Lith d by Geo. H. Baker

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THE

BEE-KEEPER'S DIRECTORY,

OR THE

THEORY AND PRACTICE OF

BEE CULTURE,

IN ALL ITS DEPARTMENTS,

THE RESULT OF EIGHTEEN YEARS PERSONAL STUDY OF THEIR HABITS AND INSTINCTS.

BY J. S. HARBISON,

PRACTICAL APIARIAN.

WITH AN INTRODUCTORY ESSAY BY O. C. WHEELER,

Corresponding Secretary of the California State Agricultural Society.

Embellished with Eighty Illustrations.

SAN FRANCISCO:

H. H. BANCROFT AND COMPANY

1861.

TOWNE & BACON, PRINTERS, 503 CLAY STREET, SAN FRANCISCO.

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PREFACE.

THE following treatise is not designed to supersede or supplant the numerous and valuable works upon the same subject which have already been given to the public; but, like each of them, to add something to the stock of general knowledge, and illustrate and enforce some particular points in the important science of Bee-Keeping. It has been the endeavor of the author, as far as possible, to shun all theorizing, and confine himself to a practical application of those scientific principles which experience has taught him to be the true basis of success in all laudable undertakings.

The following pages are the result of the author's personal attention to the Apiary in all its details, through a period of nearly twenty years, during which time he has spared neither time, labor nor money to supply himself with all the published writings, and a knowledge of all the practical facts pertaining to the culture of the Honey Bee. Wherefore, he hopes that his book may be received as it is intended—as a reliable directory for those who wish to learn the science of Bee-Keeping, or the daily, practical workings of the Apiary. He claims no literary merit for the work; strictures, therefore, upon this department, can inure to the benefit of the author in but a very limited degree; but upon the subject matter of the work he invites the most thorough criticism.

Having been compelled to write in the midst of other absorbing labors, freedom from errors cannot be anticipated; if, however, one of these errors should be found in a failure to give due credit to authors whose works have assisted me, I beg pardon in advance; for I have, in all cases, intended to give such credit; and in this connection, my sincere thanks are due to the authors of "The Honey Bee," by Bevan, Quimby's "Mysteries of Bee-Keeping Explained," Langstroth's "Hive and Honey Bee," Jaeger's "Life of North American Insects," and many individuals of practical experience, for facts and information; in the latter connection, I am especially indebted to O. C. Wheeler, Corresponding Secretary of the California State Agricultural Society.

Hoping that the reader may find as much profit in the perusal, as the author has in the preparation of the work, it is cordially submitted to a generous public, by

J. S. HARBISON.

INTRODUCTORY ESSAY.

BY O. C. WHEELER, A. M.

THE ORIGIN AND HISTORY OF THE HONEY BEE.

In the absence of historical data concerning the origin and history of the honey bee, we are compelled to rely upon well known collateral facts, and the inevitable deductions of analogy; yet these often constitute evidence as strong, and produce convictions as clear as the most direct and positive testimony.

Should we assume that this most useful and exemplary insect was among the "*Living Creatures*" made by Deity prior to the creation of man, the following arguments come to our support, unbidden as sidereal luminaries to the relief of night—clear as a vernal stream, leaping from its snowy source, down the mountain's side—resistless as the ocean's swelling surges:

1st. Other classes of creatures, not as important to the supply of human wants, and the early interests of man, were certainly among the labors of the original "six days."

2d. The fact just stated, aside from their excellence, *per se*, proves that this insect was of sufficient importance to have been one of the very early subjects of creative genius and power.

3d. Man's primeval state very strongly called for—perhaps absolutely *demanded*—just such an article as the honey bee would produce.

4th. To have neglected to provide a creature so easy of production, so important in the scale of being, and above all, so very essential to the comfort of man, "for whom all things were made," would have been totally discordant with the well known principles of universal Divine benevolence.

5th. History testifies positively to the existence and working of the bee, within a comparatively short time after the general creation.

6th. History neither records, mentions or makes the remotest allusion to any subsequent act of creation, either of this or any other creature, save woman—the "better half" of man himself.

7th. Both the laws of physiology and the principles of analogy forbid the conjecture that it may be a hybrid race, resulting from the intercommunication of some two other preceding species.

8th. There was no law, physical, moral or divine, to interfere with or to preclude such a creation, among the labors of that great fundamental "*week.*"

9th. Since we know that the Creator did prepare a garden with blooming flowers and ripening fruit, for the sustenance and the pleasure of man, to which He introduced him on the very morning of his creation; and since honey was so important to man's comfort and happiness, we have not only no reason to *doubt*, but the strongest possible reasons for believing that He also provided this fundamental saccharinum, prepared in nature's own refinery—and that our first parents actually found "honey and the honey-comb" in the garden, among "the good things of God," which everywhere greeted their first morning stroll through the avenues of Paradise.

It is certain that no song of birds in Eden's bower could surpass the mellifluous hum of the bee; no sportive gambol, circling flight, or sudden dart, or graceful curve of sparrow on the wing, could equal the grace and beauty, the action and the science of her ærial sports or daily duties; nor could the combined aroma and symmetrical form of the thousand paradisian flowers compare with the sweetness of her honey, and the garniture of her store-house. Hence, no portion of the garden, which Adam was directed to "keep and dress," could have presented greater attractions to his attention, or stronger claims upon his care and protection.

Sugar, separated from its source, and prepared for use by the hand of man, is of recent origin; but honey "was of old," among the first of good things, among the best of first things—the one, a creation of God; the other, an invention of man—the one had entire dominion for thousands of years; the other has enjoyed partial sway in very modern times.

Nor was this busy collector of nature's sweetest products left, like many of the other classes of unintelligent creatures, to withstand the changes of a precarious world alone. Man came to her early protection from danger, and her aid in toil; he built her a house to exclude the cold, break the winds and shelter from the storm. Thus, her divinely appointed protector became at once her patron and a pensioner upon her bounty. Man's early companion and blessing, she repaid his care by soothing the sorrow of his apostacy, sweetening the cup of his bitterest woe, and restoring the vigor of his toil-worn frame.

In view of her relations to human weal, she was furnished a niche in the house of Noah and his family, during the three hundred and seventy days' voyage from the former to the latter world; and was, during this protracted confinement, the object of as anxious daily care as the most delicate or superb animal intrusted to the keeping of the patriarch of the deluge.

Nor did she fail, under the fostering care of her protector after the flood, to fulfill the divine behest, "*multiply and replenish the earth;*" for we find, at an early subsequent day—long before the captivity in Egypt—that honey was considered not only an important article of commerce, but one of the "best fruits of the land,"* and fit to be made an offering to a king, whose favor might be life—whose frown must be death.

This plenteousness is more than asserted; it is illustrated when the sacred penman† associates it with "milk," and "butter," and "fat of lambs," and "wine;" and also when‡ as dropping like rain, lying upon the ground in the comb. Another, with the pen of inspiration,§ makes it as common as "flour," and "oil," and "bread;" and another, still,‖ connects it with "locusts," which were frequently so plenty as to eat up "every green thing," and when in flight to obscure the light of a noon-day sun; while the oft-repeated expression of various contributors to the sacred volume is, that the land of Canaan "flowed with milk and honey."

Divine wisdom has also brought to view the power and importance of the honey bee, by a variety of strongly expressive allusions. In one place** it is said, "They compassed me about like bees;" and in another,†† "The Amorites * * *

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*Gen. 43: 11. †Deut. 32: 13, 14. ‡1 Sam. 14: 25–30. §Ezek. 16: 13, 19. ‖Matt. 3: 4. **Ps. 118: 12. ††Deut. 1: 44.

came out against you, and chased you as bees do, and destroyed you."

Honey was also considered a great delicacy. Was a king to give a sumptuous repast, or a queen invited to a special banquet? was an exhausted soldier to be revived, or an invalid prince to be nourished? honey was an universal accompaniment of the most nutritive and costly articles of harmless diet.

As far back as human records extend; in as free and full expressions as human pen can give, testimony to the culture, the importance, and the value of the honey bee is universal and abundant. On every page of history we meet her name; in every volume of political economy or domestic industry her diligence is the motto; in the sweetest strains of Parnassus, her cheerful "hum" is the key-note—everywhere, and at all times, her products have "lightened" the darkest hours of grief and sweetened the bitterest cups of human woe; while her industry has both urged and inspired man to higher aims and nobler achievements.

> "So work the honey bees,
> Creatures that, by a rule in nature, teach
> The art of order to a peopled kingdom,"

that philosophers have embellished their most brilliant attainments by the hues of her character, statesmen have given strength to empire by copying her colonial system, and warriors have become conquerors by emulating her courage.

While the ancients studied assiduously, and wrote voluminously upon the natural history of the honey bee, yet it is a strange fact, that after the first simple hive—a home with one room, perhaps first used by the father of our race to convey a swarm with him to the wilderness when expelled from Paradise—thousands of years passed without any known effort to improve the comforts of her house, or the facilities for economy in her products, by multiplying the number of apartments and introducing a system of ventilation.

Little as is now generally known of the economy of bee-keeping, writers upon the subject have been far more numerous than on almost any kindred topic.

Democritus, who wrote upon this theme four hundred years B. C., had already been preceded by more than five hundred authors on bees and bee-keeping, among whom are several not unknown to fame in the world of letters. Those have been succeeded by a constellation of illuminating brilliants in each succeeding age; generally teaching without first having learned, and always failing, in a greater or less degree, to afford reliable information and clear illustration to the reader and the learner. In tracing this line of authors on this subject for three thousand years, we find the names of Aristomachus, who made bees—their character and habits—his study for fifty-eight years; Philistratus, who became so absorbed in the study that he retired to the wilderness and desert, and spent near a score of years in learning their nature and instincts, when untrammeled by man; Aristotle, whose writings show the most perfect familiarity with the details of the apiary in his day; Columella, who tells us that the Greeks were the first to turn the products of the bee to commercial account, and that the idea originated on Mt. Hymettus, after the return of Cecrops from Egypt to Attica; Ceci, President of the Roman Academy of Sciences; Madam Merian, who beautifully illustrates the metamorphosis of the insects; Maraldi, who, in 1712, invented the glass hive, thus preparing the way for the experiments of

Reaumer, Hunter, Schirach and Huber. There are also the names of Solin, Menus, John of Lebanon, Misland, Aristeus, Galen, Varro, Aldrovandus, Virgil, Monfet, Pliny, Boer, Wildman, Nutt, Cotton, Briggs, Ray, Willoughby, Liste, Butler, Purchass, Warder, White, Thorley, Keys and Bonner, (not given in chronological order, but as they occur to the mind at the moment of writing) and an almost endless host of others.

These writings are, at the present day, mostly unextant; but were not unfrequently as grossly in error as Virgil was when, in his Georgics, he favored the idea previously advanced, that bees originated in the putrid bodies of deceased animals—an opinion, perhaps, traceable to the fact that a swarm was once found in the carcass of a dead lion.

In 1646, De Montfet published a treatise entitled "THE PORTRAIT OF THE HONEY FLY—ITS VIRTUES, FORM, AND INSTRUCTIONS—HOW TO REAP ADVANTAGES FROM THEM."

Three years later, there was printed, at Antwerp, another work, under the title, "THE SPRING OF THE HONEY FLY, DIVIDED INTO TWO PARTS, IN WHICH WILL BE FOUND A CURIOUS, TRUE AND NEW HISTORY OF THE ADMIRABLE AND NATURAL CONDUCT OF THE BEE, DRAWN SOLELY FROM THE HAND OF EXPERIENCE." But it was a century and a half later before Maraldi, Reaumer and Swammerdam, by their dissections and experiments, gave to the world the first true light upon the natural history of the honey bee.

They discovered the sex of bees; and Schirach the fact that a queen can be raised by the workers, from a common egg, by constructing a peculiar cell and supplying appropriate food to the young larvæ; while Reims discovered the "fertile worker;" all of whom were followed by that most wonderful experi-

ERRATA.

On page 33, twentieth line, (in a small portion of the edition) the word "California" has, by a slip of the types, been divided, and the three first letters placed at the commencement of the sentence.

Page 64, twentieth line, "fig. 21," should read "fig. 11."

Page 77, fifteenth line, "plate II," should read "plate III."

Page 301, last line, should read "bees can subsist," etc.

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CHAPTER I.

EXPERIENCE IN BEE-KEEPING.

Invention of the California Hive, ... 33

price, thus destroying the great incentive to improvement.

Owing to the inaccessible nature of these rudely constructed hives, they were generally permitted to stand without any attention, from the time the swarm was hived, until they were either killed or robbed.

This left the bees to battle against the moths and other enemies as best they could.

The result has been that bees have become scarce wherever left thus severely alone.

The chamber hive (or Weeks' hive as it was called) was first brought to my notice in the spring of 1844, and after using them extensively in various forms for a period of four years, I found that they answered but the one additional purpose over the common square box, viz: to furnish surplus honey in boxes in a more desirable form.

Many hives with various patented devices attached were brought to my notice during this period. Some of the most promising I tried thoroughly, but found none of them to possess any considerable advantages over the common chamber hive.

The success which attended my efforts at bee-keeping previous to 1848, although good, was not such as I believed could be attained.

The lack of system and uniformity of hives, as well as the imperfect arrangement of the latter, caused such an amount of labor as to render bee-keeping both a small and uncertain business.

Flat-bottomed hives allow the filth to accumulate, (the bees frequently being unable to remove all of it) furnishing the moth a safe deposit for her eggs, and food for her progeny.

To remedy this defect I made an inclined bottom board, not that the thing was new but an improvement. Instead of making the main incline movable, as was then the practice when used, I made it stationary, and added an inclined front slide, held in place by means of wedges, so that it could be taken out, for the purpose of examining the combs and removing the filth, and returned to its place with facility.

This style of bottom enables the bees themselves to keep their hives better freed from worms than could well be done by such occasional cleanings as are given to flat-bottomed hives by most bee-keepers.

After having used this improved inclined bottom for twelve years, I find that it gives, as it always has done, perfect satisfaction. No bee-keeper who has regard to his own convenience or pecuniary interest, can afford to do without it, notwithstanding it costs more at first than the old arrangement.

Another want which I felt, was a hive so arranged that the bees together with their combs and contents could be transferred with safety from one hive to another, either for the purpose of renovation or the formation of artificial colonies. In other words, I wanted control of the comb.

To supply these wants I constructed a hive with a movable glass frame in the rear, and a door to cover it and the surplus honey boxes above.

Having thus obtained easy access to the interior of the hive, I next constructed a movable platform within the hive, on which the combs were adjusted, and the whole so elevated that the bees fastened the combs to the top of the hive. This plan I found to work well.

These improvements, together with the chamber for surplus honey, gave a hive well suited to the wants of the bee, and hence a greater yield of honey.

The annual mortality of bees in these hives, as compared with those in common hives, I found to be enough less to amply pay the difference in the first cost, thus making an annual profit thereafter.

At the time of making the above improvements, (fall of 1848) I had become the owner of eight hives of bees, (farther additions were afterwards made to my stock by purchase) all of which I transferred into the improved hive, and increased partly by natural swarming, and partly by artificial division. My success was such that in 1853 I sold upwards of 6,300 lbs. of honey, at an average price of eighteen cents per lb.

But, in 1854, an unprecedented drought occurred throughout many portions of the United States, which cut short the growing crops. The bee pasture was so deficient that but few localities yielded any honey for market, and in most places the bees laid up so small a store that a large majority of them died during the following winter.

I escaped with the loss of about one-half of my stock, while most of my neighbors lost over four-fifths, and others lost all.

In anticipation of such loss, I concluded to try and retrieve my fortune in California. In pursuance of this resolution, I sailed from New York October the 27th, 1854, and landed at San Francisco November the 20th of the same year.

After a residence of two and a half years in California, I returned East, and arrived at my old home on the 2d of June, 1857.

During my absence, Quinby's "Mysteries of Bee-keeping Explained," and "Langstroth on the Honey Bee," (both valuable works) had been introduced into the libraries of some of the bee-keepers, where I saw and read them for the first time.

The Langstroth hive had also been introduced into a number of apiaries, ours among others. From the glowing accounts which I had heard of it while in California, I expected to find the desideratum long sought for by apiarists, and as a result of its introduction into our apiaries, that they would be in a highly flourishing condition, particularly that portion of the stock contained in the new style of hive. In this I was doomed to disappointment, as most of the bees that had been put into them had died of starvation, they having eaten all the stores from the bottom to the top of the hive, in the center of a diameter equal to the size of the cluster, leaving an abundance of stores still within the hive, but owing to the severe cold, the bees were unable to reach them.

