cells.

Fig. 81 shows a cage much used in America. It is made of woven wire, nine meshes to the inch, and is 2 inches square. The lowest strands of wire on the sides are pulled out, leaving points projecting about $\frac{1}{4}$ of an inch, which are pushed into the comb until the horizontal wires at the sides rest on the surface, and in this way leave a depth of $\frac{1}{2}$ an inch inside. The cage is thus kept firmly in position, and the bees gnaw through the comb under wires and thus liberate the queen.

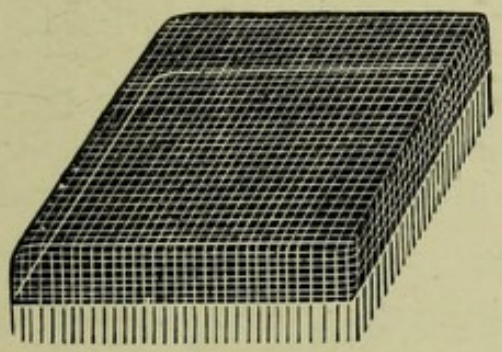


Fig. 81.—American Cage.

Queens may also be introduced successfully and easily by means of Mr. Brice's combined travelling and introducing cage. Figs. 82 and 83 show the ordinary travelling cage for queens, with the addition of an opening in the bottom covered with a card slide, B, Fig. 84, which represents Fig. 82 inverted, and shows the slide B partly withdrawn. The portion of the cage which is fixed upon the comb when in use is made entirely of wire cloth, the open side being pushed through the cells of a comb containing honey nearly to midrib. As seen in Fig. 83, it is shaped so that the top-bar

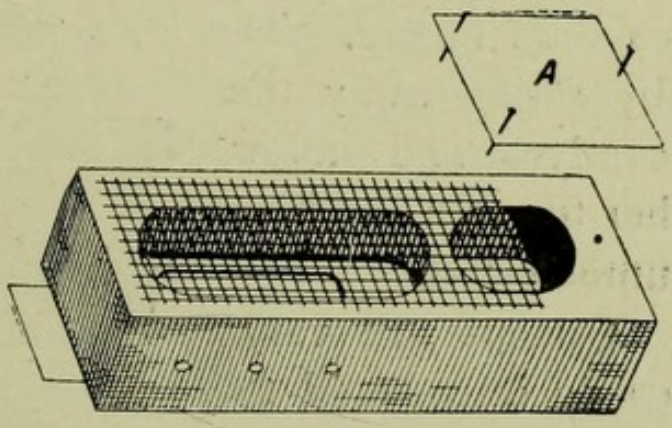


Fig. 82.—Brice's Queen-cage.

of frame fills in the part "shouldered out" when fixed on comb, leaving an aperture at top of the wire cage into which the queen passes when the slide B is withdrawn. Care must be taken to set the cage on so that the opening covered by the slide B corresponds with that of wire cage fixed level with the top of frame.

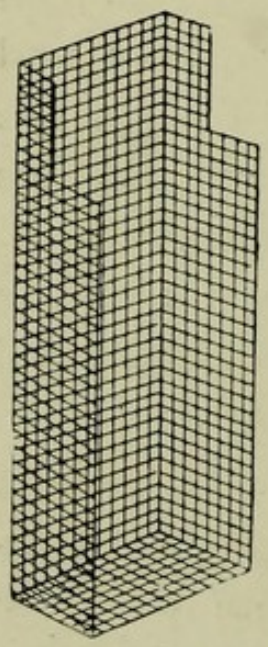


Fig. 83.

In about forty-eight hours the queen will usually be released by the bees themselves eating away the comb around the edges of the cage, and so allowing the queen to pass out.

The same cage admits of another method of introduction, viz., by placing Fig. 82 face down on top of the frames for twenty-four hours; then removing the card A, which removal exposes the portion of cage filled with soft candy; the cage (Fig. 82) is left face down on top of the frames for twenty-four hours; after which remove the cover and replace the cage as before. The bees will release the queen—by eating away the candy—and allow her to enter the hive unmolested.

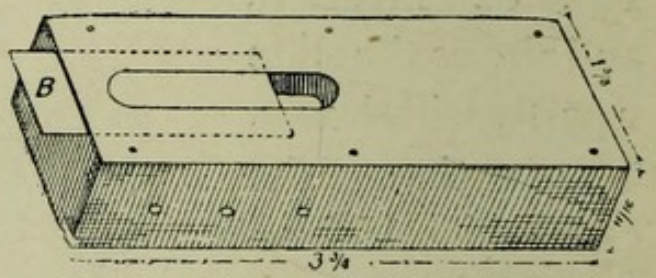


Fig. 84.

Queens are very easily introduced to swarms, and if a stock is reduced to the condition of a swarm it will readily accept a queen. Move the hive and take out the queen from the colony to which you wish to introduce a strange one, shake or brush all the bees

from their combs, and allow them to run into an empty skep placed on the stand. Then place the hive containing the combs on the original stand, shake the bees out of the skep on to a board in front, and as they run in drop the queen amongst them. Although this process is tedious, it is quite certain if properly carried out.

Mr. Simmins recommends direct introduction, as follows :—Remove the queen from the hive. Then put the one to be introduced in a box by herself, and keep her in a warm place for thirty minutes without food. At dusk, lift the corner of the quilt, drive back the bees with a little smoke, and allow the queen to run down.

Failures will occasionally occur, and if queens are choice ones, the pipe-cover cage first described is to be preferred, as in releasing the queen we can always see if she is favourably received ; and if not, we can take precautionary measures to ensure her safety. It is sometimes very difficult to introduce queens into hives having no young bees, as the old bees frequently encase the queen and hug her to death unless she be released. If it is possible, hives which have been for some time queenless should have frames of hatching brood inserted, and the queen to be introduced caged on one of the combs ; releasing her at the end of three days.

XXV.—ITALIAN BEES.

This variety—sometimes called Ligurian—was introduced into this country in 1859 by Mr. Woodbury, from a district amid the Alps, including por-

tions of Switzerland and Northern Italy, where it is indigenous.

The Italian bee is similar in form and size to the black bee, but lighter in colour, and has three distinct yellow rings about the body below the wings. It is more prolific than the black bee, more active, working earlier and later, increases more rapidly, is ready for swarming earlier, and gathers honey from plants which are not frequented by the black bee. Pure Italians are also of a more amiable disposition, and less inclined to sting, therefore are easier handled. The introduction of Italian bees has done much to improve our race of black bees by introducing new blood and correcting to a great extent the mischief which had inevitably resulted from in-and-in breeding.

CHANGING A STOCK OF COMMON BEES TO ITALIANS. —The queen being the mother of the whole colony, the increase of that variety cannot continue if she is removed and an Italian queen substituted. The Italian queen given to the colony will commence laying eggs soon after she gets on the combs. Three weeks later her progeny begin to hatch, taking the place of the black bees that are dying from natural causes, and in from four to six months all the black bees will have disappeared and their places be filled by pure Italians.

The queen with which you wish to commence Italianising should be pure beyond doubt. Purchase an imported one of some reliable dealer, who can guarantee her purity. As soon as the box containing the queen is received, take it into a room, shut the window, and open the box before it. Lift out the

little frame on which she has travelled, and pick the queen from the comb, seizing her gently by the wings. Put her into a cage, and, after removal of the black queen, she may be introduced into the hive by one of the methods described.

Picking the Queen-bee off Comb.

If the queen is introduced in the spring, she may be given to the queenless part of an artificial swarm, or added to a natural swarm after finding and destroying its queen.

XXVI.—CYPRIAN AND SYRIAN BEES.

These bees were introduced into England a few years ago. They are rather smaller than Italians, but much brighter in colour, and the bands are more strongly marked. The thorax is also yellow. The drones are smaller and brighter in colour. As far as appearance goes, they are certainly the most handsome bees cultivated. They are extremely prolific, excellent honey-gatherers, and our own experience of them was that colonies vary in temperament, some being gentle and others very vicious. Pure Cyprian queens of a different strain have been recently introduced, and a good many have been distributed during last year, so that we hope to hear more about their qualities during the coming season.

XXVII.—CARNIOLAN BEES.

These bees have been imported from Carniola, a small district in south-western Austria. They are similar to the common black bee in appearance, but have much lighter rings on their abdomen. The queens are larger and of a light brown colour. They are distinguished particularly by their good temper when disturbed and easy appeasement during manipulations, can be handled with impunity without smoke or veil, and are quite hardy, wintering well. They adhere closely to the combs, although easily shaken off, and, instead of flying, at once make

for the hive. Although so gentle they determinedly defend their hives should other bees attempt to effect an entrance. Their combs are very white, as they use but little propolis, and the appearance of their comb honey is not to be surpassed by that of any other race. Their principal failing is a propensity for excessive swarming, the queens being exceedingly prolific. The disposition to swarm may be moderated, or even entirely prevented, by giving them plenty of room and ventilation, in such hives as Fig. 34, allowing a current of air to pass through them. Carniolans are excellent honey-gatherers and very industrious. Owing to their gentle temperament they may be recommended to beginners in preference to any of the other races. They might, however, be improved by crossing with Cyprians.

XXVIII.

HOW TO COMMENCE BEE-KEEPING.