As an offset to this, I found that the bees in my old improved hive were strong and vigorous, proving most conclusively the superiority of a hive deep from top to bottom, over low flät ones.*

The worms were also much more troublesome and destructive in the Langstroth than any other hive, unless more frequently overhauled.

From my previous experience, I was satisfied that although the Langstroth hive did not fulfill its promise, yet that the movable comb principle possessed some important advantages over all others. With these views, I went to work and reïntroduced bees into a number of hives from which the previous swarms had died, and constructed others of a greater depth, but less in width and length. Into these I put a considerable number of natural swarms, also transfers and divisions. I was then prepared to test the merits of the Langstroth hive by varied and extensive use, the result of which showed the following defects to exist: *First*, The frames being simply suspended on rabbets, rendered it difficult to space them with the necessary precision; for, if the space is insufficient, the bees shorten the cells on the side of one comb, thus rendering that side useless; and if placed more than the usual width, it requires a greater amount of bees to hover the brood, as also to raise the temperature to the

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* The same result has, in a great measure, attended the use of the respective hives throughout that section of country since that time.

proper degree for building comb. *Second*, When the combs are too widely spaced, the bees, while refilling them with stores, lengthen the cells, and thus make the comb thick and irregular—the application of the knife is then the only remedy to reduce them to the proper thickness.

Another objection to the suspended frame, is the impossibility of removing the hives containing bees to a distance, without first nailing or fastening each frame to its place; and to get control of them, the hive has again to be opened and the frames unfastened; all of which requires time and trouble, to say nothing about the liability of being stung while treating the bees thus rudely.

After a fair trial of the Langstroth hive and its working capabilities, compared with the hive which I had previously used, I found it inferior, and accordingly determined to abandon its use entirely.

INVENTION OF THE CALIFORNIA HIVE.

Immediately after my arrival in California with bees, (fall of 1857) I procured lumber and other material suitable for making hives on my old plan. After cutting out the stuff for twenty, and completing a portion of them, I became satisfied that useful improvements could be made. What I wanted was a hive for the use of my own bees: one that I could adapt and use to the exclusion of all others, so long as I continued the business of bee-raising.

With this view, I went to work, and after many days and nights of close study and experimenting, the different improvements of the present hive were gradually developed. The first improvement—section honey box, (applicable to any hive)—was made December the 25th, 1857. The second improvement, the adjustable comb frame and manner of its adjustment, was made January the 2d, 1858. The third improvement was the manner of ventilation, made January the 4th, 1858; and the fourth improvement was the metallic clamps for fastening combs into frames, made January the 9th, 1858. Other improvements, as well as slight changes, have been since made, all of which have been thoroughly tested, giving entire satisfaction to all who have given them a fair trial. The large number of this style of hive now in use in this State, within so short a time as has elapsed since its invention, is good evidence of its utility.

CHAPTER II.

INTRODUCTION OF THE HONEY BEE TO CALIFORNIA.

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INTRODUCTION OF THE HONEY BEE TO CALIFORNIA.

The introduction of the Honey Bee into California was an important event, and engrossed a large share of public attention; wherefore it is peculiarly appropriate to preserve as full a record of the transaction as possible.

The following letter from one of the earliest and most successful apiarists of this State, contains an authentic account of the introduction of the first bees into California, as well as the success attending their first five years' cultivation in San José Valley.

San Jose, Jan. 11th, 1860.

Mr. J. S. Harbison,

Dear Sir:—Yours of the 26th December, propounding certain inquiries, has been received.

The first bees imported into California was in March, 1853. Mr. Shelton purchased a lot consisting of twelve swarms, of some person to me unknown, at Aspinwall. The party who left New York became disgusted with the experiment, and returned. All of the hives contained bees when landed in San Francisco, but finally dwindled down to one. They were brought to San José and threw off three swarms the first season. Mr. Shelton was killed soon after his arrival, by the explosion of the ill-fated steamer Jenny Lind. In December, two of the swarms were sold at auction to settle up his estate and were bought by Major James W. Patrick, at $105 and $110, respectively.

Mr. Wm. Buck imported the second lot in November, 1855. He left New York with thirty-six swarms and saved eighteen. I purchased a half-interest in them. I also, in the fall of 1854, bought one swarm of Major Patrick, from which I had an increase of two.

Mr. Buck returned East immediately, and arrived in February, 1856, with forty-two swarms, of which he saved but seven. Our increase in 1856, from the twenty-eight swarms, was seventy-three; we also had about 400 lbs. of honey in boxes, which we sold at from $1.50 to $2.00 per lb.

Mr. Wm. Briggs, of San José, brought out, spring of 1856, one swarm, from which he had an increase of seven or eight swarms the following summer.

The above were the only importations I know of prior to the year (spring) 1857, which covers the ground of your inquiries.

There are in our county at this time, about one thousand swarms.

Very respectfully, &c.,

F. G. APPLETON.

The first hive of bees ever in the SACRAMENTO VALLEY, was brought from San José in the summer of 1855, by Mr. A. P. Smith, the eminent nurseryman of Sacramento; they however soon died, which gave the impression that bees would not do well in this vicinity.

In this belief I did not concur, and therefore took measures to test the matter further.

In the fall of 1855, I sent East and had one hive of bees brought out, which arrived in Sacramento

February the 1st, 1856. Though most of the bees had died or escaped from the hive during the passage enough remained to prove that by careful handling they could be imported with little loss, and that they would increase and make large quantities of honey when here.

I left San Francisco May the 5th, 1857, on board the steamship Golden Gate, on my way East, for the purpose of preparing a stock of bees for shipping to California.

Sixty-seven colonies were prepared from my own apiaries, situated in Lawrence county, Pennsylvania.

They were taken to New York, and shipped on board the steamer Northern Light, which sailed from that port November the 5th, bound for Aspinwall.

The bees were put on board in good order, were placed on the hurricane deck, kept well shaded and ventilated, and arrived at the latter port on the 15th of the same month, being ten days from port to port. Having arrived at Aspinwall in the forenoon, and ascertained that no passengers or freight would be sent forward before the next morning, I obtained permission to open the hives on the Company's grounds, and let the bees fly during that evening, which greatly relieved them, and contributed to their health during the remainder of the voyage.

The hives were closed up and placed on board the cars, crossed safely to Panama, and reshipped on board the steamer Sonora, which sailed from that port on the evening of the 16th, bound for San

Francisco, where she arrived on the evening of the 30th.*

The bees had ample stores within their hives before they were started, to last them through their long journey. I neither watered or gave them any additional food during the whole trip, except what they obtained while flying out at Aspinwall.

During each day's confinement the bees labored incessantly to gain their liberty, but as soon as it was dark they always became quiet, and remained so during the night.

At San Francisco the bees were transferred from the Sonora to the steamer New World, and landed in Sacramento on the morning of December the 2d, 1857, thus terminating a journey of 5,900 miles, which was at that time the longest distance that bees had been known to be transported at one continuous voyage.†

On opening the hives, I found that considerable numbers of bees had died in each, and that in five

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*There were other importations of bees made during the winter of 1857 and 1858, a large proportion of which died.

† To the officers and agents of the various transportation companies, over whose routes I passed from Newcastle, Pennsylvania, to Sacramento, California, particularly Mr. J. F. Joy, agent, Panama Railroad Company, Capt. Tinklepaugh, of the steamship Northern Light, and Capt. Whiting, of the Sonora, I am indebted for their valuable and efficient aid in securing a safe transit, and probably the most successful shipment of bees ever made to California.

all were dead, having been destroyed by worms which had been hatched on entering the warm climate from eggs laid by the moth previous to starting. The combs were entirely enveloped in webs containing the worms, and were a perfect ruin. A few worms were found in each of the hives containing living bees, but were soon exterminated.

Some hives were found to contain so few bees that they were united with other weak ones, till the number was reduced to fifty.

In the latter part of January, 1858, I made a discovery which has since been verified in a number of instances. All the bees in two hives swarmed out, leaving them entirely deserted. On examining, I found young brood, the combs were clean and healthy, and each hive contained some six or eight pounds of honey. But it was nearly all sealed up, only a few cells containing honey being open.

The cause of their deserting was then a mystery, as they had apparently all the requisites to do well. I finally suspected that, owing to their long confinement, and frequent passing over the sealed surface of the comb, it had become glazed so that the bees were not aware that they possessed so ample a store.*

* In the spring of 1859, and particularly the present one, 1860, I have known the bees (California-raised) from a number of hives, to leave in like manner. The only difference was that the hives were not over half full of combs. But these were full of honey and tightly sealed, like those before mentioned.

Acting from this belief, I at once with a knife uncapped a portion of the honey in each remaining hive; this was repeated twice a week for the two following ones, and as the honey became scarce, feed was given to the most destitute. The result was that no more hives were *deserted.*

There was no indication of disease of any kind existing in any of them. Hence there is no doubt of the above being a cause of bees deserting their hives.

The stock was still further reduced by sale, so that thirty-four hives of bees remained on the 1st of April. These were increased to one hundred and twenty, most of which were sold in the summer and fall of that year.

Again, on the steamer of September the 20th, 1858, I returned East, for the purpose of transporting another stock, which had been prepared for that purpose during the previous summer. On the 6th of December, in company with my brother, W. C. Harbison, I sailed from New York with one hundred and fourteen colonies, and arrived at Sacramento January 1st, 1859, with one hundred and three living. Of this importation, sixty-eight were from Centralia, Illinois; the remaining forty-six were from Lawrence county, Pennsylvania.

Owing to the lateness of the season of shipping, and unfavorable weather during the first three weeks after our arrival, we were only able to save sixty-two out of the whole number; these, together with six good hives remaining from the previous year, we increased to four hundred and twenty-two (422) colonies, including the sixty-eight old ones; three hundred of them filled standard hives, and the remainder averaged half full.

The increase was all made on the artificial principle (as laid down in this work). Not a single natural swarm issued from any hive during the whole season. I also formed a large number of colonies, for different parties in Sacramento and vicinity, which were attended with like success.

During the time between the 1st of October, 1858, and April 1st, 1859, there were shipped from New York for California, over one thousand hives of bees, not over two hundred of which survived on the 1st of May of the latter year.

All but three of the parties engaged in shipping them lost money by the operation, many of them being unacquainted with the business.

Of the modes of importing bees to California, the most novel was that of Mr. J. Gridley, who brought four swarms across the Plains from Michigan, placed in the rear end of a spring wagon. He arrived in Sacramento on the 3d of August, 1859, with them, in good condition. His plan was to feed them, and in addition, stop occasionally in the afternoon and allow the bees to fly out and work till dark, when they were closed up, to resume their journey early on the following morning. This was repeated from time to time, as they required their liberty.

Notwithstanding such disastrous results attending the previous years' shipments, there were upwards of six thousand hives of bees imported during the winter of 1859–60. They arrived in better condition apparently than those of previous years; yet, owing to the fact that large numbers of them were infected with the disease known as *foul brood* prior to their purchase and shipment, together with the effects of so long a voyage, probably one-half of the whole number were lost. Many of the remainder have since died, or now linger in a diseased condition, which is infinitely worse for the parties owning them than if all had died at once. Thus, the result has been bad for *all concerned;* for, while some have lost their money, others have injured their reputation, besides paralyzing for a time an important branch of productive industry.

CHAPTER III.

THE HONEY BEE: CLASSIFICATION, PHYSIOLOGY AND CHARACTERISTICS.

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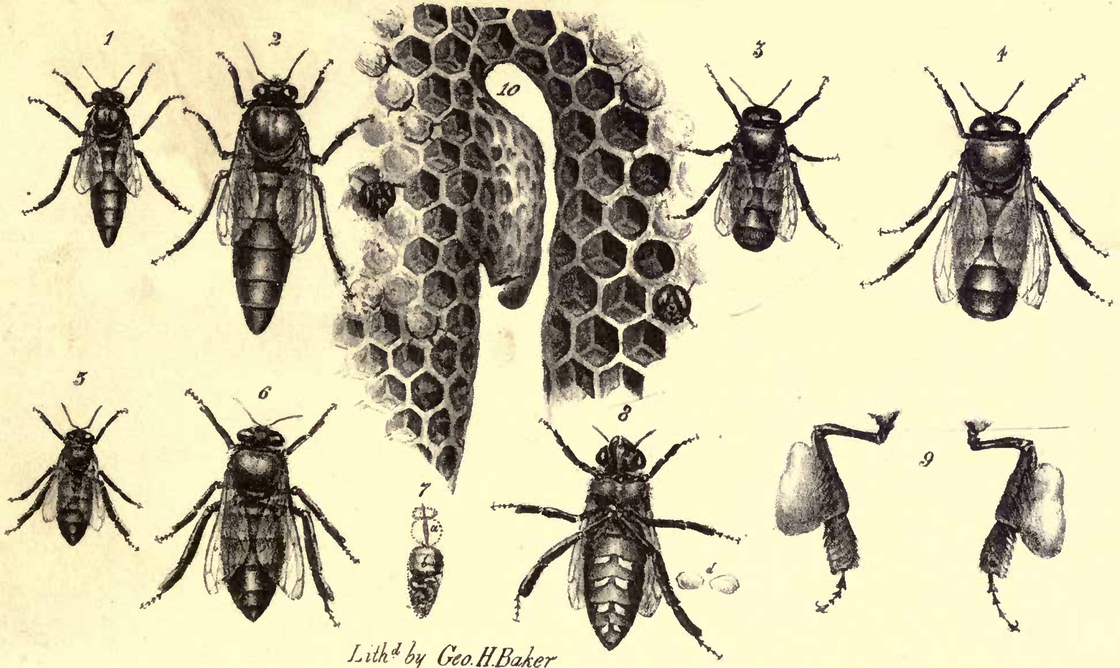
PLATE I.



Lith^d by Geo. H. Baker

CHAPTER III.

THE HONEY BEE: CLASSIFICATION, PHYSIOLOGY AND CHARACTERISTICS.

Each family of bees is composed, during a portion of the year, of three classes—viz: queen, drones, and workers. During the remainder there are only two—the queen and workers, or developed and undeveloped females. (See plate 1.)

Fig. 1 represents the queen life size, and 2, magnified.

3. Drone life size, and 4, magnified.

5. Worker life size, and 6, magnified.

7. Anatomical view of the worker; *a*, thorax or pipe through which the honey passes from the mouth into the honey sack *b*, and *c* the intestines.

8. Worker magnified, showing the scales of wax as they exude from the rings of the belly; *a*, scales of wax separated from the bee.

9. The legs of a worker loaded with pollen.

10. Section of brood comb; in the center is seen a queen cell, from which a queen has emerged; on the right, drone comb, with drone brood emerging; on the left, (where the queen cell is attached) worker comb, with worker brood emerging.

THE QUEEN.

The queen, or *mother*, is the only perfectly developed female in the hive. Her form is symmetrical and graceful; her color, on the back and sides, is usually of a dark brown, but occasionally of a slightly yellow or variegated appearance; while the belly and legs are of a bright copper color.

Strictly speaking, the queen is a working mother, rather than a ruling sovereign. Her main office is to deposit eggs in the cells; which is proved by the fact that a queenless colony continue labor with nearly the same alacrity as though they possessed one, till finally terminated by the death of the generation.

WHEN QUEENS ARE BRED.

Bees, if left to themselves to swarm in the natural way, only breed queens at a period preparatory to swarming, or to supply the place of old ones about to die.* When a hive is sufficiently full, and pasture abundant at the season when instinct prompts them to swarm, from five to eight days prior to the first

*I have, in two instances, found sealed queens (in one there were three, in the other, one) in a hive not half full of comb, with the old queen still laying eggs, although so decrepid from age, or other causes, that it was impossible for her to fly, and consequently could not accompany a swarm. After the young queen emerged, there were no more eggs deposited for about ten days, the required time for the young queen to become fruitful. During this time, the old queen had either died or was slain by her successor. From these facts, we are led to conclude that the bees were aware of the approaching death of the queen, and thus wisely provided a successor while it was in their power to do so.

one leaving, they form a number of queen cells, usually from three to eight, in which the queen deposits eggs. This is done at intervals up to the time when the first swarm departs, at which time one or more of the cells are sealed; the remaining ones are sealed afterwards, in the order of their respective ages, all being finished by the sixth day after the swarm has left, (the old queen invariably accompanying the first swarm) at which time, or within twenty-four hours thereafter, (being seven days from the departure of the first swarm) the first sealed queen emerges, and usually in three days from her birth she accompanies the second swarm.