The beginner should never attempt to start on a large scale. He should commence with one or two hives, increasing the number as he gains knowledge and experience, by swarming or purchase. The best way is to start in the spring by the purchase of a swarm as early in May as possible, from a hive which was known to have swarmed the previous season. The queen of such a swarm would be in her second year—vigorous and in her prime. Remove the swarm to your apiary in the evening in the straw skep in which it was hived, and introduce it into a movable-comb hive in the way shown on page 26.

A beginner may judge the strength of a swarm by its weight or measure, and for this purpose the following data will be of use:—

15,000 bees, weighing about 3 lbs. or measuring about a gallon, constitute a medium swarm.

25,000 bees, weighing about 5 lbs. or measuring say seven quarts, constitute a good swarm.

When buying swarms by weight, it must be borne in mind that a swarm always weighs less when received than when despatched if the journey occupies any length of time, therefore some allowance must be made for loss.

If it is decided to purchase a stock in skep in the spring, first examine it thoroughly. Drive the bees up among the combs with smoke, and invert the skep. The combs should be free from mould, and the hive contain a large number of bees. If on pushing the combs apart brood is found, it indicates the presence of a fertile queen. The combs should be straight, coming entirely down to the bottom of the hive. If the combs are not too old such a hive may be purchased. Remove it very early in the morning, or late in the evening, when all the bees have returned home; and place it on a stand in your apiary (see Moving Bees).

DRIVING BEES.—The many ways in which the operation of "driving" is found useful render it necessary that every bee-keeper should be thoroughly conversant with the best method of procedure, which is as follows:—Select a fine day, when many of the bees are out gathering honey, remove the skep to some quiet, shady spot,

Driving Bees.

and put an empty skep in its place to receive the returning bees. Blow some smoke into the skep to induce the bees to fill themselves with honey. After an interval of a few seconds, give more smoke, invert the hive into a pail on the table, and place an empty skep over it, as shown in accompanying illustration, bringing the edges together at the point towards which the combs run. Push a skewer through its edge in the lower hive so as to form a sort of hinge, and support the upper hive by means of "driving-irons," *i.e.*, a couple of iron rods, bent at ends, thrust into the skep as seen in illustration. Stand in front with your back to the strongest light, and commence rapping on the sides of the hive with open hands, hard enough to jar the combs but not so hard as to run the risk of breaking them from their attachments. The strokes should be regular and continuous. After a few raps the bees will begin to ascend into the empty hive. In from ten to twenty minutes, according to the state of the weather and the strength of the hive, the whole of the bees may be driven out. If the weather be chilly or honey scarce, the bees will leave the hive more readily if about ten minutes before commencing to drive we pour a little warm syrup between the combs ; the bees will become excited and raise the temperature of the hive, and in consequence will drive more easily. The combs are then transferred (if this is desired), the hive placed on the old stand, and the driven bees and those in the skep —placed temporarily on the stand—can be run into the movable-comb hive.

If it is desired to make an artificial swarm, drive the bees in the same way, but as they are being driven a sharp look-out must be kept for the queen. If she is seen to run up into the empty skep, stop the driving when about half the bees have left; put these into a frame-hive, and place it and the old stock on opposite sides of the old stand, about 3 feet apart. Should one appear stronger than the other, remove it further and bring the other nearer to the old stand. Should too many bees be driven out of the stock-hive before the queen is found, some may be returned. Another way is to allow the hive to swarm, and if there are few bees the driving may be dispensed with, as these will not be in the way of transferring.

TRANSFERRING.—In these days of cheap comb-foundation, transferring old combs and bees from skeps to frame-hives is not advisable; it may be occasionally done with good results, but very seldom. It is, therefore, found more advantageous in every way to have new, straight combs built out from full sheets of foundation, in lieu of filling the frames with patched-up old combs cut from skeps, which, at the best, are not only less workable, but liable to carry the hidden germs of disease into the hives to which they are transferred.

This is especially the case with beginners, but, even for general adoption, the safest and most simple plan is to allow the bees to transfer themselves from skeps to frame-hives, in spring, by the following method:—First prepare the frames as mentioned, by fitting them with full sheets of

foundation, and place above top-bars a piece of American leather-cloth large enough to cover all the frames. In centre of this covering a hole 4 inches square is cut, to provide passage-way below for the bees. Choosing a fine day in the early part of April—or later on, according to the locality—when the bees intended for transfer are seen to be working well and strong in numbers, the prepared frame-hive is placed on the stand occupied by the skep, and the latter, lifted from its floor-board, is set above the leather-cloth which covers the top-bars of frame-hive. This done, the part of hive not covered by the skep is packed round as closely as possible with warm coverings of suitable material, so as to make the lower hive as warm and snug as possible.

This completes the operation until the bees and queen have taken possession of the lower hive and established the brood-chamber therein.

In due time all brood in the skep will have hatched out, and the bee-keeper may at discretion either remove the skep and its contents prior to supering the frame-hive, or allow the combs in skep to be filled with surplus honey for removal later on.

Some transfer by driving bees and queen from skep, then set the latter above frame-hive, with excluder between, and run the driven bees in at entrance. The queen is thus got below at once, but if a cold night supervenes the danger arises of bees re-entering the skep to cover brood and leaving the queen to perish of cold and hunger below.

UTILISING CONDEMNED BEES.—The old-fashioned and barbarous method of taking up skeps in the

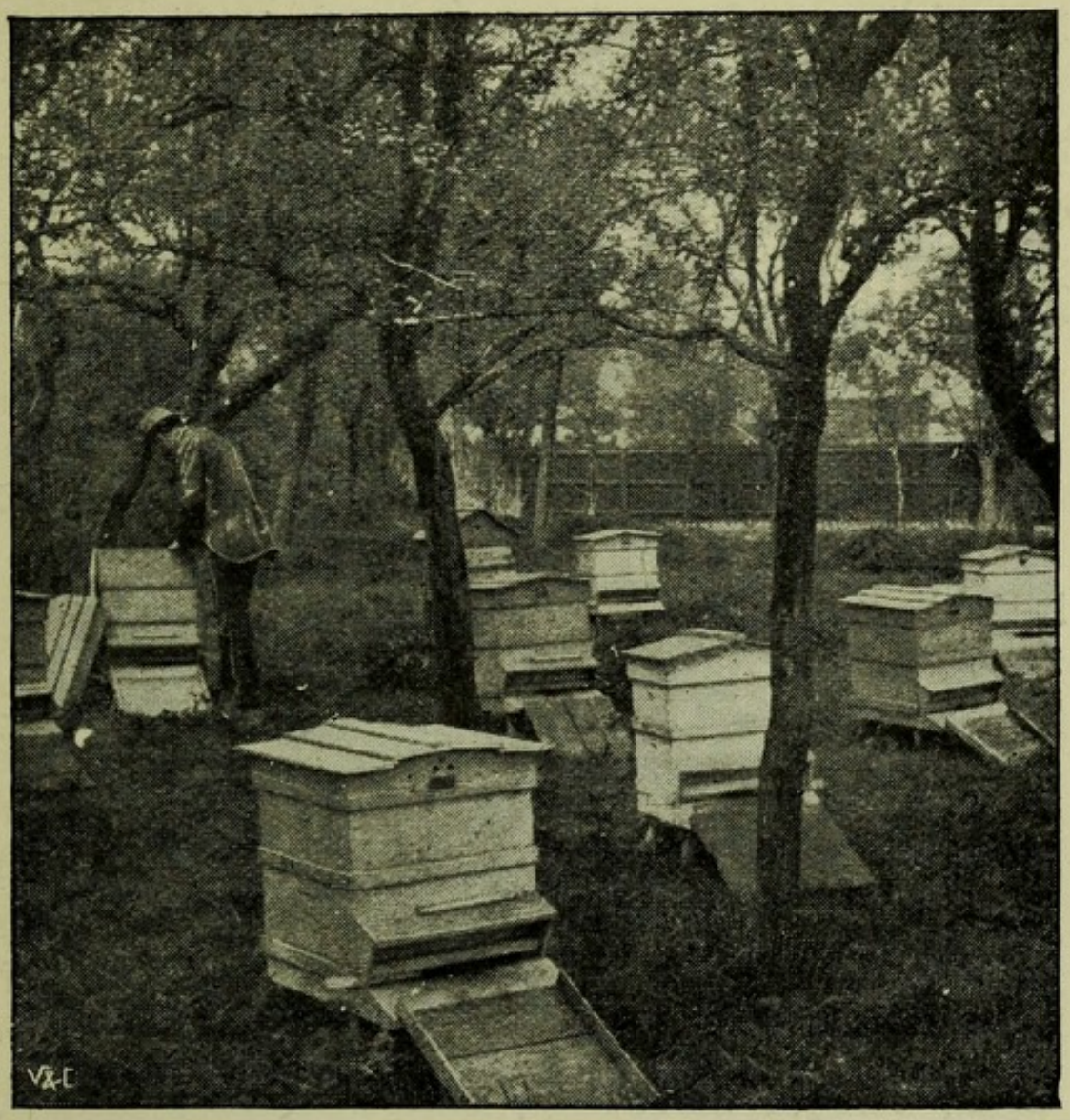
autumn and destroying the bees is still practised by cottagers, but the latter are generally glad to allow an experienced bee-keeper to take the bees by driving. Two or three lots of driven bees joined together in a hive containing frames of comb, will, if liberally fed after hiving, generally make a strong colony.

XXIX.—ARRANGEMENT OF AN APIARY.

Hive entrances may face in almost any direction, yet south or east is preferable. The morning sun shining on the hive front induces the bees to begin work early. Protect them from the north and west winds, if possible, by a hedge. Do not crowd the hives together, but have each on a separate stand, placing them four to six feet apart. The stands should be low, with an alighting-board sloping towards the ground. Without this a great many bees returning to their hives loaded in the spring are blown underneath, becoming chilled, and not rising again. Keep the ground clear of long grass and weeds, so that if a queen falls off the comb when frames are being examined she may be easily found. Have a path, if possible, at the back of the hives—which should always be opened and examined from the back—thus causing little interruption to the flight of bees passing in and out.

Fruit-trees planted near hives will not only afford the bees shade, but yield an early supply of honey and pollen. For the production of honey, none can excel apple, pear, and cherry trees, which at time

of blooming are perfectly surrounded by bees. Raspberry, whitethorn, and snowy mespilus yield an abundance of white honey of a delicious flavour, and are therefore of great value to the bee-keeper. White clover, however, is by far the most important



A Modern Apiary (in an Orchard).

source from which bees derive their supplies. It yields large quantities of very pure white honey of superior flavour.

Many other honey-producing plants could be

named, blooming at different seasons, as nearly all single blossoms, with few exceptions, produce either honey or pollen. Some of the principal are,—sainfoin, lime-trees, alsike clover, buckwheat, mustard or rape, catmint, figwort, phacelia, borage, &c. Near the hives may be planted crocuses, Limnanthes Douglasii, Arabis, wallflowers, and other spring flowering plants, as these all afford the bees early pasturage. There should be a shed or building close to the apiary where hives and apparatus can be kept, and where the honey may be extracted and stored ready for sending away.

XXX.—DISEASES.

The honey-bee is subject to few diseases compared with any other living creature; *dysentery* and *foul brood* being the two most important ones the bee-keeper has to guard and contend against.

Dysentery may be found in some hives during the latter part of winter and in the spring; the usual signs are—the bees discharge their excrements over their combs and hives; in fact, wherever they chance to be. The fæces are dark and muddy in appearance, with a peculiarly offensive smell; the bees are weak, slow in movement, and decrease unusually fast. Feeding on unsealed and fermented honey; or long confinement, during which the bees are from any cause kept abnormally active indoors, may be considered a cause of dysentery.

Feeding bees late in the autumn on watery food, so that they are unable to seal their stores before

winter, and badly ventilated hives also tend to produce the disease.

If hives are properly packed for winter and the bees not disturbed, this disease need not be feared. But if a colony is attacked, give it a clean hive and floor-board, and exchange the soiled combs for clean ones. Feed the bees on candy, or give them a comb of sealed stores; supply proper ventilation, and disturb as little as possible.

The division-boards should be moved so as to reduce the size of the hive to the number of combs covered by bees; fill up the spaces with chaff, and protect the hive well from cold.

Foul brood, or *Bee-pest*, has, no doubt, been known as a bee disease for centuries. It was also mentioned and described in 1769 by Schirach, who seems to have been the first to give the name of "foul brood" to the disease and to recommend starvation as a remedy. Not till 1874, however, was its true nature discovered by Dr. Cohn, who pronounced it to be caused by a bacillus (called by German writers Bacillus alveolaris), to which Mr. Cheshire in 1883 gave the name *Bacillus alvei*, by which name it is known in this country.

It was at one time supposed that only the brood or larvæ were attacked by the disease, hence the name "foul brood." But Hilbert's investigations in 1875 enabled him to declare it not only a disease of the brood, but that the mature bees—sometimes including the queen—were liable to be affected by it. Thus the disease is sometimes called "Bee-pest."

Healthy brood in the combs lies in compact

masses, the larvæ being plump, of a pearly whiteness, and when quite young lie curled up at the bottom of the cells much in the form of a C. When a colony is attacked, as the disease develops, the affected larva begins to move unnaturally; and, no longer plump in appearance, it becomes extended horizontally in the cell and has a flabby aspect, which indicates death. The colour now changes

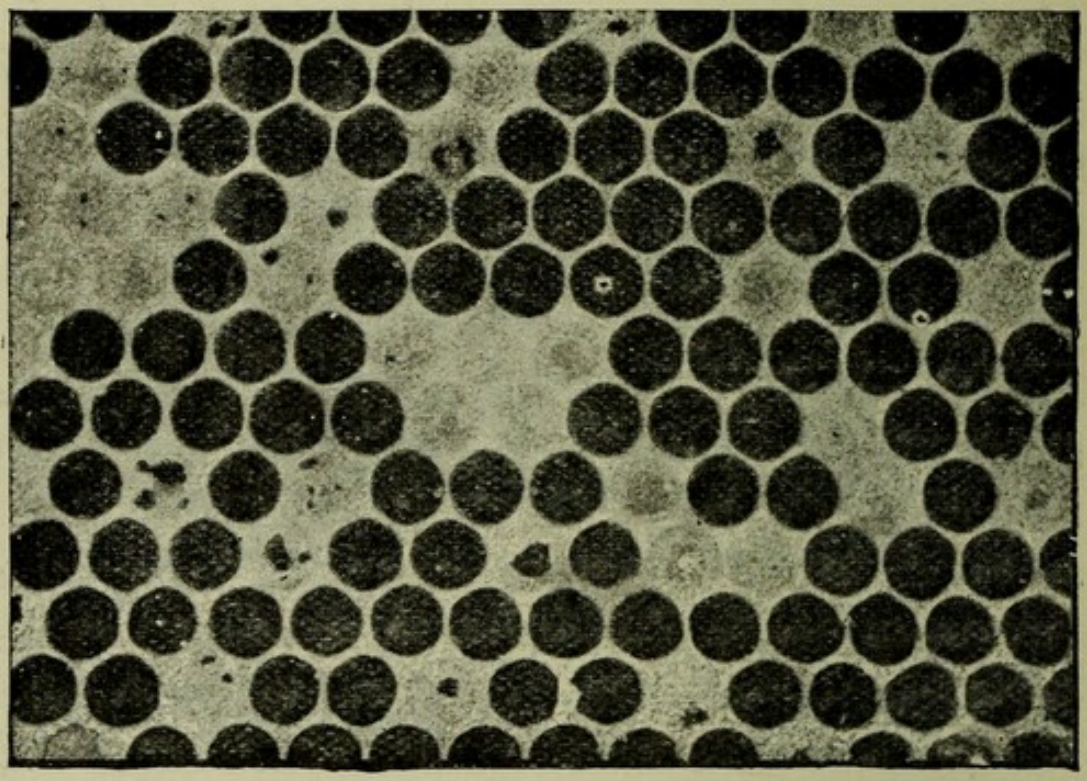


Fig. 85.—Foul Brood in an advanced stage.

to pale yellow, afterwards turning to brown; the dead larva then begins to decompose and eventually shrivels up, leaving nothing but a dry brown scale, which adheres to the side of the cell. We would here note that chilled brood should not be mistaken —as it very frequently is—for foul brood. In the former the dead larvæ turn first grey, and afterwards become nearly black (never brown, as with foul

brood). The dead larvæ are also generally removed by the bees, but they seldom attempt to carry out those which have died from disease, except under conditions which we shall presently mention.

When the larvæ die after the cells have been capped over, cappings here and there are seen indented and darker than those of healthy brood. The cappings, too, are often perforated with irregular holes, as seen in the illustration, Fig. 85. On inserting the end of a match in one of these cells, it will, on withdrawal, have adhering to it—as a putrid, ropy, tenacious, coffee-coloured mass — all that remains of the dead larva, often (but not always) emitting a most disagreeable stench. Eventually this mass dries up, as explained above. Later on the bees become inactive, losing much of their desire to fly abroad; they will also be seen fanning at the hive mouth, from which in very bad cases the disagreeable odour mentioned is emitted.

In respect to the particular pathogenic or disease-producing micro-organism with which we are obliged to deal in foul brood, viz., *Bacillus alvei*, we have to contend with it in two different forms and stages of life, in one of which—representing the earlier stages of the disease—the vitality of the organism is easily destroyed; while in the other, the same organism, but under a different form, is capable of retaining life, and germinating into the condition of the previous stage, even after what would appear the most damaging influences, such as long lapse of time, drying, heat, cold, and chemical re-agents. The bacillus condition is the first stage of active life of this or-

ganism ; and it remains in this state, splitting and multiplying so long as it has nutrient material to live upon and other conditions are favourable. A bacillus is rod-shaped, and when, in process of time, it has attained full growth, it splits in two, each of these taking up an independent existence, and going through the same process ; and as it is known that as many as two generations can be raised within an hour, and as the same rate of progression can be kept up by each individual in suitable nutrient media, it is not astonishing that foul brood spreads rapidly. Now, while in this bacillus stage, it is not difficult to kill the organism, and there are a number of chemical re-agents, such as carbolic acid, phenyle, thymol, salicylic acid, naphthol beta, and perchloride of mercury, which, even in great dilution, will prevent the growth of bacilli. But in dealing with the microbe in the subsequent stage of its existence, the case is entirely different. When the bacilli, or rods, have multiplied to such an extent as to exhaust all the nutriment upon which they were feeding, or come in contact with surroundings inimical to their existence, the rods gradually turn into spores, and this generally takes place in the latest stages of the disease. It is when this condition has been reached, and the rods have become spores, that the great danger arises, because of the difficulty in making many bee-keepers understand the difference between them and the bacillus. The spores are analogous to the seeds of plants, but differ from these in possessing greater vitality, for they not only retain the power of germinating into

bacilli after a long period of time, but will endure heat, cold, drying, and chemical re-agents, any of which influences would be destructive to bacilli themselves.