The second queen accompanies a third swarm on the second or third day from the second; a fourth, and even a fifth swarm sometimes follow, at intervals of every other day. All the swarms from the same hive must depart within nineteen days from the time the first one left; after which time no more can depart for a period of from forty to sixty days: instances of a hive swarming at a second period during the same season are rare. Bees also rear queens from worker larvæ, when deprived of their queen.*

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* "The fact is said to have been known long before Schirach wrote: M. Vogel and Signor Monticelli, a Neapolitan professor, have both asserted this; the former states it to have been known upwards of fifty years, the latter a much longer period; he says that the Greeks and Turks in the Ionian Islands are well acquainted with it, and that in the little Sicilian Island of Faviguana, the art of *producing queens* has been known from very remote antiquity; he even thinks that it was no secret to the Greeks and Romans."—*Bevan.*

It is on this fact that artificial division or formation of colonies, is founded.

When a number of queen cells remain in a hive that does not intend to swarm any more, the first queen out destroys all her embryo sister queens, by gnawing into the cells, and either biting or stinging them. The workers then carry out the dead and demolish the mutilated cells; this is usually done the first day of the existence of the queen.

If it is intended that other swarms shall issue, the royal cells are not destroyed. But after the swarms have all departed, the remaining royal pupa is destroyed.

It has been asserted that the bees guard the royal cells from the attacks of the queen. This statement I consider mere assertion, not founded on fact. My reasons for this belief are, first, that the instinct of the bees (the queen included) is perfect in every particular relating to their increase. Then why *guard the cells?* Second, I have in two instances seen a young queen running over and around the royal cells, stopping every two or three minutes, and with her wings making the piping noise.*

The bees neither seemed to notice her, or the royal cells. Whether the workers had previously given her to understand that she must not molest them, or that they ever prevent a queen from doing so, is more than I can tell, notwithstanding Huber,

* This discovery is due to A. Harbison.

Langstroth, and other authors assure us that such is the fact.

Mr. Quinby expresses his views as follows:

"It is stated that when the bees decide an after swarm shall issue, the first queen matured is not allowed to leave her cell, but is kept a prisoner there, and fed until wanted to go forth with the swarm. This may be true in some cases, (though not satisfactorily proved) but I am quite sure it is not in all.

"When she is confined to her cell, how does she ascertain the presence of others? By leaving the cell this knowledge is easily obtained. Huber says she does, and is 'enraged at the existence of others, and endeavors to destroy them while yet in the cell, which the workers will not allow; this is so irritating to her majesty that she utters this peculiar sound.' Also, second and third swarms may contain several queens, frequently two, three and four; even six* at one time came out. If these had to bite their way out, after the workers had decided it was time to start, (for it *must be they* decide it when the queens are shut up) they would hardly be in season."

IMPREGNATION OF THE QUEEN.

A young queen having succeeded to the vacancy

* About the 1st of June, 1860, I hived an after swarm which had seven queens with them. I removed all but one and supplied them to artificial colonies. I examined the hive from whence the swarm had issued within an hour thereafter, and found two more queens, which had probably emerged after the departure of the swarm.—*A. Harbison.*

occasioned by the emigration or death of the parent queen, as the future mother of the hive, (or as such in any swarm or colony) flies out for the purpose of being impregnated. This takes place from the seventh to the tenth day after she emerges from her cell; and from two to four days more elapse before she commences to deposit eggs, which will be on the ninth to the fourteenth day of her existence.

Sometimes impregnation is retarded, or fails to take place; the result in either case is that she becomes a drone layer. Exclusive drone laying (in my opinion) frequently results from the imperfect development of the ovaries of the queen.

"Impregnation," (according to Dr. Fleming) "in insects, appears to take place while the eggs pass a reservoir containing the sperm, situated near the termination of the oviduct in the vulva." "In dissecting the female parts in the silk-moth, says Mr. Hunter, I discovered a bag, lying on what may be called vagina, or common oviduct, whose mouth or opening was external, but it had a canal of communication betwixt it and the common oviduct.

"In dissecting these parts before copulation, I found this bag empty; and when I dissected them afterwards, I found it full." (Phil. Trans. 1792, p. 186.)

Dr. Leidy, who made dissections and microscopic examinations of queen bees for Mr. Langstroth, in the winter of 1851–2, "found, on making his dissections, a small globular sac, about one thirty-third of an inch in diameter, communicating with the oviduct, and filled with a whitish fluid;* this fluid when examined under the microscope, abounded in the spermatozoa which characterizes seminal fluid.

"A comparison of this substance later in the season with the semen of a drone, proved them to be exactly alike."

"These examinations have settled, on the impregnable basis of demonstration, the mode in which the eggs of the queen are vivified. In descending the oviduct to be deposited in the cells, they pass by the mouth of this seminal sac, or '*spermatheca*,' and receive a portion of its fertilizing contents. Small as it is, it contains sufficient to impregnate hundreds of thousands of eggs."

"Dzierzon asserts that all impregnated eggs produce females, either workers or queens; and all unimpregnated ones males or drones; and concluded that the eggs laid by the queen bee and fertile worker had, from the previous impregnation of the eggs from which they sprung, sufficient vitality to produce the drone, which is a less highly organized insect than the queen or worker."

"It had long been known that the queen deposits

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* "Posel describes the oviduct of the queen, the spermatheca and its contents, and the use of the latter in impregnating the passing egg. This work was published at Munich, in 1784. It seems also from his work that before the investigations of Huber, Jansha, the bee-keeper royal of Maria Theresa, had discovered the fact that the young queens leave their hive in search of the drones."—*Langstroth.*

drone-eggs in the large or drone cells, and worker-eggs in the small or worker cells, and that she makes no mistakes.

"Dzierzon inferred therefore, that there was some way in which she was able to decide the sex of the egg before it was laid, and that she must have such control over the mouth of the seminal sac as to be able to extrude her eggs, allowing them at will to receive or not a portion of its fertilizing contents. In this way, he thought she determined their sex, according to the size of the cells in which she laid them."

Bonner (who wrote a work on bees in 1795) was of the opinion that a queen would lay eggs capable of producing both males and females, although they never saw a drone.

From circumstances that have come under my own observation, I believe that Bonner is nearer the truth than Dzierzon, yet there are doubts in my mind as to the entire correctness of either.

The following theory was advanced by Mr. Wagner (p. 38, "Hive and Honey Bee") viz: "that the queen in depositing eggs in worker cells has her body slightly compressed by their size, thus causing the eggs as they pass the spermatheca to receive its vivifying influence. On the contrary, when she is laying in drone-cells, as this compression cannot take place, the mouth of the spermatheca is kept closed, and the eggs are necessarily unfecundated."

This theory needs no other refutation than the fact that the queen frequently, as in the case of young swarms, lays her eggs in cells not an eighth of an inch deep; this she does both in worker and drone cells, yet they always produce workers and drones respectively, with the same regularity as if the cells had been built the usual length at the time the eggs were deposited.

SEX OF EGGS.

That the sex of the eggs is determined at, or previous to the time of deposit in the cells by the queen, there can be no doubt, as all the eggs laid in drone cells produce drones only, while those laid in worker cells can be developed perfect queens or workers at the pleasure of the nursing bees. To prove this I give the following experience. In practicing the dividing system I have frequently found the bees to build a portion of the queen cells on drone comb containing drone larvæ, and in three instances all built being the same. In two of the cases I supplied comb the second time, containing eggs and larvæ, both in the worker and drone cells, and in both cases the queen cells were all built on the drone comb, and in one instance this was repeated three successive times. I have given these apparent queen cells repeatedly to queenless colonies, but in no instance have either queen or drone emerged from them. I have opened nearly one hundred of these cells, and at various times, and have found them to contain larvæ of considerable size, but none had ever become a pupa, but had died on reaching that age. These cells are larger than the proper cells built from worker brood, and should be destroyed whenever found. Many of the failures to produce queens have resulted from using such cells, not knowing their true character. By using the queen nursery, as directed in Chap. XVII, it will prevent, in a great measure, such cells being built.

LAYING AND HATCHING OF EGGS, AND TREATMENT OF THE YOUNG.

The following quotations from *Bevan*, give a very full and correct description of the manner in which the egg is laid, and the appearence and treatment of the insect in all stages to the fully developed bee.

" It is the office of the queen bee to multiply the species by laying eggs, which she deposits in cells constructed for their reception by the working bees. These cells vary from one another in size (and in the instances of the royal cells they also vary in form and direction) according as they are intended to be the depositories of eggs that are to become drones, or of those that are to become workers. When the queen is about to lay, she puts her head into a cell and remains in that position for a second or two, probably to ascertain its fitness for the deposit which she is about to make. She then withdraws her head, and curving her body downwards, inserts her tail into the cell; in a few seconds she turns half round upon herself and withdraws, leaving an egg behind her. When she lays a considerable number, she does it equally on each side of the comb, those on the one side being as exactly opposite to those on the other as the relative position of the cells will admit. The effect of this is to produce a concentration and economy of heat for developing the various changes of the brood.

" The eggs of bees are of a lengthened oval shape, with a slight curvature, and of a bluish white color; are composed of a thin membrane filled with a whitish liquor, and being besmeared at the time of laying with a glutinous substance, they adhere to the basis of the cell and remain unchanged in figure or situation for four days; then they are hatched, the bottom of each cell presenting to view a small white worm or maggot, with several ventral rings. On its growing so as to touch the opposite angle of the cell, it coils itself up in the shape of a semicircle; to use the language of Swarmnerdam, 'it coils itself up like a dog when he is going to sleep;' and floats in a whitish transparent fluid which is deposited in the cells by the nursing bees, and by which it is probably nourished; it becomes gradually enlarged in its dimensions till the two extremities touch one another and form a ring. In this state it obtains indifferently the name of *worm*, *larva*, *maggot*, or *grub*, and is fed with farina or bee-bread. The slightest movement on the part of the nursing bees suffices to attract it to its food, to receive the welcome morsels of which it eagerly opens its two lateral pincers, and a most liberal supply is afforded to it, though by no means trenching on the bounds of prodigality.

"So nicely do the bees calculate the quantity which will be required, that none remains in the cell when the larva is transformed to a nymph. It was the opinion of Reaumur, and is still that of many eminent naturalists, that farina does not constitute the sole food of the bee-larva, but that it consists of a mixture of farina with a certain proportion of honey and water, partly digested in the stomachs of the *nursing bees*, the relative proportions of honey and farina varying according to the age of the young. The compound at first is nearly insipid, but gradually receives an accession of sweetness and acescency which increase as the insects approach maturity.

"The larva having derived support in the manner above described, for four, five, or six days, according to the season, continues to increase during that period, till it occupies the whole breadth and nearly the length of the cell. The nursing bees now seal up the cell, with a light *brown* cover, externally, more or less *convex*, (the cap of a drone cell is more convex than that of a worker) and thus differing from that of a honey-cell, which is *paler* and somewhat *concave.* The larva is no sooner perfectly inclosed than it begins to labor, alternately extending and shortening its body, whilst it lines the cell by spinning round itself, after the manner of the silk worm, a whitish silky fiber or *cocoon*, by which it is encased as it were in a pod or pellicle. 'The silken thread employed in forming this covering proceeds from the middle part of the under lip, and is in fact composed of two threads gummed together as they issue from the two adjoining orifices of the spinner.' When it has undergone this change, it has usually born the name of *nymph or pupa.*

"It may appear somewhat extraordinary, that a creature which takes its food so voraciously prior to its assuming the pupa state should live so long without food after that assumption; but a little consideration will perhaps abate our wonder; for when the insect has attained the state of pupa, it has arrived at its full growth, and probably the nutriment taken so greedily is to serve as a store for developing the perfect insect.

"The bee when in its pupa state has been denominated, but improperly, chrysalis and aurelia; for these, as the words import, are of a golden yellow color, and they are crustaceous, whilst the bee nymphs are of a pale dull color, and readily yield to the touch. The golden splendor to which the above names owe their origin is peculiar to a certain species only of the papilio or butterfly tribe. The term pupa, which is employed by the higher class of entomologists, after the example of Linnæus, signifies that the insect is enveloped in swaddling clothes like an infant; a very apt comparison. Kirby and Spence have remarked that it exhibits no unapt representation of an Egyptian mummy. When in this state, it presents no appearance of external members, and retains no very marked indications of life; but within this outward case its organs are gradually and fully developed, its integuments hardened and consolidated, and as soon as it is qualified it bursts its fetters, and is introduced to a new career of existence; from having been a mere worm, it becomes a sportive inhabitant of the air and enters upon new scenes and new enjoyments.

"The *working bee-nymph* spins its cocoon in thirty-six hours. After passing about three days in this state of preparation for a new existence, it gradually undergoes so great a change as not to wear a vestige of its previous form, but becomes armed with a firmer mail and with scales of a dark brown hue fringed with light hairs. On its belly six rings become distinguishable, which, by slipping one over another, enable the bee to shorten its body whenever it has occasion to do so; its breast becomes entirely covered with gray feather-like hairs, which, as the insect advances in age, assume a reddish hue.

"When it has reached the twenty-first day of its existence, counting from the moment the egg is laid, it quits the exuviæ of the pupa state, comes forth a perfect winged insect, and is termed an *imago*. The cocoon or pellicle is left behind, and forms a closely attached and exact lining to the cell in which it was spun; by this means the breeding cells become smaller and their partitions stronger the oftener they change their tenants; and when they have become so much diminished in size by this succession of pellicles or linings as not to admit of the perfect development of full-sized bees, they are converted into receptacles for honey.

"Such are the respective stages of the working bee; those of the royal bee are as follows. She passes three days in the egg and is five a worm; the workers then close her cell, and she immediately begins spinning the cocoon, which occupies her twenty-four hours. On the tenth and eleventh days, as if exhausted by her labor, she remains in complete repose, and even sixteen hours of the twelfth. Then she passes four days and one-third as a nymph. It is on the sixteenth day, therefore, that the perfect state of queen is attained.

"The male passes three days in the egg, six and a half as a worm, and metamorphoses into a fly on the twenty-fourth or twenty-fifth day after the egg is laid. The great epoch of laying the eggs of males may be accelerated or retarded by the state of the atmosphere, promoting or impeding the collection of the bees. The *development of each* species likewise proceeds more slowly when the colonies are weak or the air cool, and when the weather is very cold it is entirely suspended. Mr. Hunter has observed that the eggs, maggots and nymphs all require a heat above 70° of Fahrenheit for their evolution. The influence of temperature in the development of embryo insects is very strongly illustrated in the case of the *Papilio Machaon*. According to Messrs. Kirby and Spence, 'if the caterpillar of the *Papilio Machaon* becomes a pupa in July, the butterfly will appear in thirteen days; if it do not become a pupa till September, the butterfly will not make its appearance until the following June.' And this is the case, say they, with a vast number of other insects. Reaumur proved the influence of temperature by effecting the regular change in a hot-house during the month of January. He also proved it conversely by having recourse to an ice-house in summer, which enabled him to retard the development for a whole year.

"The larvæ of bees, though without feet, are not always without motion. They advance from their first station at the bottom of the cell in a spiral direction; this movement for the first three days is so slow as to be scarcely perceptible, but after that it is more easily discerned. The animal now makes two entire revolutions in about an hour and three-quarters, and when the period of its metamorphosis arrives, it is scarcely more than two lines from the mouth of the cell. Its attitude, which is always the same, is a strong curve. This occasions the inhabitant of a horizontal cell to be always perpendicular to the horizon, and that of a vertical one to be parallel with it."

"The young bees break their envelopes" from the inside; they immediately come forth and commence cleansing themselves. They seldom leave the hive till four or five days old and probably commence their labors soon after this event.

PLAYING.

Playing is a peculiarity in the habits of the bee not generally understood, and as it sometimes causes perplexity to new beginners, I deem it worthy of notice.

On the first warm day that succeeds cold or gloomy weather, the bees hold a jubilee; not usually all at once, but a separate hive or a limited number at a time, usually in regular succession. This is for the purpose of purification and exercise. As soon as the day has become warm enough to excite them to go forth, large numbers will be seen to suddenly issue from the hive and mount on the wing with songs of rejoicing, circle round, play a short time, and then return. Others are constantly sallying out and returning in like manner. Then may be heard the *bee-hive's happy hum.* The excitement occasioned by the departure and arrival of the bees is kept up for about thirty minutes, more or less, according to the number of bees composing the swarm, and the temperature of the atmosphere. This playing occurs at intervals during the whole season.

During the active breeding season, the young bees flying for the first time constitute the great body of players; the drones also go forth in considerable numbers. At this period it bears so close a resemblance to that of a swarm commencing to depart, that it requires a practiced eye to detect the difference. Hence, young apiarians not unfrequently mistake the amusement for the process of swarming, and prepare to hive them.

By observing closely, however, numbers will be seen returning, as well as departing, which is not the case in swarming. This playing indicates a healthy and prosperous condition, and frequently precedes the issuance of a swarm.

DRONE-LAYING QUEEN.