Fig. 86 is a photo-micrograph showing *Bacillus*

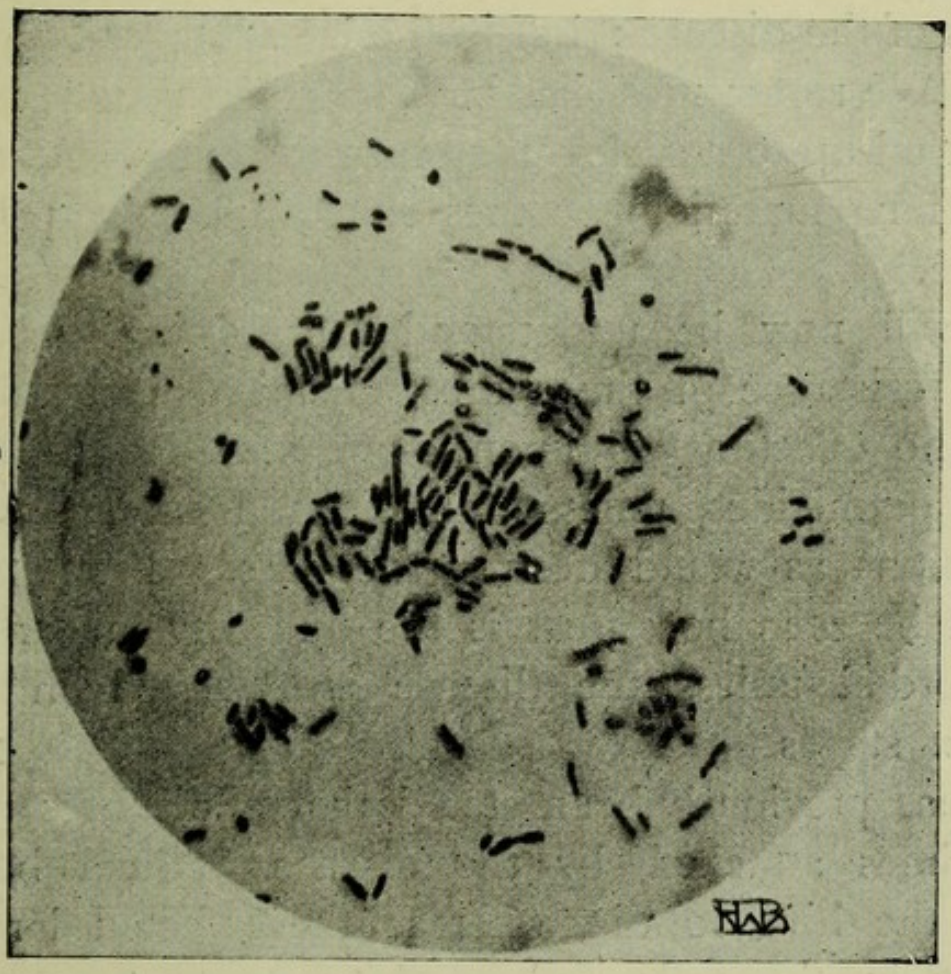


Fig. 86.—Bacilli and Spores.

alvei, both in the rod and spore conditions, very much enlarged.

The great resistance of spores to high and low temperatures, to acids and other substances, is due to their being encased within a thick double membrane.

There are certain antiseptics such as carbolic acid,

phenyle or creolin, izal, eucalyptus, camphor, naphthaline, &c., which evaporate at the ordinary temperature of the hive, and whose vapours, while not actually killing the bacilli, arrest their increase or growth.

As we have seen, bacilli are present in the earliest stages of the disease; but in the latest stages—when the whole rotten mass has become coffee-coloured or has dried up to a scale—they turn to spores. As the nourishing material becomes exhausted only spores remain.

It will now be understood that, owing to the great resistance of the spores, chemical substances have no effect at all upon them, and do not become germicides, unless administered under such conditions as would destroy the bees. From this it will be seen how great is the difficulty in curing foul brood unless the disease is attacked in its earliest stages.

It has previously been stated that adult bees are sometimes attacked by the disease. Such bees leave the hive to die, whereas the infected larvæ remain in the cells, unless disinfectants to arrest decomposition are used, in which case the bees remove them from the hives. Although many theories have been advanced, the causes of the disease are not yet clearly known. Experience has, however, plainly shown that with foul brood—as in all epidemic diseases—the weak, sickly, and badly nourished are attacked and become centres of infection to others, and as colonies become weak, bees from healthy hives rob them of their honey,

and thus carry off the germs of the disease along with their ill-gotten gains. The bee-keeper even may himself be a cause of spreading the pest by indiscriminately manipulating first diseased and then healthy hives without taking proper precautions to disinfect himself or his appliances. Combs which have contained foul brood retain the spores. The queen lays eggs in the cells and the workers deposit their honey and pollen in them. Both honey and pollen in this way become vehicles for transporting disease to the larvæ in process of feeding these by the nurse-bees.

The owner of a movable frame-hive can, by the facilities it affords for examining the combs, at once detect the disease in its earliest stages, and adopt measures for arresting its progress or for stamping it out altogether.

If, on examining combs, we detect the first symptoms of foul brood, as already described, the further progress of the disease can, at this stage, be arrested by feeding the bees with syrup, medicated with naphthol beta (see page 164), because at this stage there are no spores present. This is employed by the nurse-bees in preparing food for the larvæ, and in this way the bacilli are destroyed. We can further assist the bees by using preventive measures later on.

Apart, however, from experienced bee-keepers or trained experts, very few are fortunate enough to detect the disease at such an early stage, or to effect a cure so easily, and it becomes advisable to describe the method of procedure in ordinary cases—

that is, when the combs have irregular patches of brood, with sunken and perforated cappings to the cells (Fig. 85) containing the coffee-coloured mass inside. In this condition the cells are crowded with innumerable spores, and the treatment just mentioned would not have the slightest effect upon them.

If the colony be weak, destruction of bees, combs, frames, and quilts, together with thorough disinfection of hives, is by far the best course to pursue. We thus destroy the spores, and so remove the source of infection. If, on the contrary, the colony be still strong in bees, the latter may be preserved by making an artificial swarm of them. They are then confined in a straw skep and fed on syrup medicated with naphthol beta. The frames, combs. and quilts must be burned, and the hive disinfected by being either steamed or scrubbed with boiling water and soap; then painted over with a solution of carbolic acid (one part of Calvert's No. 5 carbolic acid to two parts of water, see page 168). When the smell has disappeared it will be ready for use. The bees are kept confined to the skep for forty-eight hours, by which time all honey they may have taken with them will have been consumed, and such of the bees as are diseased will have died off. Those remaining are then shaken from the skep into a clean frame-hive furnished with six frames, fitted with full sheets of comb-foundation, and are fed with medicated syrup for a few days longer. The skep used as their temporary home must then be burnt. All such work as is here described should be done in the

evening when the bees have ceased flying for the day, to avoid chance of robbing.

The whole secret of success lies in having the drug ever present to act on the micro-organism, and either kill it or prevent its development and growth.

In his endeavours to rid his apiary of foul brood, the bee-keeper must, by keeping the bees strong, with young and prolific queens, good wholesome food, cleanliness, and proper ventilation, also raise to its proper standard the lowered vitality of his bees, which enabled the disease germs to get a footing.

Foul brood is so extremely contagious that it is advisable at all times to adopt preventive measures against infection. Naphthaline in balls is generally used; two of these split in half being the proper dose. The pieces are placed on the floor-board of the hive in the corner farthest from the entrance. The temperature of the hive causes the naphthaline to evaporate, and it must be therefore renewed as required. All syrup used for feeding should also be medicated with naphthol beta. Clothes, appliances, and hands must be washed with carbolic soap, and other articles disinfected by spraying with a solution of one ounce Calvert's No. 5 carbolic acid in twelve ounces of water.

It was formerly thought that honey was the only source of infection, so that, if bees were starved until they had got rid of the honey carried by them from the diseased hive, a cure would be effected. We now know that this starvation method, good as far as it goes, has always failed from the fact of its

not embracing disinfection of hives and appliances. The spores, which were not destroyed, and whose vitality was only latent, were possibly lurking in hidden places to be some day brought into contact with suitable nourishing material, when they would again start into growth, and thus the disease constantly broke out.

My experiments with soluble phenyle have shown it to be a powerful disinfectant, possessing all the good properties of carbolic acid, but superior to this, inasmuch as it is entirely non-corrosive and non-poisonous as regards human beings and animals. But it must not be forgotten that in large doses it is destructive to insects, therefore the proportions which here follow must on no account be exceeded.