It sometimes happens that the young queen is unable to fly out, on account of bad weather or defective wings; consequently she fails to become impregnated, (at the only time probably that it can take place, viz: within twenty-one days of her birth) which usually takes place on the wing. She, however, lays eggs, which only produce drones;* which being laid in worker cells, their character is not easily determined until sealed up. The only indication from the eggs is, that a portion of them appear deficient in size, being only the covering without the substance. After they are sealed up, or nearly so, it is easily detected; there being but a part of the cells occupied, the comb presents an unusual appearance, being in irregular rows and clumps. These cells are raised and oval, being lengthened out and enlarged, to accommodate this unnatural production. (See plate II, fig. 21.) Drones so raised are dwarfs, being but little more than half the size of the drones proper, and are short lived. A hive possessing a drone-laying queen is soon depopulated, and falls a prey to robbers.

* Bee-keepers, even from the time of Aristotle, had observed that all the brood in a hive were occasionally drones.—*Langstroth.*

PLATE II.

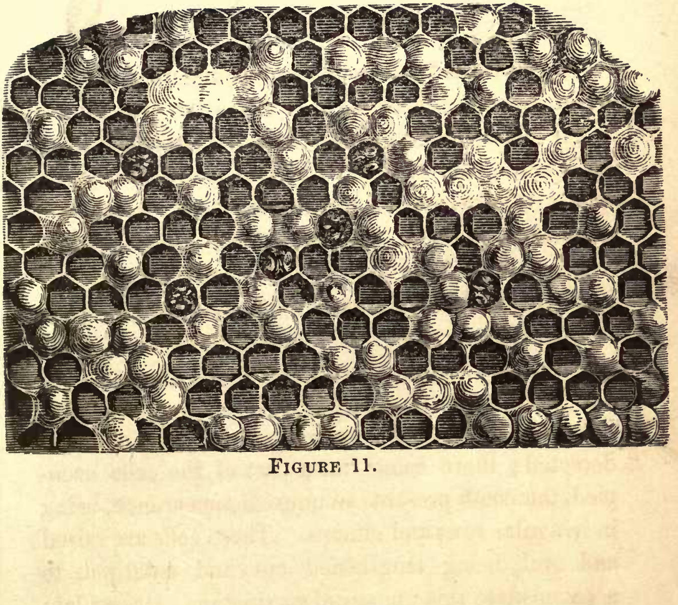

FIGURE 11.

When a hive is found to have such a queen, search her out and destroy her; then cut out all the comb occupied with her brood, as it is entirely useless. The balance of the combs should then be exchanged for perfect brood, and a queen or royal cell supplied. But if few bees are found, then break it up, and give the remaining bees and comb to other hives.

Occasionally young queens lay only drone eggs (but in worker comb) for the first few days after becoming fertile, and afterwards produce workers and drones perfectly developed in their proper order. When the raised oval cells are found, search for the queen; if her wings are defective, destroy her, but if they are all right, it is best to wait a few days longer, when her character is fully determined. If she changes for the better, it is known by the last brood sealed being smooth and regular. The abdomen of a drone-laying queen usually appears more slender than that of a perfect one.

EXTERNAL EVIDENCE OF THE LOSS OF THE QUEEN.

The loss of the queen creates much disturbance during the first day, after which the bees continue their labors as usual. As soon as their loss is discovered, numbers of them may be seen running out of the hive and roaming about in an inquiring manner, evidently searching for their lost *mother*. Though other causes frequently produce similar excitement, the agitation will be brief; whereas, the loss of the very sensitive, and will attack and sting their keeper or other persons disturbing them, more readily than those having a prolific queen.

Cells resembling acorn cups with the mouth downwards, (called false queen cells) are always built by queenless swarms. Such are also found in hives fully organized, and it requires a practiced eye to detect the difference. If queenless, they are found usually in clusters on the ends of the combs; while if having a queen, there is but an occasional one, and they are to be found on the sides or edge of the comb.

Retaining drones late in the season, after other hives have destroyed them, is an indication, though not a positive one, of queenlessness; for good hives are occasionally known to retain a few through the winter, but they are always killed during the first days of flying, in the spring.

It is stated by different authors that the bees of a queenless hive will *not carry in pollen.* (They say the bees have no use for it, that it is used for the one purpose only of feeding the young.)

The assertion however, is not well founded, for I have invariably found them carrying in and storing it as long as a *small cluster of bees remained, or till the last stages of its existence.* When they fail to do so, it is because there is no pasturage from which to gather it.

Mr. Quinby is of the same opinion.

THE DRONE.

Drones are males, and without stings, and are about one-fourth larger than the workers, making their appearance in the month of March, and continuing during the season of breeding, serving no other useful purpose* than to impregnate the young queens; for shape, see plate No. 1.

They leave the hive for excursions from 10 o'clock A. M., to 3 P. M. When on the wing, they make a loud and quick buzzing sound, easily distinguished from that made by the workers.

The number found in each hive varies from less than one hundred to several thousand. When very numerous, they consume a large proportion of the honey, rendering the hive unprofitable. As only a small number is necessary to each hive, it will be well to prevent useless hoards being reared. This can be done by removing most of the drone or large-celled comb from the hive in the early spring, or at any period during the season. A portion however should remain and be allowed to mature, for if all is destroyed, the bees will persist in rebuilding.

By placing the frame from which the drone comb was cut between two combs already built, they are more likely to rebuild with worker comb.

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* Various opinions formerly prevailed as to the use of the drone. The following one, given to me many years ago by an aged bee-keeping friend of the name of Brown, is, I believe, original. "The drones (said he) are for the purpose of tramping the mortar for the worker bees to build combs of."

THE DRONES KILLED BY THE WORKERS.

As a matter of animal economy, or to save the expense of useless boarders, the workers destroy the drones at irregular periods during the spring, summer and fall. The immediate moving cause of the slaughter is a scarcity of honey and pollen secreted in the flowers. They seldom kill all at these periods in the spring or summer, but when flowers fail at autumn, and no more honey can be gathered, they are all killed, or driven forth to perish from hunger and cold.

When this killing occurs about the time that swarms should be expected, it is a sure indication that this intention is abandoned or deferred. When a hive retains its drones after all others have killed them, it indicates that such a hive is queenless; and it should be seen to immediately. If sufficient bees remain, they can be supplied with a queen from some small colony, or what is far better, the two combined in one. (See directions for supplying queens.) In rare instances the bees will retain a limited number of drones through the winter, which I account for as follows. In some localities a supply of very late pasturage is afforded, giving employment to the bees until the propensity to rid themselves of these useless consumers is passed for the season. They are, however, killed as soon as the spring opens.

WHITE-HEADED DRONES.

In the summer of 1856 I discovered in one of my hives a number of drones, with heads nearly white, some of which continued through the season up to the usual time of killing drones.

The same phenomenon has reäppeared in the same hive each year since that time, and during the past year they have been more numerous than any of the preceding. I have counted as many as thirty-six of these in sight at once, by looking through the glass in the rear of the hive. In the spring of 1859 a young queen superseded the old one in this hive; still the drones reared afterwards were the same, there being about one-half thus marked. I have examined a large number of stocks in the middle and western States, and have made inquiries of various bee-keepers, but have failed to learn of another instance of like character.

The above hive of bees is owned by W. C. & J. S. Harbison, and is in their apiary at the residence of the former in Chenango, Lawrence county, Pennsylvania.—*A. Harbison.*

THE WORKER.

The workers are undeveloped females, in size, considerably less than either the queen or drones; in numbers, comprising the great majority, and being practically the sovereigns of the hive. All as members of the same family work together in the greatest harmony.

Nature has provided all animals, birds and insects, with means to protect and guard themselves, so as to insure their proper increase ; hence we find the honey bee *armed* and equipped, in accordance with the above laws.

No less formidable weapon, or less courage than that which they possess, would suffice to guard their young and their treasures, affording as they do, temptations to so many hungry creatures.

Their means of defense consist of a sting to pierce, and poison to inject into the wound by means of the sting. As a means of protection, nature provides them with a habitation inaccessible to most of their enemies.

The sting is situated within and at the termination of the abdomen; it is about an eighth of an inch long, and is thrust out in the act of being used ; it is composed of three parts, (which to the unassisted eye appear as one) the piercer and two laminæ. The piercer is a little longer than the lamina, and is furnished with a number of barbs, barely perceptible under the microscope, which when once entered into any yielding substance, not only hold the sting so firmly that the bee leaves it sticking in the wound, but cause it, assisted by the momentary nervous vitality, to sink its entire length into the flesh.

The poison is contained in a reservoir at the base of the sting, and flows into the wound through the channel formed by the lamina in combination with the piercer; this is shown by the drop of poison not appearing at the end of the piercer, but at the termination of the lamina.

This poison is the cause of the pain and swelling usually experienced by persons when stung.

It is supposed that the loss of the sting proves fatal to the bee; such a theory appears reasonable, yet I am not aware of any experiments being tried to prove its correctness.

When a bee stings another it does not usually lose its sting, as in the case of stinging other objects.

They are natural mechanics, and appear to do their work as perfectly the first day of their labors as the old artizans that have plied their trade for nearly a life-time.

Their sight and smell are very keen, enabling them to discover objects and detect the presence of honey when at a considerable distance; hence, to select the choicest pasturage and make the most rapid accumulations possible. Their peculiar formation —combining strength and activity with their baskets for carrying bread or pollen on their thighs, and an internal sac (separate from their main stomachs) for receiving and carrying honey—eminently fits them for their laborious and provident habits.

Each department of labor has its special workmen, such as field laborers, wax producers, builders and nurses, the latter being also the guards.

The field laborers collect honey and pollen, and store it in the combs, and also collect propolis with which to coat the interior surface of their habitation. It is probable that the field laborers are the principal comb builders.

WAX PRODUCED BY THE WORKERS.

The wax of which the comb is composed, is an animal secretion, emitted from the folds of the abdomen in a manner similar to the emission of silk from the silk worm.

The wax producers remain in the hive inactive, while elaborating the wax. This consumes several days from the time they commence feeding for the purpose. Their food during this time is mostly honey; pollen as food is not essential to the elaboration of wax.

The wax appears in two rows of scales of four each, in sacklets on the under side of the abdomen, as represented in plate I, fig. 8. These are taken away by the builders and converted into combs.

When about to lay the foundations of a new comb, the bees cluster in ranks formed into festoons, so that the builders can pass freely at their work; this arrangement seems designed to create and maintain a sufficiently warm and uniform temperature to enable them to mold the wax into a perfect structure, which, when first built, is white, semi-transparent and fragile; it afterwards changes to a darker color and becomes stronger. These effects are produced by the thickening of the partition walls of the cells, and also by the cocoons left by each emerging young bee.

The bees that remain inactive, forming these clusters, are mainly wax producers, and are thus constantly at hand with a supply of *mortar* ready for the use of the builders, who by means of relays continue their labors day and night during the time of their harvests. But when this is ended, and no farther accumulations of stores can be expected, no more *garners* are built.

It is probable that the wax producers continue their emissions for some time, and then die. Or it may be they produce wax at different periods; yet they are certainly short-lived. (This subject will be farther investigated at some future time.) This class of bees are non-resistant, and never volunteer an attack.

The nurses attend to the wants of the young from the egg until they emerge from the comb, protecting the brood with great constancy. They are also the water carriers and guards.

Their care and attention to the wants of the queen are of the most devoted kind. Sometimes when swarming she falls to the ground near the hive, when she is soon surrounded with her faithful attendants, who remain till death parts them.

Their ability to determine the course and locality of their hives, after passing from flower to flower in all directions, and for a long time, is truly wonderful. On the approach of a storm, they take the alarm and seek their homes for safety. If overtaken and blown down, they usually crawl under leaves and other places of shelter, where they remain in safety till the storm has passed over. Yet numbers are frequently caught out and perish from cold and wet.

Their disposition is mild and peaceful, while rapidly acquiring riches; but as soon as pasturage fails they become irritable, and will not permit intrusion without resisting it *sharply.*

THEIR INDUSTRY.

"Industry belongs to their nature. When the flowers yield honey, and the weather is fine, they need no impulse from man to perform their part. When their tenement is supplied with all things necessary to reach another spring, or their store-house full, and no necessity or room for an addition, and we supply them with more space, they assiduously toil to fill it up. Rather than to waste time in idleness during a bounteous yield of honey, they have been known to deposit their surplus in combs outside the hive, or under the stand. This naturally industrious habit lies at the foundation of all the advantages in bee-keeping; consequently, our hives must be constructed with this end in view, and at the same time, not interfere with other points of their nature."—*Quinby.*

a fertile worker. I lifted out the comb in which all the eggs were deposited; there was a thin cluster of bees on it. I soon discovered a bee inserting her abdomen in a cell, and then withdrawing it, in the same manner as done by a queen when laying eggs. This was repeated four times. I then, with a pair of scissors, clipped a small point off each wing, in order to be able to again identify her. I examined this hive daily for some time, but only detected her in the act of laying an egg on one other occasion. She remained in the hive for five weeks after I first discovered her, by which time the bees had nearly all disappeared. This fertile worker was apparently a young bee, and was of small size and starved appearance, the very opposite of what would have been expected. This fact is good evidence that there are different orders of development (or at least a division of labor, probably according to age) amongst the workers, viz: the nursing bees, field laborers, wax producers, and comb builders.

The same bee is doubtless capable of performing either of those duties, at different periods of its life, but not indiscriminately at any one time.

Since the above was written, other fertile workers have been seen in the act of depositing eggs, as follows:

Previous to the first of September, 1860, a small colony had become queenless, and remained so for some time; on examination, it was found to have one or more fertile workers; the colony was on the above date removed into an observatory hive; in a short time afterwards one worker was seen depositing eggs, and on the third day thereafter (being the third of September) there were three different workers seen depositing eggs at the same time. This was witnessed by J. P. Lockey, J. R. Frame, Mr. Lyon, A. Harbison, and others.

CHAPTER IV.

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CHAPETR IV.

DISEASES.

DYSENTERY, OR DIARRHŒA.

Bees frequently suffer from this disease, particularly during the winter and early spring. It is *caused* by unwholesome food, unusual confinement, insufficient ventilation or dampness, cold or heat, either separately or in combination.

"The presence of this disease is indicated by the appearance of the excrement, which, instead of a reddish yellow, exhibits a muddy black color, and has a very offensive smell. Also by its being voided upon the floor, and at the entrance of the hive," and also on the comb, "which bees, in a healthy state are particularly careful to preserve clean."—*Bevan.*

When bees are suffering from this disease, they frequently separate from the cluster, (even when the weather is quite cold) and endeavor to fly. When the weather becomes mild, numbers of them may be seen crawling at the entrance of the hive or on the ground, presenting a bloated or bedaubed appearance, and rapidly dying. At this stage of the disease the hive will rapidly depopulate, unless soon relieved by the return of a warm day, to enable the bees to fly out and discharge their filth.

HOW TO PREVENT DYSENTERY.

FIRST.—Reject all hives having unwholesome food, as unfit for wintering. For example: honey gathered during wet weather, which frequently turns slightly sour. This honey will be peculiarly thin, and will contain great numbers of minute air bubbles. Such honey is unfit for bees to feed upon.

Honey gathered from "honey-dew" also contains a considerable amount of acid, and will render bees that feed upon it, especially in winter, unhealthy, and should therefore be avoided. If bees are fed late in the fall or during the winter, with sugar or honey of an inferior quality, and much of it remains in the cell unsealed, it will attract moisture, become sour, and debilitate or destroy the bees that feed upon it.

SECOND.—Avoid confining bees for a long period at any one time, particularly if the weather is warm.

THIRD.—See that the hives are properly ventilated.

FOURTH.—Have the apiary located on dry land, and the hives kept dry, and allow the sun to shine on them at all times during the spring, when the temperature is below 75° (Fahr.) in the shade, but as soon as it rises above 75°, screen the hives from the direct rays of the sun.

FIFTH.—Avoid as much as possible opening or otherwise disturbing the bees after they have ceased to work in the fall until they commence work in the spring, particularly when the temperature is below 60°. The hives should, however, be occasionally freed from all dead bees and other impure matter.

REMEDY FOR DYSENTERY.

FIRST.—See that the bees are supplied with an abundance of wholesome food.

SECOND.—If there is no immediate prospect of a warm day, to allow them to fly out and relieve themselves, and the case is a bad one, remove the hive to a room or other place having full light and a temperature above 60°. Attach to the entrance of the hive a box having one or more of its sides made of glass or wire screen, or a net similar to the one recommended for catching swarms, (see plate XXXII, fig. 57,) and allow the bees to fly freely in it.

They will usually return into the hive as soon as it is dark. After this exercise and their return, the hive should be kept protected from cold, and no light allowed to enter it. As soon, however, as the weather will admit of their flying with safety, remove them to a suitable stand and give them their liberty.