Several most successful cures have been effected with it when dealt with as under:—Prepare a clean hive, which has been washed or painted over with solution No. 10 (page 168). Remove brood-combs one at a time from infected hive, shake the bees into the clean hive, spray the combs with solution No. 8 and place them also into the clean hive. Remove all superfluous combs, spray them as before, and extract the honey. The latter may be boiled, and if wanted as food for bees it should be diluted and phenyle added in the proportions given in No. 7. Close up with division-boards, and commence feeding with syrup, using a quarter of a teaspoonful of phenyle to one quart. If the bees take kindly to this, the proportion may be gradually increased, but must not exceed one teaspoonful to a quart of syrup. If bees refuse the food (which is probable

if they have access to other stores), pour the weakest medicated syrup into the combs round the brood. They will soon learn to take it in the usual way. As more combs are required give them those sprayed with solution No. 8. Then by liberal feeding stimulate brood-raising, and if the disease does not give way replace the queen by a healthy one.

So rapidly has foul brood spread by contagion that in one season, unless precautions are taken, a whole neighbourhood may become seriously affected, and the chances of successful bee-keeping seriously imperilled, if not utterly destroyed.

XXXI.—ROBBING.

Bees seldom rob when forage is plentiful, or when, by the management of an able bee-keeper, precautions are taken to guard against it. When honey is scarce in the fields any exposure of sweets to bees will induce robbing, and once accustomed to plunder they will try to enter every hive in the apiary. A strong colony will sometimes attack and destroy several weaker ones, and carry off all their stores.

When a hive is being robbed an unusual agitation of the bees near the entrance may be noticed; they keep up a constant buzz, and rapidly enter the hive when they alight; bees will be seen to run towards their enemies and quickly drag them away; fighting may also increase, and many be killed. Bees always defend themselves unless weak or queenless, and

such colonies must be carefully protected. If robbers are found actively at work, close the entrance so that only one bee at a time can enter. If this does not quickly stop it, the hive should be entirely closed till sunset, taking care to provide sufficient ventilation. Sometimes it requires all the bee-keeper's patience and skill to stop robbing, more especially if it has been going on for some time unnoticed.

When robbing has commenced, place a piece of window-glass 8 by 5 inches in front of the flight-hole, the top resting against the hive, and the lower end about 1¼ inches from the entrance, on the alighting-board, to allow the bees of the hive to go in and out at the sides. The robber bees, going straight at the entrance, are stopped by the glass, which can be removed after a few days.

I have used successfully a rag moistened with carbolic acid, hung on the front of the hive just over the entrance, and the Rev. G. Raynor recommended a cloth sprinkled with carbolic solution, as described on page 99, laid upon the alighting-board. The cloth is replaced every morning, and sprinkled or sprayed with the solution several times a day in bright weather.

The tendency to start robbing should, however, be guarded against by leaving no sweets exposed, by uniting weak stocks, and keeping all colonies strong.

Up to a recent date, trouble from robbing was usually prevalent in the autumn, when removing the final surplus for the year; or more frequently still

when getting boxes of combs—wet after extracting—cleaned up for storing. This evil has, however, been almost entirely done away with by the use of

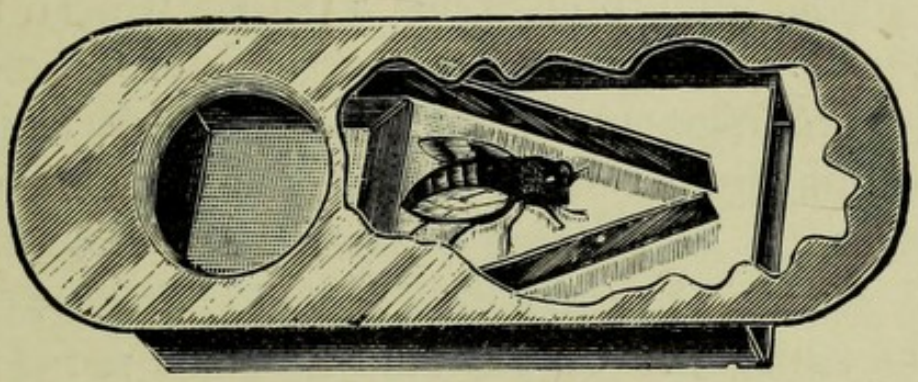


Fig. 87.—"Porter" Bee-escape.

the super-clearer (Fig. 36, page 63), fitted with the "Porter" bee-escape, Fig. 87. This appliance, properly used, keeps the bees quiet, and is altogether helpful for the end in view. (See page 63.)

XXXII.—ENEMIES OF BEES.

WAX-MOTH.—This moth hatches from an egg laid either in or close to the interior of the hive by a winged insect, which may be seen late of a summer evening flying near its entrance. During the day the female moth may be found concealed in the vicinity of the hive, and if admittance be gained she will deposit a large number of eggs in some crevice containing the litter of the hive, which affords the young worms their first food and protection. Sometimes the eggs are deposited in empty combs, or combs not covered by bees. As soon as the worm hatches it begins to eat wax, pollen, and brood, spinning passage-ways of a tough, silky film in

the direction of its movements. After three weeks the worm has attained its full growth, and then seeks a crevice or other secure place wherein to spin its cocoon, prior to emerging a perfect winged moth. The usual indications of the presence of the moth in a hive are fragments of wax mixed with black specks, resembling gunpowder—the excrement of the grub. If hives are kept strong in bees the wax-moth need not be feared, because of its small chance of effecting an entrance. Care should be taken not to leave old combs about, or in empty hives with entrances left open. If not melted into wax they become a nursery for moths, which will in their turn seek to enter hives when old enough to fly.

WASPS.—In some seasons wasps are very troublesome, more especially towards the end of summer. At this time the entrances should be narrowed, to give the bees a better chance of protecting themselves against the superiority in strength and greater activity of the wasps. In the spring destroy all queen-wasps, as each of these starts an independent colony. Nests may be destroyed by pouring in at the entrance a cupful of gas-tar, turpentine, or paraffin, and then stopping it with earth or a good sized clod. Bottles partly filled with sweetened beer, placed near the hives when wasps are very troublesome, will catch many of them.

MICE will enter hives if they find an opening large enough to admit them, and sometimes do great damage to the combs, besides eating honey. To keep out these intruders entrances should be

only $\frac{3}{8}$ inch high. Placing $\frac{1}{4}$-inch mesh wire-net in front also keeps them out very effectually.

SPIDERS should not be allowed to exist in the vicinity of the hives, as they catch bees in their webs.

BIRDS.--The blue-tit is always ready to feed on bees; and in winter, when snow is on the ground, will sometimes be seen on the alighting-board of a hive, occasionally tapping it with his beak. The noise brings a bee to the entrance, when it is promptly snapped up. If tits are numerous a net placed over the hive will prevent their getting on to the alighting-board.

ANTS are sometimes very troublesome; they crawl into the hives, and often carry off large quantities of stores. There are several ways of getting rid of them. Leaves of tansy or black walnut keep them away, as will turpentine rubbed on the stand and bottom of hive. Sprinkling powdered naphthaline between hives and outer cases and about the quilts is also effective. Hives on legs can have a saucer of water placed under each leg.

TOADS watch for bees returning to their hives, and frequently snap them up when they are blown to the ground in windy weather; hence the advantage of a large alighting-board reaching down to the ground, as the tired bees drop on to this, and then safely make their way into the hive.

BRAULA CŒCA, or blind louse, is a small reddish-

brown parasite which attaches itself to the bee, and is sometimes found in large numbers on the queen. It has three pairs of legs, and is difficult to catch, owing to its rapid movements. The eggs hatch inside the insect, and the larvæ are nourished by the secretion from a gland. The pupa is extruded on to the floor-board of the hive, and, 14 days later, the perfect insect emerges. The young lice remain on

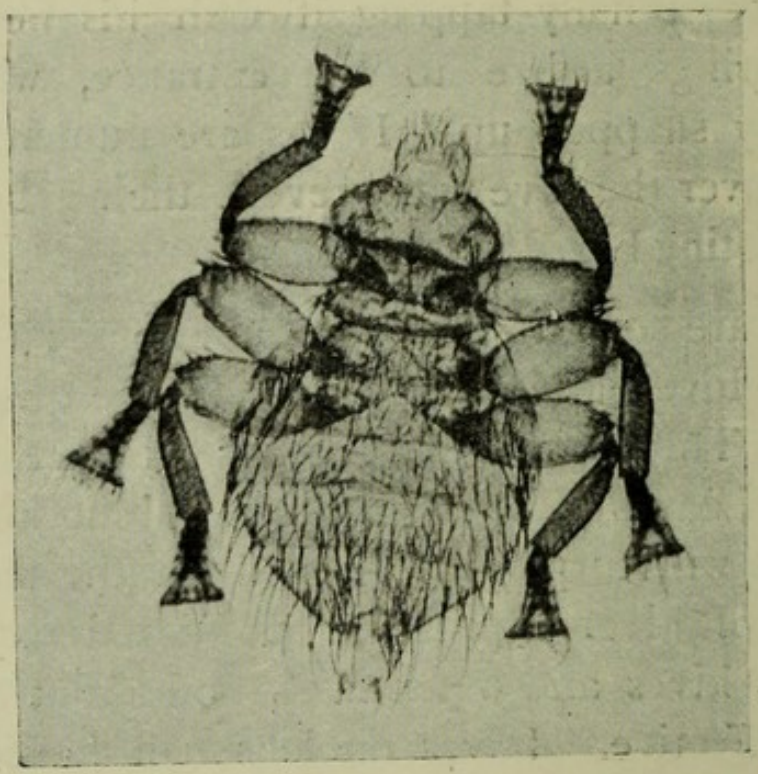


Fig. 88.—Braula cœca, or Blind Louse.

the floor-board until they have the opportunity of climbing on to a passing bee. They do not seem to do the bees any harm, and although prevalent in the southern parts of Europe, usually die off in our climate towards the winter. Strong fumigations of tobacco will dislodge them, followed by cleaning the floor-board and washing several times with phenyle or carbolic solutions (Nos. 9 or 10, page 168).