All bees after they have been long confined evince considerable uneasiness to fly, even when the weather is quite cold; they should be restrained by darkening the hive and admitting more air. There is but little danger of giving the bees too much, provided the wind is not permitted to blow directly on them.

FOUL BROOD.

"Foul brood"* is the only contagious disease peculiar to bees with which I am acquainted. Nothing is known at present concerning the origin or cause of this disease; it seems, however, to have been in existence more than two thousand years ago, yet we have no definite information concerning it until comparatively a recent period. There can be but little doubt, however, that it, like small-pox and other contagious diseases, was in existence long ago, and that it has been perpetuated in like manner. If the one is ever spontaneously produced, so too the other may be. This, however, is an open question.

Mr. Quinby, many years ago, "made enquiries through the *Cultivator*, (an agricultural paper) as to a cause and remedy, offering a reward for one that would not fail when thoroughly tested."

Mr. Weeks, in answer, said "that cold weather, in spring, chilling the brood was the cause." Another gentleman said, "dead bees and filth that accumulated during winter, when suffered to remain in the spring, was the cause."

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* So called by the Germans. Diseased brood by Quinby, and is probably the same disease as was called Faux Convain by Schirac. According to Langstroth, this disease was probably known to Aristotle, "who was born in Stagyra, Macedon, about 384 years before Christ."

"A few years after, another correspondent appeared in the *Cultivator*, giving particulars of his experience, proving very conclusively to himself and many others that cold was the cause."

Mr. Quinby says: "Had I no experience further than this, I should, perhaps, rest satisfied as to the cause, and should endeavor to apply the remedy."

Several other writers have appeared in different papers on this subject, and nearly all who assign a cause have given this one as the most probable.

"Now I have known the chrysalis in a few stocks to be chilled and destroyed by a sudden turning of cold weather, yet these were removed by the bees soon after, and the stocks remained healthy. To me the cause assigned appears inadequate to produce all the results with the larvæ. After close, patient observation of fifteen years, I have never yet been wholly satisfied that any one instance among my bees was thus produced."

It is a singular fact that Mr. Quinby and Mr. Dzierzon, both of whom recommend and practice the wintering of bees in large numbers in dark repositories or cellars, have been the greatest sufferers from this disease, and the first (as far as I know) to definitely describe and publish its character.

Mr. Dzierzon attributed the origin of the disease, in his case, to feeding bees on American honey, but is not sure that such was the fact.

Whether they had discovered its existence in their apiaries previous to practicing the above method of wintering bees, does not appear. Information concerning it, from either of them, would doubtless throw important light on the subject. There can be no doubt, however, that in wintering bees in the above manner, if a single hive in the lot has the disease, the vitiated air arising from it would infect many of the adjoining hives, with as much certainty as if they had obtained infected honey.

It has been supposed by some that foul brood was caused by shipping bees across the *Isthmus* to *California*. Having made two shipments myself, I am probably as well qualified to judge of this matter as any other person. And I can safely say, that I have never seen anything to indicate such a result. Neither have I found it to exist in any bees when brought into this State from healthy districts in the East. Consequently, I am forced to the conclusion that every hive having the disease when landed in California, had it previously to being shipped from the Atlantic States, and that it has been spread from those, to large numbers of hives previously healthy.

"In the year 1848, a fatal pestilence, known by the name of 'foul brood,' prevailed among his (Dzierzon's) bees, and destroyed nearly all his colonies before it could be subdued, only about ten having escaped the malady, which attacked alike the old stocks and his artificial swarms. He estimates his entire loss that year at over five hundred colonies. Nevertheless, he succeeded so well in multiplying by artificial swarms the few that remained healthy, that in the fall of 1851 his stock consisted of nearly four hundred colonies."

"Mr. Quinby informs me that he has lost as many as one hundred colonies in a year from this pestilence. It has never made its appearance in my apiaries, and I should regard its general dissemination through our country as the greatest possible calamity to bee-keepers."—*Langstroth.*

Mr. Quinby says, in the "Mysteries of Bee-keeping Explained," that this disease is probably of recent origin; that Mr. Miner knew nothing of it until he moved from Long Island to Ontario county, New York. Mr. Weeks, in a communication to the *N. E. Farmer*, says: "Since the potato rot commenced, I have lost one-fourth of my stocks annually by this disease;" at the same time adding his fear that this race of insects will become extinct from this cause, if not arrested. He says "it attacks the chrysalis (pupa) instead of the larva."

He (Quinby) claims that his experience "goes back to a date beyond many others; it is almost twenty years since the first case was noticed." ("Mysteries of Bee-keeping Explained" was copy-righted in 1853; hence we infer the above was written about that time.) "I had kept bees but four or five years, when I discovered it in one of my best stocks."

"*A post-mortem* examination revealed the following circumstances: Nine-tenths of the breeding cells were found to contain young bees in the larva state, stretched out at full length, sealed over, dead, black, putrid and emitting a disagreeable stench. * * * I learned why there was a scarcity of bees in the hive; what should have constituted their increase had died in the cells; none of them were removed, consequently but few cells where any bees could be matured were left." He further says that the cause is uncertain, but attributes its spread to contagion; that honey carried from infected stocks will impart the disease to the hive receiving it. As a check to the spread of this disease, he recommends that no stock be permitted to dwindle away until plundered by others; by persevering in this course, he thinks the disease would soon disappear.

Mr. Quinby supposed this disease of recent origin; hence it would appear that his was one of the first cases noticed in the United States.

At present this disease exists to some extent in New York, New Jersey, in some portions of the New England States, and in the northeast corner of Pennsylvania. From the above places it has been introduced to California and Oregon, along with bees imported during the last three or four years, and is now almost as widely spread on the Pacific slope as the bees themselves. The fact that the disease had been introduced to California was furnished by me to the agricultural jurnals, and was published in March, 1860.* It seems, however, to have been known to

* Previous to July, 1859, I had never seen a case of *foul brood,* and was skeptical as to its existence, attributing the death of the brood to hunger and cold. But at the above time some diseased

some persons years previous, but was not by them made public.

SEAT OF DISEASE IN THE BROOD.

The disease attacks the young bees while in embryo, and at the stage of growth denominated pupa, which they attain soon after being sealed over by the workers. At this juncture, and while in the act of spinning their cocoons, they are suddenly seized with the disease and die within their cells, and

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comb was shown to me, although it was entirely different from anything I had ever seen, yet I attributed it wholly to bad management, not doubting but it would disappear with different treatment. I paid no more attention to the matter till in the latter part of January, 1860, at which time I was called on to examine some hives of bees that had been purchased from the same party that had exhibited the diseased comb to me the previous season. I found that the bees of some of the hives had swarmed out; on examining the combs I found them to agree so exactly with the description of "diseased brood" given by Quinby, that I no longer had any doubts as to the existence of *foul brood.* From information which I received from the East about the same time, I was made aware that large numbers of diseased hives had arrived and were on the way to this State. I then notified a number of persons who had purchased bees of us, to beware of certain bees; not to permit any of them to be placed near their stocks, as there was danger of the disease being communicated, etc. A portion took warning, while others made purchases of diseased stock, many of which swarmed out on the first warm days of spring and were lost. In most instances they left honey, which, as is always the case, was soon carried off by neighboring bees. Thus many stocks previously healthy became diseased, and were totally lost.

are suffered by the bees to remain and rot, thus generating a most offensive effluvia, which affects the general health of the bees in the hive where it exists.*

After the effluvia subsides, the cells, being nearly empty, are cleaned out by the bees and again used for breeding, (this however is only while a numerous swarm remains) and what seems most singular is, that a portion of the next generation of brood reared in the same cells come to maturity, while in adjoining cells that previously produced mature bees, increased numbers of dead are found. During cold, moist weather, the disease increases rapidly, but as soon as it changes to warm and dry, the disease frequently abates, exhibiting an intermittent character. It is generally about three months from the time the virus is introduced into a hive before the disease appears,

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* Having advanced the idea that the health of the adult bees was affected by this disease, I instituted the following experiment to prove it: On a clean white paper I dissected twelve bees taken at random out of a hive that was badly affected, over half the brood being dead, and emitting an intolerable stench. The intestines of seven were found to contain excrementitious matter of a dark color and offensive smell, being evidently the result of disease. The other five were found to contain matter of a yellow color, comparing exactly with that of bees taken from healthy hives, dissected on the same paper. This was satisfactory evidence to my mind, that a proportion of the adult bees in hives having *foul brood* are diseased, and reproduce it in hives to which they may be driven, unless repeated a number of times, during which a portion of them die, and the balance, by being compelled to fly, discharge their filth.

and from six months to two years more before it terminates fatally.*

Mr. Quinby says that hives "in which the disease has not advanced too far will generally swarm." I have had no experience in this particular, but think it unlikely that many swarms or much surplus honey will ever be obtained after the disease is once seated. Mr. Langstroth says: "There are two species of *foul brood*, one of which the Germans call the *dry* and the other the *moist* or fœtid. The dry appears to be only partial in its effects and not contagious, the brood simply dying and drying up in certain parts of the combs."

From numerous examinations which I have made of diseased hives imported into California during the

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* This opinion was founded on the following experiment: In the month of February, 1860, upwards of one hundred hives of newly imported bees, most of them diseased, were placed within one hundred rods of a stock of thirteen full and healthy hives. Honey from the dead and weak hives of the former being exposed within the reach of the latter, they immediately appropriated it to their own use, thereby planting the seeds of disease, which, however, did not develop itself so as to be discernable till in May, being about three months from the time they obtained the infected honey. Several other instances of the disease being contracted in like manner have also come under my own observation, each tending to confirm the above idea of the time between the infection and the development of the disease.

Since the above was written, a case has come to my knowledge where infected honey was said to have been obtained and the disease developed within six weeks; this occurred during July and August, 1860, yet it is possible that the disease in this case was communicated at an earlier date.

fall of 1859 and spring of 1860, I have arrived at the conclusion that what has been called the *dry* foul brood is but a condition of the moist, or is chilled brood simply left remaining in the cells, and becoming mummied, which is a thing of common occurrence in hives that are not strong.

MICROSCOPIC EXAMINATIONS.

I am indebted to Dr. Harkness, of Sacramento City, for his kindness in making numerous microscopic examinations of specimens of brood combs, submitted to him at different times during the months of March, April, and May, 1860. The following interesting letter gives the result of his examinations:

MR. J. S. HARBISON—

Dear Sir:—Having made careful microsopic examination of the samples of healthy and diseased brood combs placed in my hands by you, I find the following conditions to exist: First, in all the samples of healthy brood, I find the cocoon surrounding each pupa or young bee, whether finished or only partly so, to be constructed with great regularity, the threads of each being arranged in the same relative position, forming a regular system of delicate net-work. Second, in the samples containing diseased brood, I find, in most cases, that death has occurred while the pupa was in the act of forming its cocoon, as I find them constructed with great irregularity, and in an unfinished state. In some of the samples, however, I find cells interspersed in which the larva has entirely disappeared, leaving a residiuum of dark, inorganic matter, emitting a foul and disagreeable odor. Upon examining the cocoon of such under the microscope, I find that it is complete in texture and finish, showing that the pupa was ready to change to a more perfect state of existence at the time of its death, giving rise to a doubt as to the cause producing it. Being apparently the first case to occur in the hive, may it not have resulted from chill in the winter? If such is the fact, the effluvia arising from these decaying bodies, in my opinion would, under certain circumstances, poison the young larvæ in adjoining cells before being sealed up; the disease thus engendered proving fatal after the larva has reached the pupa state, and while in the act of forming its cocoon.

H. W. HARKNESS.

SACRAMENTO, June 12th, 1860.

Chilled brood may be a cause, amongst a combination, to produce the disease, yet I have never seen a case (although I have had chilled brood under almost every conceivable circumstance) that would go to prove such a result.

HOW TO DETECT FOUL BROOD.

To detect foul brood, observe the capping of the cells: while those containing healthy brood are of a yellow color and appear regular, those containing dead are of a dark color and are slightly sunken; (chilled brood has the capping of the cells raised almost invariably) on opening them, their condition is easily seen. The living pupa is nearly white, till it attains the form of the perfect bee; it then gradually turns to a brown or grayish color. When death has resulted from disease, and is recent, the pupa will be found discolored, being a dull brown color; but if dead some time, a portion of ropy matter will be found. While if death occurred several weeks or months previously, the capping of the cell will be found entirely black; on opening it, only a small portion of dry animal fiber will be found at the bottom of the cell. If the disease has caused death several months previously, occasional cells are found of a dark color, and so coated over with wax or propolis as to make them quite oval, and bees do not like to cluster on them. On opening these cells, they are found to contain a small portion of inorganic matter, and to emit a disagreeable smell, somewhat resembling that from carrion.

This, to a person familiar with it, is sufficient evidence of the presence of the disease. It is possible that where a limited number of the pupa die from disease, and the bees discovering the same at once seal them densely with wax or propolis, the spread of the disease may be prevented for a time. Even the virus contained in honey may be carried in and sealed up, to remain for a considerable length of time, and then fed to brood, causing their death, as well as a farther spread of the disease.

Chilled brood, as has before been stated, wlll mostly have the capping of the cells raised; on opening them, the young bee is found to be dead, but will show the head and other members nearly developed.

Pupa, if dead from chill, at first has a dark streak through its center; when decayed, it turns of a gray color, and watery, with sediment not usually ropy. *Chilled larva* turns nearly black soon after death.

In all cases of death from chill, the skin remains whole, or shows a separate texture from the body; (at least for some time) while in *foul brood* the skin decomposes as soon as any other part of it, the whole melting into a jelly-like substance.

NO CURE—SANITARY MEASURES.

No cure has as yet been discovered for this disease, although it has existed for so long a period; neither is it likely that there will be, other than by a constant watching for and destruction of every vestige of every hive, together with all their contents, whenever found to contain the disease.*

This plan has been found to be the only safe one, as every delay and every effort made to cure it by driving the bees, is liable to result in communicating it to healthy stocks. This may be done by removing the infected honey, or by the bees from diseased

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* "Three weeks from the first swarm will be the time to examine them. It is easily done now, as about all the healthy brood (except drones) should be mature in that time. Again, after the breeding season is over, in the fall, *every stock should be thoroughly inspected, and all diseased ones condemned.* It is better to do it, even if it should take the last one. It would pay much better to procure others instead, that are healthy."—*Quinby.*

In addition to making *the special examinations* as above, I would recommend that at any time when a hive is noticed to be *in a weak or despondent condition, it be immediately examined as to the cause.*

hives swarming out and entering other hives that are healthy.

The transferring of any combs, (whether empty or containing stores or brood) queen cells, honey, bees, or any other thing whatever from a diseased hive, or any one that may be suspected of disease, into healthy hives, should be strictly avoided.

Neither should any hive be again used that has once been occupied by diseased bees.

In any apiary where the disease makes its appearance, or the bees have been exposed to contagion, *the formation of colonies, forcing of swarms, and all interchange of combs should at once be discontinued*, for by either of these processes the disease is certain to be extended. NATURAL SWARMS ALONE SHOULD BE DEPENDED ON FOR INCREASE, and they should be removed the same evening that they are hived to a distance of at least two miles from any stock having the disease. Thus, by persevering in the destruction of all that are diseased, and the constant separation of all new swarms as above directed, the disease can be annihilated; but probably never will be by any other method.

Driving the bees from diseased hives and placing them in new ones, has been practiced to some extent, but has been attended by various results. Some have become apparently healthy under this treatment, while in a majority of cases the disease has reäppeared.

In fact, the greatest good thus far accomplished by it has been to hasten the destruction of diseased bees, which but few persons not knowing their true interest would do directly.

In short, I believe that the time and money spent in driving bees, (particularly if badly affected) will in most cases be worth more than the bees, even if successfully cured.

It is both safer and cheaper to establish an apiary with one or two healthy hives at one hundred dollars each, than to start with any number of diseased hives, even if received as a gift.

DIRECTIONS FOR DRIVING.

To bee-keepers who may wish to try driving, I would recommend the following plan.

First.—Have ready a common cheap box, well ventilated, into which to drive and confine the bees.

Second.—The hive containing the bees to be driven is to be gently opened, if it is a frame hive, at the top, but if not, invert it.

Third.—Have ready some well sweetened water, and sprinkle over the bees, continuing to supply them till they are effectually gorged (this is to prevent their filling themselves with tainted honey). All the bees are then to be driven into the box, as directed in Chapter on Transferring.

But no combs or stores of any kind are to be given to them at this time. As soon as the bees are driven into the box and confined, all the combs and stores should at once be so disposed of as to prevent any bees from ever having access to them.

FOURTH.—*This driving should positively be done* AFTER DARK; it can either be done out of doors, on a mild, calm evening, or removed inside of a building, to allow of a light to see to work by.

This precaution is doubly important; *first*, to prevent any other bees from getting honey; *second*, to prevent the straggling bees from the diseased hive entering others in the vicinity.

FIFTH.—The driven bees are to be confined in the box till one hour before sunset on the following afternoon, when they are to be placed on their original stand, and the box opened to permit them to fly. After dark, place as much feed within the box (dissolved sugar is best) as they can consume the following day, and again confine them till the following afternoon as before. Now have ready a second box, similar in appearance to the one the bees are in, which is to be put in its place with an aperture open for the bees to enter.

The box containing the bees is now to be turned bottom up, a few feet in front of its former position, and the bees allowed to take wing and return into the second box.

They should be disturbed to compel them to fly, and if possible the queen should be found and put in the box. The compelling the bees to fly is to allow them to discharge their filth, which doubtless helps to free them from the virus contained in their bodies.

SIXTH.—Early on the following morning, place in a new, clean hive, one or more combs containing not less than four or five pounds of stores from any healthy hive; then drive the bees into it, and place upon the permanent stand, and give them their liberty.

Giving them stores prevents the tendency to swarm out, which will prevail if not so supplied.

The process of redriving may be carried still further. I would recommend, however, that driving be only done at a time when pasturage is abundant.

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CHAPTER V.

ENEMIES.

The enemies of bees are certain animals, birds and insects.

BEARS.

Among animals, bears are known to be such lovers of honey as frequently to search out a bee-tree in the forest, gnaw a hole into the cavity occupied by the bees, and devour the honey.

In some instances they have visited apiaries, overturned the hives, and helped themselves to the contents, honey, comb and bees.

SKUNKS.

Skunks, or polecats, are also formidable enemies of the bee family. They search for and dig up the nests of wasps and hornets, humble bees, &c., eat the brood and mature insects and honey, if any is found. They also frequently visit apiaries, and if they find bees clustered on the outside of the hive, they will devour large numbers of them. If none are on the outside they scratch at the entrance, which causes the bees to run out, when they are devoured. If they can reach it, they will also devour the comb containing the brood and honey also. To prevent their ravages, elevate the hives two or three feet from the ground, so that they cannot reach them. A good dog, or the use of strychnine, will keep them away or give them their quietus.

RATS.

Rats will also devour large quantities of honey, and destroy the comb, whenever they can gain access to it. I am not aware that they eat bees.

MICE.

The white-bellied wood mouse is a formidable enemy. Entering the hive during cold weather, they mutilate the combs and build their nests, and not only create a noisome stench, but eat both bees and honey.

It might reasonably be supposed that the bees would sting them. This I suspect seldom happens, as they only take up their abode within the hive during the continuance of cool weather, and then are only in motion during the night.

They should be excluded from the hive by a timely contraction of the entrance. When they are found to have made a lodgment, the hive should be carefully cleansed from all impurities, otherwise the bees are liable to desert it on the return of warm weather. The common house mouse is also an enemy.

TOADS.

The toad will frequently visit a hive in the dusk of the evening, and either catch the bees as they cluster on the outside, or catch those that accidentally drop on the ground; to prevent which, have the hive elevated one or two feet, and in such a manner that they cannot climb up to it; or they may be forcibly ejected from the premises, and placed where their services are more particularly needed.

BIRDS OF CALIFORNIA.

I have not noticed any kind of birds whatever catching bees in California, yet there may be some that do.

WOODPECKER.

The red-headed woodpecker of the Atlantic States is an inveterate bee-catcher, and is perhaps the only one of the bird tribe that should be executed for this offense, as I doubt whether they destroy enough of other insects to compensate for what bees they kill.

KING BIRD.

The king bird frequently catches bees, and I am always tempted to shoot at them when I see them depredating.

Mr. Quinby thinks they only catch drones. I will "guess" that they prefer a dainty drop of honey to the gross carcass of the drone.

PEWITT.

The pewitt, and a few other varieties of birds, occasionally catch bees; but as they render valuable services to man, in destroying other insects, I think they should be protected.

BEE MOTH. (GALLERIA CEREANA.)

The bee moth has been known and described by various ancient authors, amongst whom are "Aristotle, Virgil and Columella." It seems to have been as destructive to the bees then as now.

This insect is a distinct variety of the moth tribe, and is so dependent on honey bees for its subsistence, that no instance is known of its being found apart from them. Hence there is but little doubt that it has, at some period, been brought to this continent with the bees.

We have no definite account of their depredations amongst the older settlements, but may it not have been that they were so well known as to excite no remark?

It must be borne in mind, that at this early period, vegetation was luxuriant, and uncropped to a great extent by domestic animals, so that the bee had almost an uninterrupted harvest. This, it is well known, would give the worms less chance to increase than if a dearth of pasturage prevailed; for when bees are prosperous they subdue the worms with ease, but when not adding to existing stores they decrease, and thus afford the worms a season of peace and plenty which enables them to increase more rapidly.

Owing to the peculiar habit of the *honey bee* in swarming and flying long distances before locating, they were enabled to leave the moths far in the rear; they thus advanced westward without the aid of man, and being found by the settlers in the wilderness, who captured and cultivated them, no worms troubled them for many years. Hence it is not strange that when they did come they were mistaken for a new enemy.

It has been about forty years since the moth was first known west of the Alleghany mountains; they crossed the Mississippi at a still later period.

There are still places in the so-called "far west," where it is said no worms exist.

Of all the bees that have been brought to California few have been free from worms, and frequently there have been more of them than bees.

Great *carelessness* has been shown by some *importers* and *purchasers* in not *destroying* them. Hence a number of hives (even of those bred in this

steal in and deposit their eggs on the combs, which they accomplish* unless prevented by the vigilant sentinels that are usually on guard.

They are not often baffled in their purpose; and having effected an entrance, they at once make their way to the upper portion of the hive, where they encounter less bees than at or near the mouth. Having thus gained an entrance, they deposit their eggs on the brood comb. Great sagacity is displayed in thus depositing their eggs where they will be hatched by the heat naturally ascending from the bees below, and also remaining above to obtain ample food without molestation during the first stage of their existence.

Should they fail to effect an entrance, they seek to deposit their eggs in cracks or at the entrance of the hive, where they will be likely to come in contact with, adhere to, and be borne into the hive by the pollen and propolis with which the entering bees are loaded. By whatever means they are carried to the center of the hive, they become attached to the comb, where they soon hatch out and burrow under the cappings of the sealed brood. They at once commence to form galleries—at first so small as scarcely to be perceptible; in fact, their presence is only detected by a fine, thread-like filament, with numerous small particles of wax adhering. But as they gain in size, they extend and enlarge their gallery, till it presents the appearance as shown in plate

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* As soon as the eggs are deposited, the moth dies.

v, fig. 14, (AA is the gallery and B is a break in it) and fig. 15, the gallery separate. The bees, having discovered the presence of the worm, immediately set to work to remove it, together with its silken shroud. If not caught and carried out by the bees, it drops down on the bottom board, and seeks a corner or crevice in which to spin a cocoon to protect itself while undergoing the transformation from the *worm* to the *moth*. (See plate VI, fig. 16, showing the worm during its first stage of growth, also after having nearly completed its cocoon; fig. 17, pupa in the advanced stage, also cocoon from which the moth has emerged.)

Each young bee over which the worm extends its gallery, is either killed or mutilated, and is carried out of the hive by the bees.

Sometimes the worms penetrate to the center of the comb containing brood, and there form galleries, entangling the young bees so that they cannot get free from it. The worker bees discovering this, immediately detach a portion of the comb, together with the young bees and worms, which falls to the bottom of the hive, there, perhaps, to form the nucleus of a web soon to entangle and destroy the whole colony.

When enough worms are present to cause the bees to abandon the portion of comb occupied by them, they spin innumerable threads, extending in every direction, enveloping the comb in a thick net-work. This is extended on all sides, and securely attached to the top and walls of the hive—it then serves, also

PLATE V.

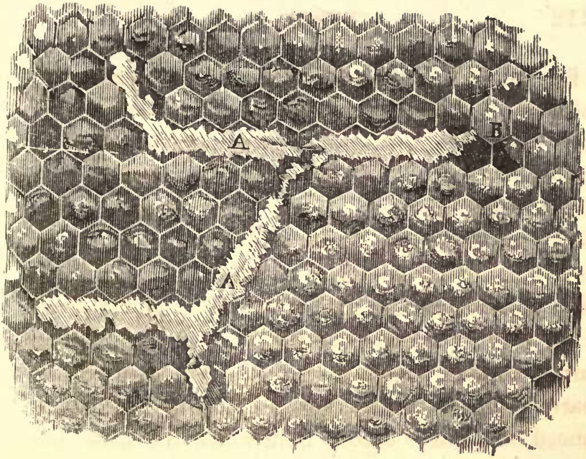

FIGURE 14.

FIGURE 15.

PLATE VI.

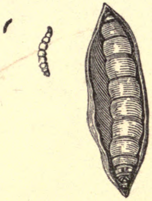

FIGURE 16.

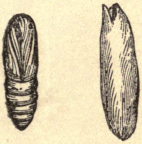

FIGURE 17.

FIGURE 18.

to support the combs while they, with their contents, are being devoured by the voracious worms.

Each worm, as soon as arrived at the requisite age, spins a cocoon separate for itself; but numbers of these are generally joined together, forming large, compact masses; (as shown in fig. 18) then the work of destruction progresses, till scarcely a vestige of the handiwork of the bees remains.

The worms, like the human, or rather the inhuman, pillagers of cities, abandon the hive as soon as nothing remains to live on or to destroy.

Queenless colonies and small swarms having newly built combs, are the most liable to their attacks. The new combs are most frequently penetrated to the center, while old comb is more generally traversed at the surface—hence the latter is but little injured, while the former is ruined. Young swarms are frequently thus destroyed during the first summer; but an old hive, having a prolific queen, seldom falls a victim to their ravages, particularly if the hives are so constructed as to enable the bees to easily remove all impurities.

Queenless hives, suffered to remain so for months, become hot-beds for the propagation of worms.

One or two such hives will, if suffered to remain, breed enough *moths* to effectually *pollute* a large apiary. It is like permitting a field of *Canada thistles* to go to seed, which, by means of their wings, are sure to be carried to adjoining fields.

INDICATIONS OF MOTH WORMS.

The first indication of the presence of worms in a hive, is their excrement. It is either dark brown or black, and is in grains resembling gunpowder, and is either small or large, according to the size of the worm voiding it. By raising the hive and carefully examining the droppings on the bottom board, it is easily distinguished from the cuttings of the combs, the latter being of a lighter color and composed of wax.

The number of worms will be in proportion to the amount of excrement.

Where hives are provided with inclined bottom boards, it may be seen at the entrance without even removing the slide. This indication is next followed by finding an occasional worm cast down on the bottom, dragged or driven outside, or encased in cracks and underneath the hive. Young bees, or portions of them, may next be found in the morning, some of them, perhaps, living, but with mutilated wings, and having a portion of the worm web sticking to them, crawling upon the bench or on the ground near the hive, making vain efforts to fly.

MOTHS SHOULD BE EXTERMINATED.

The only effectual remedy that will avail the bee-keeper is the extermination of the race.

No weak or queenless hives should be allowed to remain so, as they, sooner or later, fall a prey to worms. Nor should combs or honey be exposed, to afford them food and shelter. Old hives, that have been used for a length of time, but from which the bees have been transferred, are frequently occupied by the worm as a nursery. These should always be burnt.

All hives should be frequently and carefully examined, from April to November, and every worm destroyed that can be found.

A sharp watch should also be kept for the moths, as they can be found during the day sticking on the hive, or other objects near it; or, in the evening, caught flying around the hives; each one found, should be instantly killed. By persevering in the destruction of the worms in all stages, and preventing their propagation, as above directed, no great damage can ever result from them; but if these admonitions are disregarded, vexation and loss are sure to ensue.

NO MOTH-PROOF HIVE.

There being *no* such thing as a *moth-proof hive* in *existence*, nor any prospect of such a discovery ever being *made*, we are compelled to be content with that which makes the nearest approach to it—viz: one that gives the bee-keeper easy access to the worms. The best yet known is the adjustable frame, or California hive, which gives the control of each comb separately, in combination with the inclined bottom, whereby the bees are enabled to remove any filth that would otherwise accumulate. The dead space in *flat bottomed hives* serves to accommodate the *moth* with a *nest* and *comfortable quarters* for her progeny, to the great detriment of the bee. The bee-keeper is only able to remove them by lifting out the frames, and this is quite likely to be neglected, as it is a formidable undertaking to most persons, particularly if it has to be repeated often.

ANTS.

Some have been of opinion that bees might require to be protected against ants; but Reaumur says that ants never originate the pillage of a hive, but are ready to join in it after it has been commenced by others. In this I quite agree with him, having never known an instance to the contrary. When, therefore, ants are seen entering in a predatory manner, it may fairly be suspected that some other enemy has been at work. M. Reaumur was of opinion that ants are not to be reckoned among the enemies of bees; and he relates an instance of their living as very close neighbors, yet in perfect harmony. "The ants established themselves between the glass panes of this bee-box and the wooden shutters which covered them;" and as a similar circumstance occurred to Bonnet and in other of Reaumur's hives also, it seems probable that the ants took up their quarters in this situation for the sake of the equable warmth that the bees would impart to their eggs. "Ants were without the hive," says Reaumur, "and bees within; a single glass only separating two nations so different in manners, in customs and genius. The bees were abundantly provided with a dainty of which ants are exceedingly fond—I mean honey. The ants had just reason to be apprehensive, and the bees would be uneasy and jealous to preserve so precious a treasure; nevertheless, the utmost harmony and concord prevailed between the two nations. Not a single ant was tempted to enter the hive, how strongly soever she might be invited by the fragrance of the honey; nor did any bee disturb the ants, though superior to them in power; the several individuals, on each side, went in and out peaceably; they would meet in the way without teasing or molesting one another, respect on one side and complacency on the other, were the foundation of this peace."—*Natural History of Bees*, p. 352.

Ants frequently intrude themselves into the chambers of a hive that contains honey boxes; they do so for the sake of the warmth imparted by the bees; they do no harm, as they seldom have access to the stores. They are, however, seriously in the way when the boxes are to be removed. If any of them chance to get among the bees, the latter are forced to run away, on account of the pungent odor given off by the ants.

TO DRIVE ANTS AWAY.

Ants may be driven away by sprinkling a liberal quantity of dry ashes or quick-lime in the spaces around the boxes.

Ants are a serious annoyance in getting into honey after it is removed from the bees. I have found no other efficient way to prevent them from doing so, except to place it on a table, the legs of which are set in cans of water.

WASPS AND YELLOW-JACKETS.

Wasps and yellow-jackets have, by some, been reckoned as enemies, and doubtless are in some places.

I have seen them occasionally carrying off honey from weak swarms, but never have seen them make any formidable attacks on strong hives.

SPIDERS.

There is one species of large black spider (quite common in California) that is a great enemy to bees. They seek a hive that is weak or only partially full, in which to make their abode. They lay their ropes so as to entangle the bees, which they seem to be partial to as food.

There are other species, which spread their nets in the vicinity of hives, and occasionally within them; straggling bees are sometimes caught in these nets, and a portion of their bodies eaten.

When their ropes or nets are noticed, they should not only be removed, but the spiders (for there are generally two) searched for and killed.

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CHAPTER VI.

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CHAPTER VI.

TAMING BEES.

Most authors have expressed the opinion that the honey bee is capable of being taught submission, thus intimating that it is necessary to tame them before they are of use to man. This opinion obtains so generally, that a usual remark of persons visiting apiaries is: "I suppose your bees know you;" or, "They know you from strangers."

I have never been able to discover any signs of recognition from my bees, they being just as apt to sting as those of a hive that I have never before seen. If I am less frequently attacked by them than others, it is because I understand their habits, and treat them accordingly. That some persons are more liable to be stung than others, is owing to one or more of the three following causes.

First.—Color and texture of dress; dark clothes or those of a hairy texture—particularly a fur hat—form a prominent mark, and hence the wearer is liable to receive an occasional *dart*.

Second.—Any quick motions made in the vicinity of the hives attract their notice, and cause them to attack the person making such motions.

THIRD.—The odor from some perfumes and from the insensible perspiration of some persons, and the breath of persons in bad health, are all offensive to bees, and tend to excite their anger and their propensity to sting.

Bees retain the same unchangeable habits whether they are domiciled in the forest or in the finest flower garden, being even more docile and less liable to sting, when handled for the first time, than at any subsequent time.