XXXIII.—WINTERING.

Bees, like any other stock, if well wintered are ready in spring for a good summer's labour, but otherwise will take the best part of the season to gain sufficient strength to even sustain themselves. Success thus depends in a great measure on the proper preparation of a colony for wintering. The requirements are—

1st. An abundance of sealed stores.

2nd. A large number of young bees and a prolific queen.

3rd. Provision for sufficient and proper ventilation without cold draught.

By the middle of September ascertain the exact condition of every colony, and if breeding has been kept up by stimulative feeding, this should now be discontinued, and the bees fed up as rapidly as possible to ensure sealing of all stores before the approach of cold weather, and thus avoid the risk of dysentery induced by wintering bees on unsealed stores. Hives should contain about 30 lbs. of food, and those with a superabundance of stores may spare a frame or two for colonies short of food.

All combs not covered by bees on both sides should be removed, and the size of the hive reduced by division-boards placed on either side, so as to crowd the bees into as small a space as possible. There should be sufficient bees to crowd eight

frames, and these should be placed 1¾ inches from centre to centre for the winter months. The middle combs are generally used for breeding, while honey is stored in the side combs; and as bees cluster near the centre, these latter, if filled half-way down, should be inserted in the middle, so that the bees may be near their stores. They also require empty combs to cluster upon, therefore those full of stores should be placed on each side of cluster.

Those who object to cut holes in combs may provide winter-passages by placing a couple of pieces of wood, ⅝ of an inch square, across the top of the frames, and about ⅝ of an inch apart. Or by placing a good-sized cake of candy below the quilts, bees will make their own passages over frames. Over all place the quilts or a chaff-cushion. A bottomless box, size of the hive top, and 4 inches deep, having a piece of calico tacked on the bottom, and filled with chaff, or a shallow-frame super, as shown in Fig. 14, makes a very good cover, allowing sufficient ventilation without draught.

The space between the hive and outer-casing should be filled with chaff or other material, such as drugget, carpet, or paper torn into small pieces; this will prevent the escape of heat, and greatly assist in keeping an even temperature within the hive. When there is no longer any danger of robbing, the entrance should be opened to 6 inches, and the bees disturbed as little as possible. All these preparations for wintering should be completed by the beginning of October. If in the autumn we have not been able to feed up our bees, and have no frames of sealed

stores to give them, candy will supply them with the necessary food for safe wintering.

Entrances should be shaded from direct rays of the sun when ground is covered with snow; bright sunlight often tempting bees out in winter only to perish.

About the end of February, if the weather permit, an examination of hives may be made by gently lifting the quilt and looking between the combs, and if any are short of stores a cake of flour-candy (see Recipe No. 4) may be placed on frames under the calico cover, care being taken that it is placed immediately over the cluster of bees. The bee-keeper must bear in mind that a large number of bees will consume less food proportionally than a smaller number, and that the heat produced in the hive by the bees is in proportion to their numbers and the food consumed. During winter, entrances should be examined frequently, and any dead bees found there removed with a hooked wire, as an accumulation of dead bodies might smother those in the hive. Such an accident, however, is likely to happen only if zig-zag entrances are used, or the opening left for entrance be too narrow.

As success in wintering depends upon having strong colonies, containing a large number of young bees, all weak ones must be united, so that at least six or eight combs are well crowded with bees.

XXXIV.—CLEANING HIVES.

All hives, floor-boards, and frames, that have been in use should be scalded and thoroughly cleansed before they are used again. Winter is a convenient time for doing this, so that they may be ready for work again in the spring. In addition, they should be painted over with solution No. 10 (page 168) mentioned in next chapter as a preventive of foul brood. Empty combs should be fumigated with burning sulphur and sprayed with No. 8 or 9 before being used again. These solutions are inexpensive, and the prudent bee-keeper will be well repaid for the simple precautions he may take to prevent the introduction of foul brood into his apiary. In any case, precaution is better than cure.

XXXV.—RECIPES.

No. 1. Naphthol Beta Solution.—Naphthol Beta was introduced after exhaustive experiments by Dr. Lortet, and subsequent experience here has proved its efficacy. To make the solution, proceed as follows :—For convenience of measuring, procure from a chemist an 8-oz. bottle, marked with sixteen divisions of half an ounce. (See illustration on next page, Fig. 89.) Thus each division will be equal to one tablespoonful. Put an ounce of naphthol beta into the bottle and half fill with pure methylated spirit. Shake until the crystals are dissolved. Then add spirit till the liquid reaches the fourteenth line

on the bottle. The solution is then ready for use. Each division will contain one tablespoonful, which is just the right quantity for 10 lbs. of sugar. The solution should be stirred into the syrup while the latter is still hot.

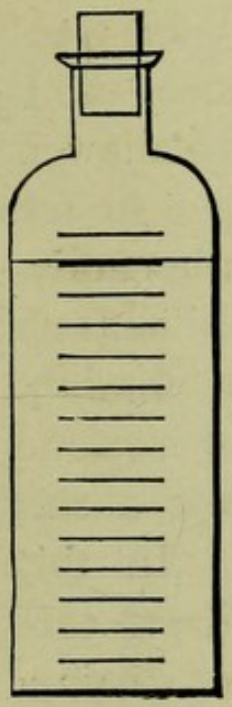


Fig. 89.

No. 2. Soft Bee-Candy.—In making this, get a brass or an enamelled-iron pan and use only loaf or refined crystallised cane sugar, to 6 lbs. of which add 1 pint of water and a half teaspoonful of cream of tartar. Set the pan beside the fire (not on it) and, as the water gradually warms, give an occasional stir until the sugar is quite dissolved. When the pan is placed on a brisk fire, stir without stopping until the mass begins to boil. Withdraw the pan a little from the fire, and let the mixture boil for half a minute or so, then with a spoon drop a small quantity on a plate. If the sugar does not stick to the finger when pressed into it and withdrawn, it is boiled enough, but if sticky it must be boiled another minute to evaporate the excess of moisture. When the proper condition is reached remove the pan from the fire, and at once medicate according to recipe No. 4, page 166; then, without loss of time, place the pan in a large vessel of cold water—a running stream is still better, if available, as hastening the cooling process; stir without ceasing until the mixture stiffens and begins to turn white, like thick paste. Then, before it gets too stiff to run freely, pour into suitable moulds, prepared

beforehand, or into shallow dishes, lined with paper for easy removal and to prevent the candy from sticking to quilts. A handy mould for bee-candy can be formed from a wood section-holder (made like an ordinary folding section), grooved for glass on both sides. Only one glass is, of course, used, directly on to which the candy is poured and allowed to stiffen. The glass allows the bee-keeper to see when the supply needs renewing. Well-made candy, though so soft as to be easily cut with a knife, sets firm and stiff with a smooth grain, like the fondant sugars made by confectioners. It does not become stone-hard, but may be easily scraped into a soft buttery consistency with the finger-nail. In this condition the bees can take it readily. Great care must be taken in making candy, by constant stirring, to prevent the sugar from being burnt, as in this condition it is injurious to bees if they are fed with it in cold weather.

No. 3. Flour Candy.—Proceed in the same way as for making candy (No. 2), and as soon as it is taken off the fire, stir in 1½ lb. of wheat-flour, or 1 lb. of pea-flour, and when it is setting pour out into saucers. This is very useful for stimulative feeding in autumn and spring. If put over the frames the sticks may be dispensed with, as the bees will eat passages through the candy.

No. 4. Medicated Candy.—This is made like Nos. 2 and 3, but when the syrup is taken off the

fire put in one tablespoonful of naphthol beta solution No. 1 to every 10 lbs. of sugar used.

No. 5. SPRING and SUMMER food for bees.

White lump cane sugar	10 lbs.
Water	7 pints.
Vinegar	1 oz.
Naphthol beta solution, No. 1	½ oz.
Salt	1 oz.

Boil for a few minutes.

No. 6. AUTUMN food for bees.

White lump cane sugar	10 lbs.
Water	5 pints.
Vinegar	1 oz.
Naphthol beta solution, No. 1	½ oz.
Salt	½ oz.

Boil for a few minutes.

No. 7. SYRUP FOR FEEDING.

Soluble phenyle...	¼ to 1 teaspoonful.
Sugar syrup	1 quart.

The sugar syrup can be made as in recipes Nos. 6 and 7, omitting the naphthol beta solution No. 1.

NOTE.—The water and syrup *must always be poured on the phenyle*, and it will then, on shaking, form an emulsion.

No. 8. SOLUBLE PHENYLE SOLUTION FOR SPRAYING AND DISINFECTING.

Soluble phenyle...	½ teaspoonful.
Water	1 quart.

No. 9. Phenyle Solution for Washing Hives, Floor-boards, etc.

Soluble phenyle...	2 teaspoonfuls.
Water	1 quart.

No. 10. Carbolic Solution for Painting Hives, and Carbolised-cloth for Quieting Bees.

Calvert's No. 5 carbolic acid	1 part.
Water	2 parts.

No. 11. Carbolic Solution for Disinfecting Clothing, Hands, Etc.

Calvert's No. 5 carbolic acid	1 oz.
Water	12 ozs.

XXXVI.—GENERAL MANAGEMENT.

Spring.—If the weather be favourable about the end of March, every hive in the apiary should be thoroughly inspected to ascertain its exact condition. Examine each comb as it is removed, and make certain of the presence of a queen. If she has commenced to lay, the bees may be further stimulated by uncapping some of the honey. Reduce the size of the hive by division-boards to the strength of the colony, and in all cases where the frames have been spaced wider apart than the ordinary distance for the winter, push up the frames until they are

about 1½ inches from centre to centre—this being the ordinary distance for brood-raising—and place the superfluous combs in the space outside division-boards. If a colony is found to be queenless, unite it to one having a fertile queen. This should also be done if the queen chances to be a drone-breeder, in such a case she should be removed. Any colonies short of provisions should be fed or assisted with frames of sealed stores taken from those hives which can spare them. Keep all hives well covered and protected from the cold; contract entrances to exclude robbers.

Stimulate breeding by uncapping honey-cells, and supply artificial pollen as long as the bees will take it, also water; and directly any stocks are found getting short of stores, commence gentle feeding with liquid food.

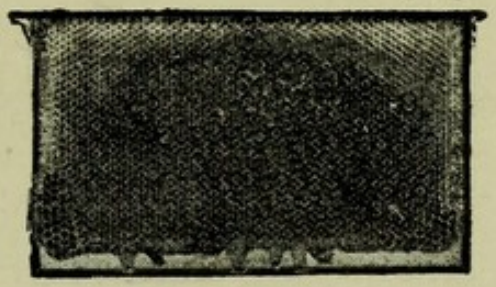


Fig. 90.—Frame of Comb, with Queen-cells.

It takes about six weeks to build up a colony of sufficient strength to take advantage of an early flow of honey.

Prepare for queen-rearing early in April by introducing drone-comb into the centre of those hives intended to be used for rearing drones, and when drones begin hatching out, remove the queen from the colony intended for raising queens.

Form nuclei as soon as queen-cells are ready for introduction to them (see Fig. 90).

Supply food as often as may be required.

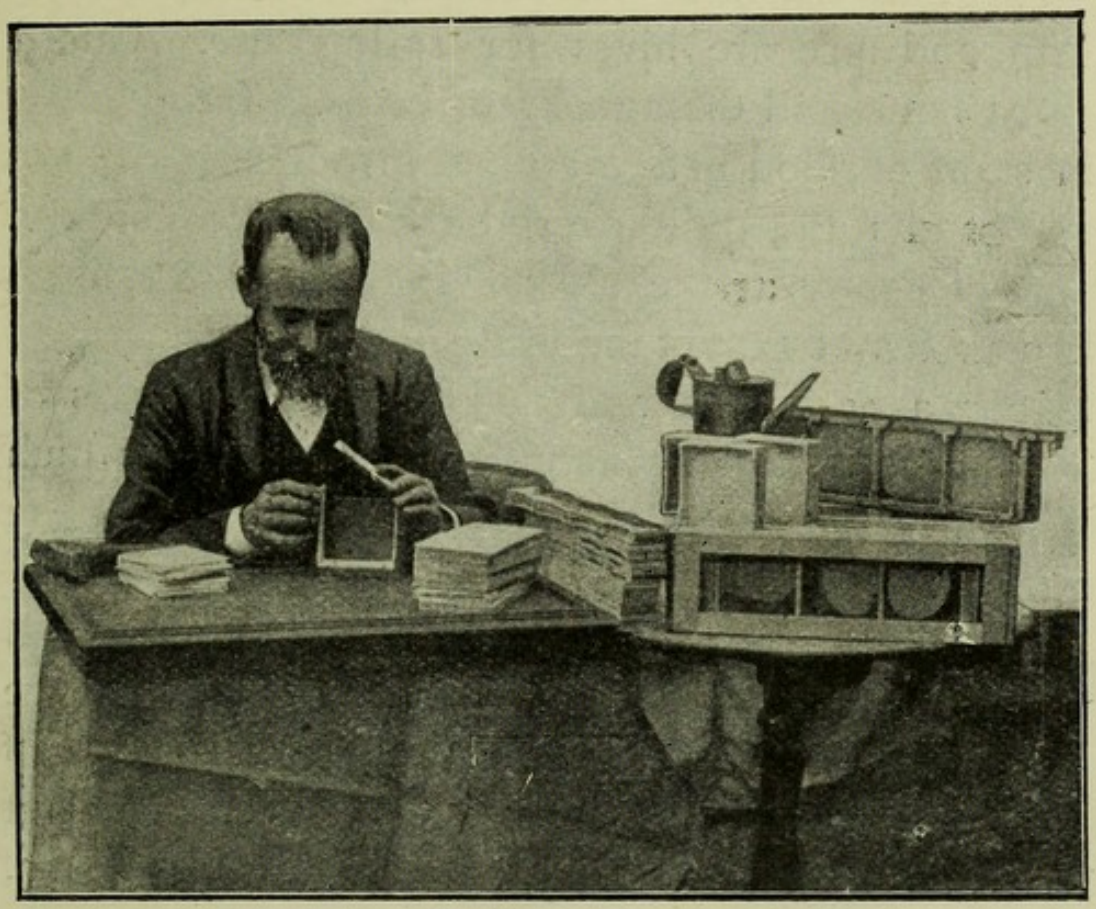
In the beginning of May, if the weather be favourable, the winter chaff packing may be removed, and the frames and bees transferred to clean hives, giving them also clean floor-boards. The best plan is to move the stock on one side, placing a clean hive in its place, and transfer the frames and bees into this. The other hive can then be cleansed, have a coat of paint, and will be ready for the next stock. Where drones are not required place the frames 1¼ inches from centre to centre. Be on the look-out for foul brood, and if present commence treatment with one or other of the remedies recommended without delay.

As brood nest becomes enlarged and bees need more room, push division-board to one side and insert at side one of the superfluous combs previously removed when contracting brood nest. In this way add combs gradually till the full number is introduced.

SUMMER.—When bees begin to collect honey in large quantity, place a rack of sections on the hive, and proceed as recommended on page 55. To prevent swarming give additional room in advance of the bees' requirements.

Double those colonies intended for extracting, and extract at suitable intervals. Open entrances to full width. Make artificial swarms if required, and check swarming by removing frames of brood, cutting out queen-cells and extracting honey.

AUTUMN.—When honey is becoming scarce in the fields remove all unfinished sections, extract the honey from them, and return them to the bees to clean. Prepare the bees for winter by stimulative feeding and uniting all weak colonies. Introduce



Fitting Foundation in Sections.

queens to queenless stocks. Prepare honey for market, and for the various shows held about this time.

In the middle of September commence to feed up rapidly, and extract all unsealed stores. Reduce the number of frames to the strength of the colonies, place the frames $1\frac{3}{4}$ inches from centre to centre, contract the space by division-boards, cut winter passages, or make passages over the combs by placing sticks under the quilts. Pack with chaff,

reduce the size of entrances, and complete all arrangements for wintering by the beginning of October. After there is no longer danger from robbers open the entrance to 6 inches.

WINTER.—Disturb the bees as little as possible. Clean and prepare hives for spring use. Guard against mice and the attacks of birds. If any hives run short of food before spring introduce a cake of candy under the quilt over the frames, or put in a frame of candy at the side of the cluster. Boil up old combs and extract the wax.

Keep a note-book and make accurate entries of all operations and observations, to simplify which the *British Bee-keeper's Practical Note-book* has been arranged.

Carefully read and study all the directions given in the foregoing chapters. No instructions have been given but those which the writer has himself thoroughly tested, and he has endeavoured to put these into such plain language that any person of intelligence may succeed and become proficient in the management of bees in movable-comb hives with both pleasure and profit.

In the event of difficulties arising, questions are replied to through the weekly "British Bee Journal" or the monthly "Bee-keepers' Record," on writing to the office, 17 King William Street, Strand, London, W.C.