When a hive has been once opened and their combs disturbed, on returning to repeat the same operation a few hours or days afterwards, they remember it and resent the injury. This proves that they are naturally vindictive, and but few, if any, can ever be taught submission. *The latter can only be done by force or bribery, or the two combined.*

The season of greatest irritability is when there is least pasturage; for while rapidly accumulating stores, they are less careful and more easily and safely handled.

HOW DONE.

Smoke is the principal agent to be used. Various things are used for producing it, such as tobacco and rotten wood; but the most convenient, as well as the least hurtful to the bees, is dry cotten or linen rags rolled in the shape of a large candle (the size of which can be varied according to the volume of smoke desired) and tightly wrapped with twine ; by setting one end of this on fire, it continues to burn slowly without flame, the smoke of which, if blown on the bees, is effective in subduing and driving them wherever wanted.

Cold water sprinkled on them is also an efficient agent to effect the same purpose. And another way is to suddenly close up the entrance and rap on the hive for a space of five minutes, on opening it they are generally found to be subdued, this excites their fears and causes them to fill their sacs with honey, when they will have no disposition to seek revenge.

Sweetened water or diluted honey is recommended to be given by sprinkling it over the bees and comb, and is intended as a peace offering to keep them quiet while their works are being overhauled. This plan succeeds well where there is no danger of robber bees. But it requires more time than can well be afforded, if time is valuable ; hence I much prefer any of the plans previously named.

MEANS OF PROTECTION.

Protection is sometimes necessary to guard against being stung, while tending the bees or working in the immediate vicinity of those that have been disturbed. A protection for the face and neck should be made of material such as is used for ladies' veils, of a size to go over a hat, the brim keeping it expanded, and of a length to be tucked under the coat or vest collar, to prevent the bees from getting underneath it. A pair of gloves for the hands are sometimes necessary. The clothing should be sufficiently thick to prevent the sting of a bee from penetrating through it.

Thus protected, any person can go amongst the bees and perform any operation that may be required without being stung. Most persons will, as soon as they become accustomed to working amongst bees, prefer to do so without any protection.

A bee must alight before it can sting; consequently, if the person attacked has either hand at liberty, he can kill or remove it before being stung; to do so a little patience and judgment is required, for if struck at before alighting they dodge the blow, and then return and sting before a second one can be made.

When attacked while performing any operation with them, use some one of the means heretofore recommended to subdue them. But if not performing any operation, the best plan is to quietly retire, either amongst shrubbery or within some building.

Whenever the anger of any hive becomes so aroused as to attack any person or thing that may chance to come near them, they should be immediately treated to a very liberal smoking, or application of cold water, enough to make them desist from wreaking their vengeance.

REMEDY FOR STINGS.

As the sting of a bee has a different effect on different persons, there can be no universal remedy for their cure. The best, however, is to remove the sting as quickly as possible, which will prevent its penetrating deeper, and injecting all the poison it may contain. If a portion of the poison can be squeezed or otherwise extracted from the wound, it will help to prevent pain or swelling.

Bathe the wound either with warm or cold water, then apply either spirits of hartshorn, dissolved borax, soda or other alkaline substances. Alcohol, spirits of turpentine, or camphor will, in some cases, afford relief.

HORSES LIABLE TO BE ATTACKED.

Horses are liable to be attacked, and instances have occurred where they have been stung to death. Consequently they should never be hitched or allowed to stand in the vicinity, where bees are kept.

Some horses, if stung, will rear and plunge, and either throw themselves or take to flight, while others become sullen and lay down, so that no effort can induce them to move.

HOW TO PROCEED IN CASE HORSES ARE ATTACKED.

If attacked, at once get them in motion and keep them going until the bees give up the chase. But if a horse once gets down, or cannot be removed, cover him with blankets, hay, or any thing that will keep the bees from alighting on him; in addition, throw cold water, dry ashes, dust, or quick-lime over the horse, and amongst the flying bees; water may also be thrown amongst the bees in the hive from whence they come. Such attacks are only liable to be made by the bees from hives already established, and but seldom, if ever, by a swarm that has but recently issued.

Such attacks generally result from recent disturbance, by which the anger of the bees has been aroused. A hive thus enraged should *never* be left where persons or animals will be likely to approach it, or notice should at once be given of the danger they are in, and measures immediately adopted to subdue them.

CHAPTER VII.

HIVES.

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CHAPTER VII.

HIVES.

NATURAL.

WHERE nature makes the hive, bees are known to thrive in a remarkable degree.

On examining the hollow of a tree, such as bees select for their residence, we find it almost invariably deep from top to bottom, in proportion to its width, varying in diameter from ten to fifteen inches, while the height varies from two to five, or more feet. The space at the top commences in a point, and gradually widens downwards till the largest diameter is reached; this is then continued for some distance, and not unfrequently terminated in a point like the top. The entrance is through a hole caused by the rotting of a limb, or by the bill of the *woodpecker*.

From three to eight gallons of honey are usually obtained from a single bee-tree, indicating a capacity varying from two thousand to four thousand cubic inches. There are instances where as high as fifteen gallons have been obtained, but they are rare; double this amount has been frequently reported as found, but in the absence of proof I will not vouch for its correctness.

That so large a quantity of honey as is sometimes found, should ever be stored by a single swarm, and succeeding generations, within the same habitation, seems at first sight to be in direct opposition to the known law of the honey bee, viz: that but one queen is ever tolerated in a hive, and consequently there being a limit to the number of workers in each.

It is however only in a habitation shaped as we find it in a hollow tree that such large accumulations of honey are ever made; the reason is plain. A swarm of bees when clustered in their hive, whether it is full of comb or not, will always assume a globular form, or as nearly so as the shape of their habitation will allow; this holds good as well while in their winter cluster as when building combs; consequently if the diameter of a cluster is equal to that of their habitation, they are then able not only to better regulate and economise their native heat, but to exclude and guard against the intrusion of enemies.

Commencing to build combs at the top of the cavity as they invariably do, they work them downwards, and as fast as any portion is sufficiently advanced, it is immediately occupied either with brood or stores.

As each generation of brood emerges from the comb, a portion of the vacancies are rëoccupied with stores. Thus, the process of building and filling is continued through each succeeding season of flowers.

The bees preferring always to cluster amidst and embracing the lower portions of their combs, they are in a position to guard their accumulated stores without any bees clustering on the upper portion of them.

Thus an amount of honey is frequently accumulated that is utterly impossible to be made in a habitation of large diameter, whether it is deep from top to bottom or low and shallow.

It is true, that a habitation like the hollow tree, laid on its side, would in some measure compensate for height; but the increased bottom surface, always difficult to clean, will, wherever moths abound, eventually preclude their use. Low, shallow hives, which compel the cluster of bees to be flattened, thwart their instinct, and cause a waste of animal heat which often retards their progress and increases the mortality.

Another advantage possessed by the tree is the lining, composed of dry, decayed wood, which is a non-conductor; this is surrounded by a wall of green wood, covered with bark, under which the life-giving sap flows; such a combination insures an evenness of temperature not attainable by art. No heat can ever injure the texture of the comb, neither are the bees liable to be caught in a position to starve while plenty of food remains in the hive, as is frequently the case in the States where cold winters prevail, and the hives are made *low* and *flat*.

THE BEE-GUM

Is made by cutting the trunk of a hollow tree in lengths, usually two or three feet long, after removing the rotten wood, either by burning or the use of a gouge; a piece of board is nailed on one end, holes are bored through the middle, and sticks inserted to sustain the combs while being built; notches are cut in the lower edge, and an inch hole bored midway to the top for egress and ingress. After a swarm is hived, it is either set on a board or stand, and generally suffered to remain without further attention till fall. A plan frequently adopted to obtain honey is to remove the lid, smoke the bees downward, and cut out a quantity of honey; if too much is taken, the bees die of starvation during the winter. The most common plan, however, is to consign the whole swarm to the sulphur pit, and take all their stores. The latter method is also mostly used to obtain the honey from straw hives. The use of the gum has generally been attended with good success, which is attributable to its shape; many eminent apiarists bear testimony to the superiority of deep hives over those that are low and of large diameter—Mr. Langstroth amongst the number—but while he candidly admits this superiority, as is shown by the following quotation from his valuable work on the honey bee, yet he willingly sacrifices it for what he seems to think of more importance, viz: a wider top surface in which to place store honey boxes. Whether this is an absolute gain at any time, or will hold good in a majority of cases, remains unsettled in the minds of most bee-keepers. The only plan will be for each one to determine for himself, and practice accordingly.

"A hive *tall* in proportion to its other dimensions, has some obvious advantages; for as bees are disposed to carry their stores as far as possible from the entrance, they will fill its upper part with honey, using the lower part mainly for brood, thus escaping the danger of being caught in cold weather, among empty ranges of comb, while they still have honey unconsumed. If the top of this hive, like that of an old fashioned churn, is made (on the Polish plan) considerably smaller than the bottom, it will be better adapted to a cold climate, besides being more secure against high winds. Such a hive is deficient in top surface for the storing of honey in boxes, and it would be impossible to use frames in it to any advantage; but, to those who prefer to keep bees on the old plan, one of this shape, made to hold not less than a bushel and a half, is decidedly the best."

Mr. Quinby recommends to make hives, "say, twelve inches square inside, by fourteen deep. I prefer this shape to any other, yet it is not all-important. I have had some ten inches square by twenty in length; they were awkward looking, but that was all; I could discover no difference in their prosperity. Also, I have had them twelve inches deep by thirteen square, with the same result. Hence, if we avoid extremes, and give the required room, the shape can make but little difference."

Although he (Quinby) says "the shape can make but little difference," yet he directs a particular size and shape as preferable; he also practices as he teaches, which says more than the mere utterance of theory.

The attention of English apiarists has lately been drawn to the bee practice of those countries, (Russia, &c.) by the work of a Pole, which issued from the press not a year ago.

Mr. Dobiogost describes the hive of his country as being *three and a half to five feet in height*, about eight inches in diameter at top, increasing downwards gradually to twenty inches or more at bottom, *all inside measure!*

This is indeed a large hive. It is a fact, however, that such are the dimensions of the hives commonly in use in Poland; and it is also a fact, that large as they are, they yet contrive to swarm with as much regularity as the hives in use among us, while the parent stock remains vigorous, notwithstanding, for many years together. Mr. Dobiogost assures us that an apiary containing a hundred stocks of this size, will throw off about one hundred and fifty swarms every spring, each of such formidable power that it resembles a small cloud when hovering in the air.

It seems to us almost incredible that hives of such dimensions should throw any swarms at all.

In opposition to the general belief among us, the author seems to attribute this circumstance to the

PLATE VII.

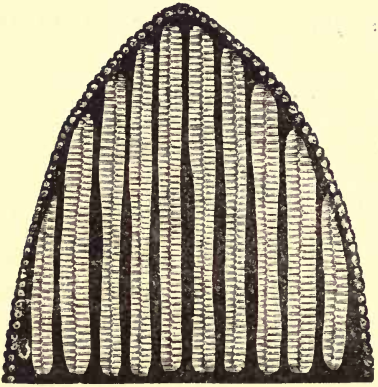

Fig. 19.

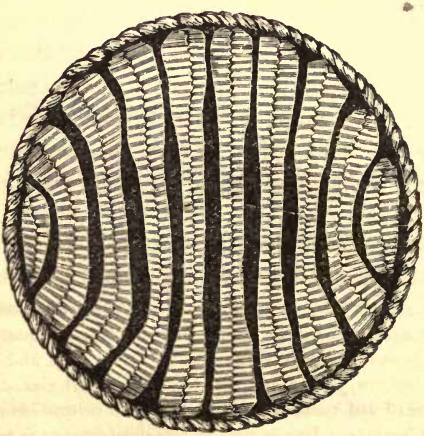

Fig. 20.

fact that, on the first establishment of these stocks, *four times as many bees* are put into them as we are in the habit of hiving together."*

STRAW HIVES

Have been used from a very remote period, and with less change of style than any other agricultural implement. They are still extensively used in many parts of Europe; but in the United States they are fast passing away, being supplanted by those made of wood. Plate VII, fig. 19, shows a straw hive† full of comb, cut through the center from top to bottom, at right angles with the comb, the edge only being seen. They are shown to be straight and of remarkably even thickness. The cause of this regularity is at once apparent: commencing to construct comb at the top of the hive, where a space only large enough for the foundation of two combs exists,‡ they extend them downwards, and as the space

**The Cottage and Farm Bee-keeper,* by a country curate.

†Also called Skep; is becoming obsolete in the United States.

‡Although narrow-topped hives have been described as not affording top surface for store honey boxes, I have in many instances cut a hole in the top of the conical straw hive, and after adjusting a platform, placed two boxes of the usual size. The bees in all cases filled them as rapidly as those in wooden hives with large top surface. Hence the objection referred to is not so serious as would appear at first sight. This hive has been longer and perhaps more extensively used than any other, and will be perpetuated at least as an emblem of industry.

widens, the foundations of other combs are laid at each side, and all are carried down uniformly. Thus, straw hives as well as the cavities of trees, terminating in a cone, are found to have remarkably uniform comb, there being but a slight curvature near the edges. Plate VII, fig. 20 represents a cross section of the above straw hive. As the combs extend downwards, the cells near the edge of each are lengthened and filled with honey. This causes the adjoining comb to diverge from a straight line. The cells at the edge of this comb are lengthened in like manner, causing the third comb to diverge still farther but without lessening the breeding capacity. Thus it will be seen that the bees invariably diverge their combs from a straight line, by placing brood in one part and stores in another of the same comb.

It has been supposed that the reason why bees in straw hives wintered better and increased faster than in those constructed of other materials, was their non-conducting properties. This is doubtless true in part, but quite as much is due to the regularity of the combs, and to concentration of heat, whereby breeding and the building of comb is greatly facilitated.

BOX AND CHAMBER HIVES

Are made of boards, the capacity and shape according to the fancy of the builder.

The *Box Hive* is managed in the same manner as the "bee-gum." Holes may be made in the top of

PLATE VIII.

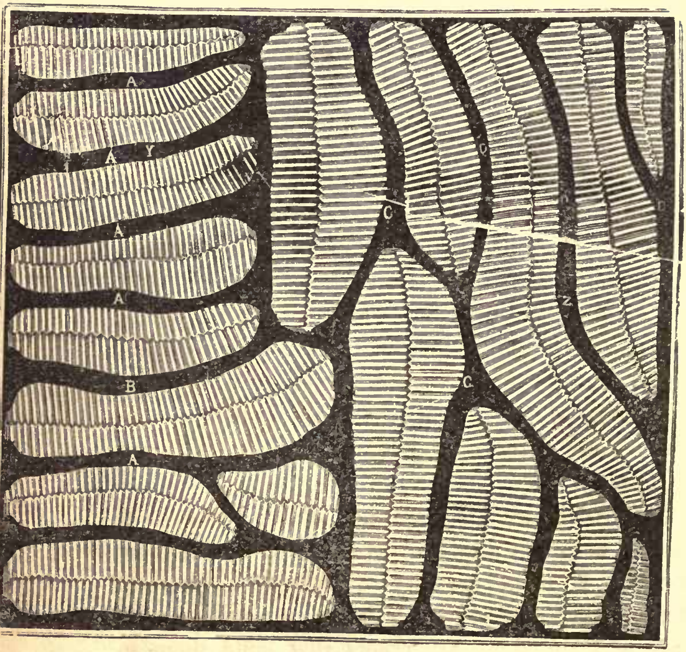

FIGURE 21.

either, and surplus honey boxes placed over them; a cap or cover may be placed over these, making it, practically, a chamber hive.*

The *Chamber Hive* differs from the box in having a chamber floor placed usually about two-thirds of the distance from the bottom to the top, making a chamber above in which to place surplus honey boxes. Access is had to the chamber (for the purpose of supplying or removing boxes) by means of a shutter or door made to cover one side of it; holes are made through the chamber floor for the bees to pass into the honey boxes.

The principal advantage which the above class of hives possesses is cheapness. There are disadvantages, among which are the following: First, the comb is not convenient of access, and is beyond control. Second, the comb is almost always built very irregularly.

This irregularity is occasioned by the broad, even surface to which they are compelled to attach their combs. While a majority of swarms build their combs sufficiently regular to insure a reasonable degree of thrift, there are others that build them so irregularly as to be totally worthless as stock hives.

To illustrate this matter more clearly, the reader is referred to plate VIII, fig. 21, which represents a case of this kind. The hive was a common box

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* This is the plan recommended by Mr. Quinby, in "Mysteries of Bee-keeping Explained."

thirteen by fourteen inches square and twelve inches high, all inside measure.

A large, first swarm was hived within in the month of June, being well provided with wax as well as abundance of pasturage; the bees forming a cluster extending over the whole top of the hive (but without guides to direct the course of their combs) commenced at the same time to build combs in two places, which we will suppose Y and Z.