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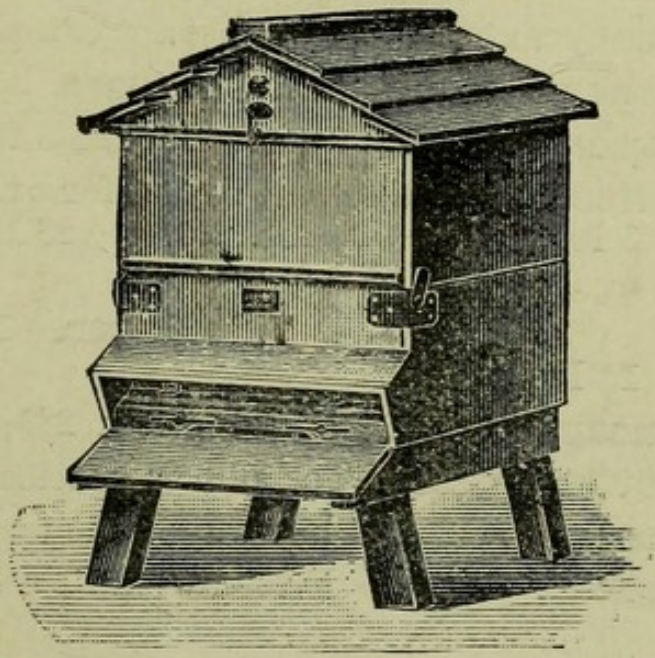

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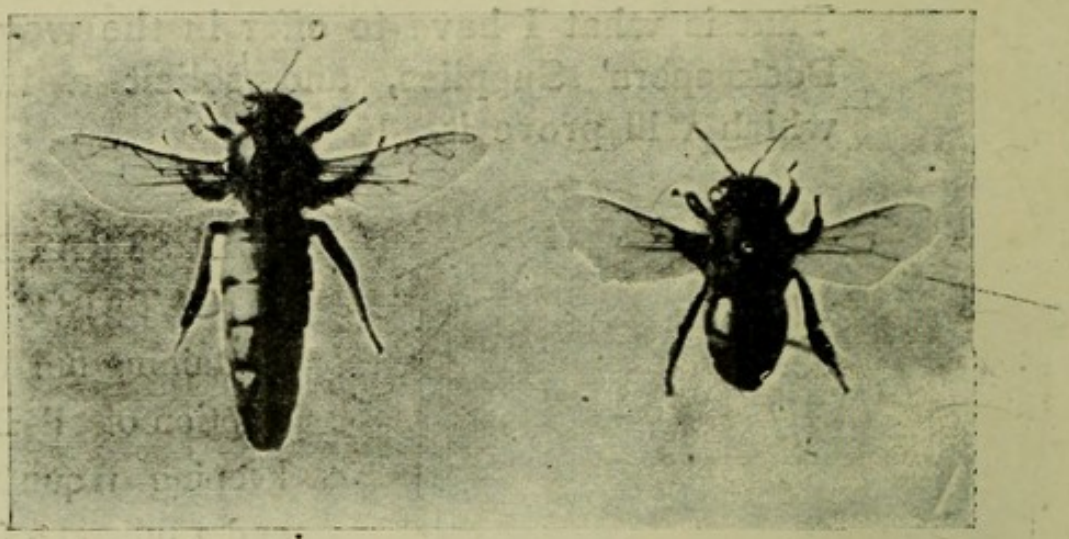

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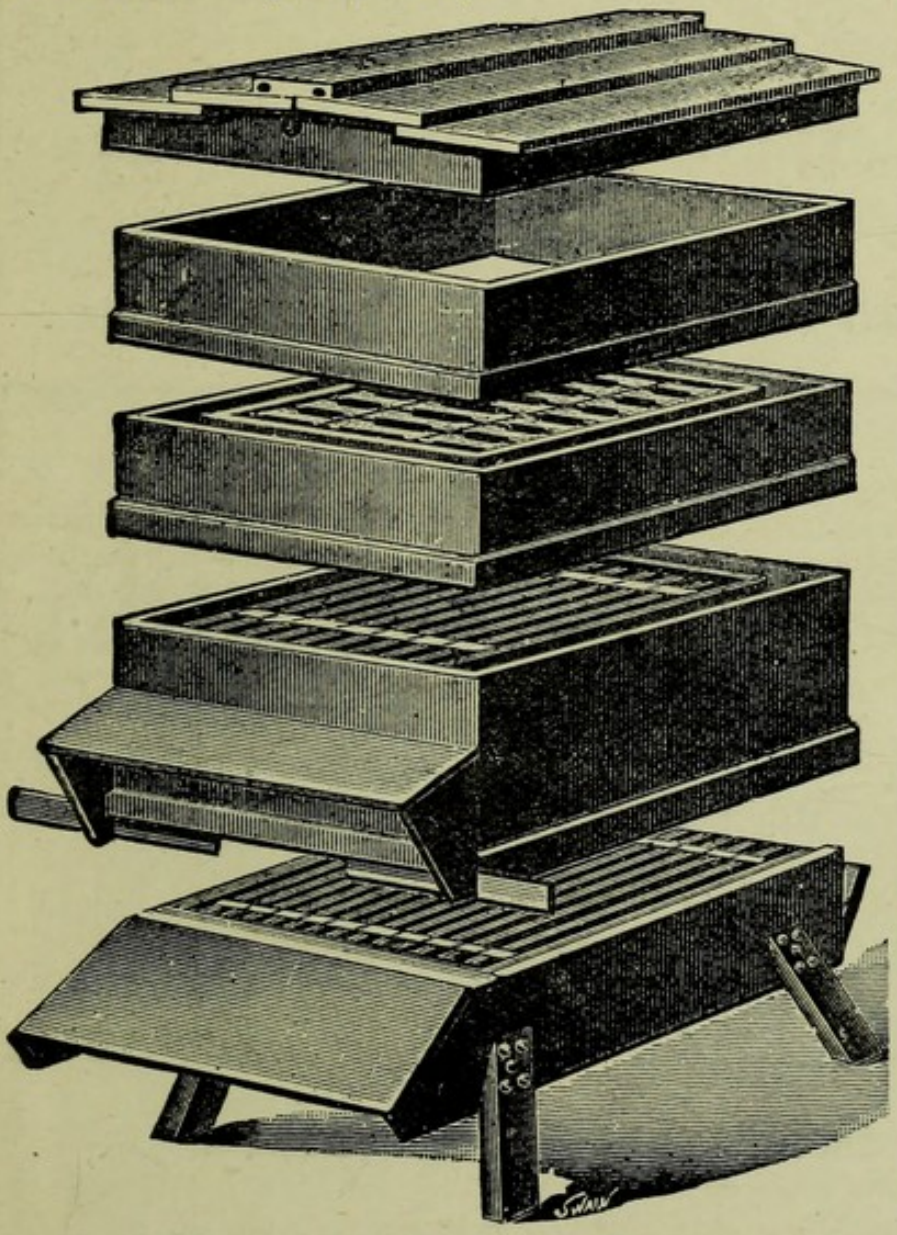

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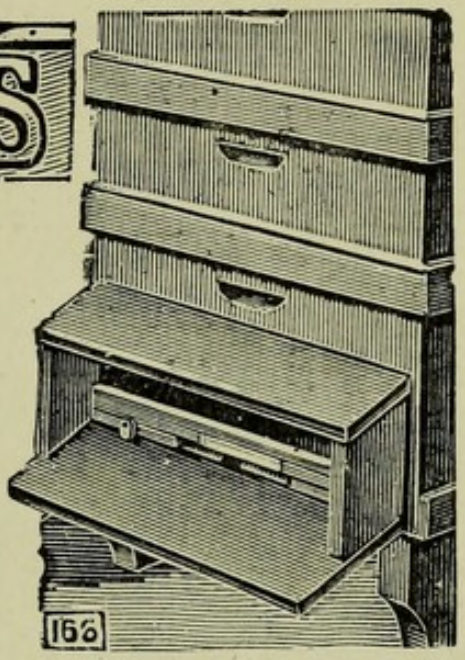

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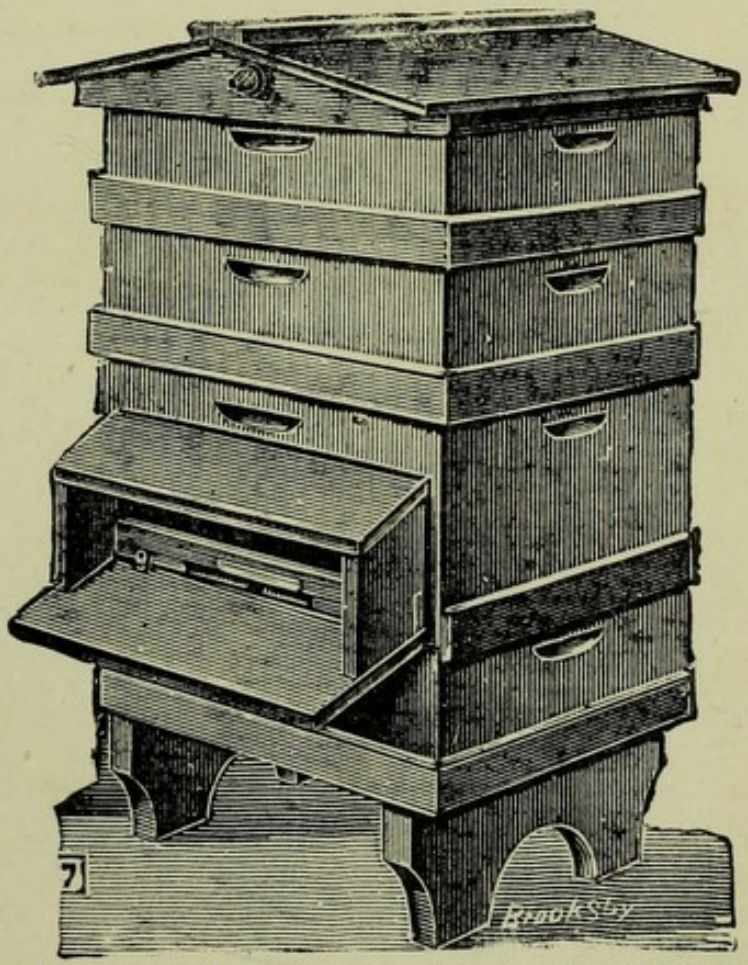

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