As the queen was unquestionably in that portion of the cluster commencing to build at Y, the bees constructed a number of the first combs of worker cells; while at Z, store combs only were built. All combs marked A represent worker cell, B drone cell, and C and D store combs, part of the latter being worker and part drone, but having the cells lengthened and considerably curved upwards. The combs being started in two places* and at nearly right angles, with less than one-half of them suitable for rearing brood, they never increase sufficiently in numbers to enable them to swarm, neither will they be likely to fill surplus honey boxes. Such a hive, if left to remain, will frequently live for years without affording its owner any profit.

The remedy in such case is either to transfer the bees and suitable combs to new hives, or prune out the objectionable combs.

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* Combs are frequently built in different divisions, and if the combs in each are parallel one with the other and mostly worker cells, there is but little difference in their prosperity. In cold climates such hives generally winter the best.

THE DIVIDING HIVE

Is made in two equal parts, similar to a common chamber hive divided vertically. Narrow slats are fastened at intervals on the open sides of each of the parts, and are temporarily attached together in the same position by means of hooks.

When both of the sides are full of bees and comb they are separated, and empty parts of the same size attached to each of the full ones. This plan has succeeded in some instances, but much oftener has resulted in failure.

PALACE.

Palaces and apartments capable of holding hundreds and even thousands of pounds of combs and honey have often been tried, but owing to causes previously shown, they have mostly resulted in failure.

AFRICAN BEE-HIVE.*

"In these forests (Loanda) we first encountered the artificial bee-hives so commonly met with all the way from this to Angola. They consist of about five feet of the bark of a tree fifteen or eighteen inches in diameter. Two incisions are made right round the tree at points five feet apart, then one longitudinal slit from one of these to the other; the work-

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* *Dr. Livingstone's Travels and Researches in South Africa,* January, 1854.

man next lifts up the bark on each side of this slit, and detaches it from the trunk, taking care not to break it, until the whole comes from the tree.

"The elasticity of the bark makes it assume the form it had before; the slit is sewed or pegged up with wooden pins, and ends made of coiled grass rope are inserted, one of which has a hole for the ingress of the bees in the center, and the hive is complete. These hives are placed in a horizontal position on high trees in different parts of the forest, and in this way all the wax exported from Benguela and Loanda is collected."

UNICOMB AND LEAF HIVES.

"Narrow hives for experimental purposes, with large glazed doors on each side, have been used by amateur apiarians for many years. That of Reaumur was too wide: it allowed the construction of two combs parallel to each other. This form is unfavorable, as it precludes all observation of the proceedings of the bees in the interspace between the combs, Bonnet recommended a hive, the doors of which should be only so far asunder as to allow the building of one comb between them. This suggestion was successfully adopted by Huber; and to prevent the bees from building short transverse combs, instead of a single one parallel to the sides of the hive, he laid the foundation himself, by fastening a piece of empty comb to the ceiling of the box.

"The hive in which Huber conducted his first experiments, had only an interspace of an inch and a half between the glass doors, so that the bees could not cluster upon the surface of the comb, and yet had room to pass freely over it. Mr. John Hunter recommended the diameter of these narrow hives to be three inches and the superficies of the sides of sufficient size to afford stowage for a summer's work. Mr. Dunbar, with his *mirror hive*, constructed somewhat like Huber's, has been able to make some interesting observations on the economy of the bee. The distance of his glass doors from each other is an inch and two-thirds, the height of the hive about eighteen inches, and the width about two feet. Across the center of the mirror hive, he introduced a light frame, which, though apparently dividing the hive into four compartments, allowed the bees a free passage; the light was excluded by a pair of folding shutters on each side.

"Mr. Dunbar hived a small swarm in one of these narrow boxes in June, 1819; the bees began to build immediately, and he witnessed the whole of their proceedings, every bee being exposed to view. The narrowness of their limits constrained them from the very commencement to work in divisions, so that four separate portions of the comb were begun and continued, nearly at the same time.

"But this arrangement did not sufficiently employ these industrious creatures; for, contrary to their usual mode of building, which is from above downwards, they laid two other foundations of comb upon the upper parts of the cross sticks.

"The bees now wrought upwards and downwards at the same time, till the originally separate portions were united and became one comb.

"For want of proper precautions, the family perished during the intense cold of January, 1820.

"On the 25th March following, Mr. D. introduced another family into the same unicomb hive; and as early as the 27th he saw the queen laying the eggs of workers. This second family found plenty of honey and farina in the hive, left by its former tenants. Other particulars, upon the same unquestionable authority, will be found in the chapters to which they belong.

"Huber carried the principle of these experimental hives still further; he joined several of them together with hinges, which were so constructed as to admit of easy removal, and as the frames, or leaves, as Huber called them, were not glazed, they afforded a free communication with each other.

"It has been said that Huber borrowed from the Candiotes the first idea of his leaf hive. These descendants of a highly intelligent people, without being aware of the principle of their proceeding, continued the practice of their ingenious predecessors in so far as simply surmounting their hives with loose bars can be considered as a continuation of it; and are thereby enabled *occasionally* to raise artificial swarms, and *sometimes* to practice *partial depriva-*

tion in a very easy and simple manner; but there is much of casualty in their proceedings, and little of science—for, in answer to inquiries which I have repeatedly instituted through the medium of persons residing in the islands of the Archipelago, I have learned that the attainment of either of the advantages referred to is liable to great uncertainty; the mere removal of loaded combs among the Greek apiarists so far from being *at all times* a simple and easy process, to use the language of one of my informants, often involves 'a very delicate and difficult operation.'

"Huber extended and rendered the system more complete; probably approximated it more nearly to that of its ancient Greek inventors. These experiments, however, of Mr. Golding, myself, and others already detailed, have shown that this hive admitted of still further improvements; the leaves were too narrow to be applicable to all purposes, and the hive, altogether, has been so much simplified by Mr. G., that I shall confine myself to a description of the particular form and dimensions which he has adopted. The general width of the leaves should be an inch and five-eighths, but slightly varying in the same proportion. The exterior dimensions of this hive are one foot, two and a half inches high, by one foot, one inch deep; the width will depend on the number of leaves—the number usually employed is eight. The perpendicular bars at the front and back converge at the bottom towards each other, so that at the top the interior of the hive, from front to back, measures eleven inches; at the bottom only ten inches. The upright pieces are, of course, kept in their positions by having the top pieces tenoned into them, and are further held together by a small cross bar, also tenoned into them about half an inch or an inch from their lower ends, so as to allow a free passage for the bees beneath. A series of these leaves being placed in juxtaposition, secured at the front by shifting butt-hinges, and at the back by hooks and eyes, and having a glazed door, covered by a shutter at each end, constitute what I think will be found to be an improved modification of the hive of Huber.

"A still further improvement was made in this hive by Mr. Dunbar. When closing the leaves, (after inspecting the interior) as those leaves were originally constructed, a few straggling bees were every now and then crushed between their edges. To obviate this, Mr. D. had those edges ploughed out through their whole extent, to within the eighth of an inch of their outsides, by which contrivance the bees are very effectually protected from injury.

"By attaching a piece of comb to the top bar of each division, in the manner already described, the bees will be induced to construct their combs with such uniform regularity as to admit at any time of the opening of the hives to inspect the interior, or to remove an entire division when loaded with honey comb, or (if required for the purpose of observation or experiment) to take out an entire brood comb or

PLATE IX.

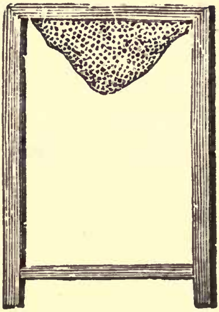

FIGURE 22.

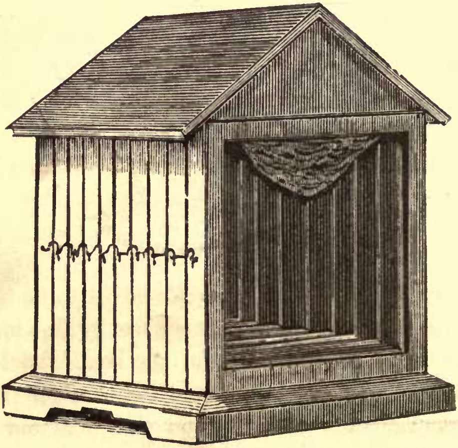

FIGURE 23.

any portion thereof, without at all interfering with the other combs of the hive, or materially disturbing its general economy. The leaves from between which a remove has been made, should be either brought immediately, but carefully, together, or have a spare supernumerary leaf interposed between them."

Plate IX, fig. 22, represents one of the frames of the Huber hive. Fig. 23 is the Huber hive itself, composed of eight frames, and showing the hooks and eyes which secure it behind, each frame being secured in front by movable hinges. Each external frame must have a glazed door, covered by a shutter. These are not shown in the figure.

"It will be evident that the Huber hives here delineated are designed for an out-door apiary. For a bee-house or shed their construction may be simplified, particularly as respects the cappings, which are merely intended as protections from the weather."

BEVAN'S "BEE-BOXES."

Doctor Bevan recommends bee-boxes to be made "eleven and five-eighths inches square, by nine inches deep, *in the clear*. The sides of the boxes should be an inch thick, and have the upper edges of the fronts and backs rabbeted out half their thickness and half an inch deep, to receive a set of loose bars upon their tops, (see plate X, fig. 24) which should be half an inch thick, one and one-eighth of an inch wide, and seven in number. If the distances of the bars from

PLATE XI.

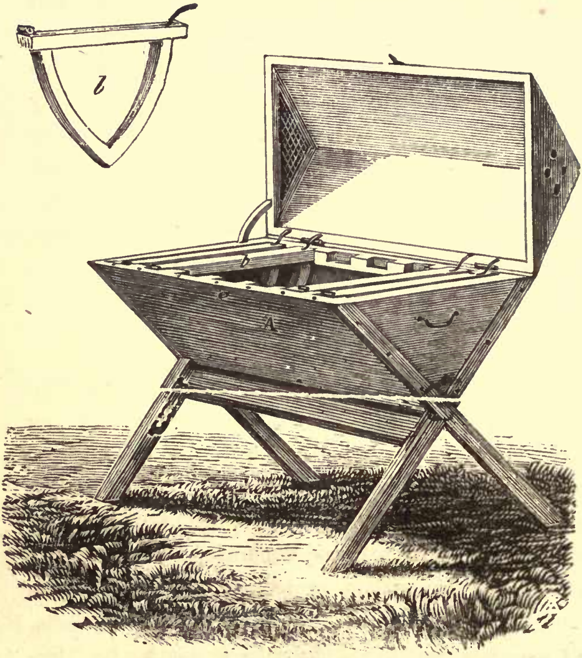

FIGURE 26.

"Storifying means the piling of hives or boxes upon each other, (as shown in plate x, fig. 25,) and preserving a free communication between them; a method which enables the apiarian to take wax and honey without destroying the lives of the bees.

"Attempts have been made to accomplish this object in different ways. Thorley, Jr., placed empty hives or boxes over full ones; Wildman and Keys did the reverse; White and Madame Vicat placed them collaterally. Aristotle, Pliny, and other ancient writers, speak of contrivances for taking honey, and inspecting the operations of the bees."

MUNN'S HIVE.

From a pamphlet entitled "A Description of the Bar and Frame Hive," invented by W. Augustus Munn, Esq., published in London in 1851, (a previous edition having been published in 1844) I have copied plate XI, fig. 26, which represents the Munn hive, together with a frame separate. The frame is made triangular, with a projection at either of the

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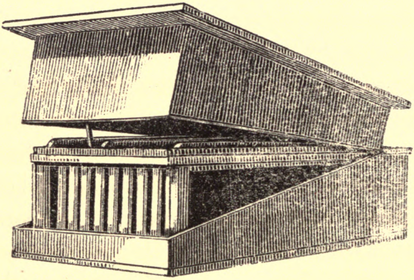
* I have seen plate x, with directions for making the "bee-boxes," copied into various works, but called "Bevan's Cross-bar Hive," as though it were a complete hive of itself, instead of part of a hive, as described by Bevan himself. He (Bevan) has thus (in my opinion) been misrepresented, as advocating small hives, whereas, it is shown, as in plate x, fig. 25, as well as implied throughout both of the chapters above referred to, that two or more of these boxes are always used in combination, as shown in the plate, thus making a hive even larger than I advocate.

upper corners, as shown at *e*; seven of these frames are suspended in the top of a triangular box, gains being cut to admit the projections of the frames to keep them properly spaced. Each frame is so contrived that it can be raised into an observatory frame, without the bees having liberty to annoy the observer.

Although it might seem at first sight that this hive was only intended for making observations of the habits of the bee, yet there is no doubt of its having been used for all the purposes required of any hive. This I think is conclusively shown by the following extract, taken from the pamphlet above named:

"The objects to be attained in the construction and management of an apiary, are to secure the prosperity and multiplication of colonies of bees, to increase the amount of their productive labor, and to obtain their products with facility, and with the least possible detriment to the stock. It is to the interest of the owner, therefore, that he provide for the bees shelter against moisture, and the extremes of heat and cold; especially sudden vicissitudes of temperature, protection from their numerous enemies, every facility for constructing their combs and for rearing their brood, and that the hive should be so constructed as to allow of every part of the combs being inspected at any moment, and capable of removal when requisite; and while attention is paid to economy, it should be made of materials that will secure its durability."

PLATE XII.



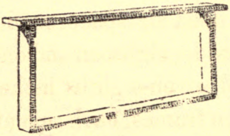


FIGURE 27.

As special mention is made in the same work of Huber's leaf hive, and Golding's Grecian hive, as well as referring the reader to Dr. Bevan's "Honey Bee," for a description of all hives and boxes, it is evident that the author aimed to combine the good qualities of each, as well as to make new improvements.

LANGSTROTH HIVE.

The Langstroth hive, like the *Huber* and *Munn* hives, is constructed on the movable comb principle; but more properly combines the oblong bar frame, as originally used by Munn, with Bevan's bee-box, and other additional improvements, making it more simple and practical than either of its predecessors.

Plate XII, fig. 27, represents the Langstroth hive, with a dead-air space between the inner and outer cases; a frame is removed, and shown separately.

The simplest form, however, is a single case or hive, without the dead-air space, made fourteen and one-eighth inches wide, eighteen and one-eighth inches long, and nine and seven-eighths inches high—all inside measure. Ten frames, each seventeen and three-eighths inches by eight and five-eighths inches, with a projection of seven-eighths of an inch at each upper corner, to rest in the rabbets, are inserted into each case.

It is intended that these frames are to be made "indiscriminately applicable to every box," or case.

A honey-board, having apertures for the bees to pass through, is placed on the top of the case, and boxes for the reception of surplus honey are placed on the top of the board—a cap is then put over these, making the hive complete.

To remove a full frame, " the apiarist should *gently* push the third frame from either end of the hive a little nearer to the fourth frame, and then the second as near as he can to the third, to get ample room to lift out the end one, without crushing its comb or injuring any of the bees. He should take hold of its two shoulders which rest upon the rabbets, and carefully lift it, so as to crush no bees by letting it touch the sides of the hive or the next frame."

CALIFORNIA HIVE.

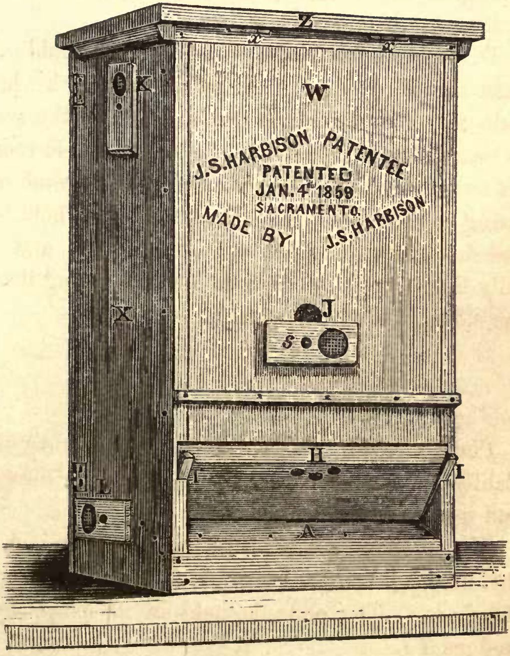
Plate XIII, fig. 28, represents a front view of the California hive as arranged on the stand for the egress and ingress of the bees.

H is a slide elevated three-eighths of an inch from the inclined bottom board *A*, forming a passage for the bees. The slide is held in its place by the wedges *II*.

J. An aperture one and a half inches in diameter, used either as a passage for the bees, or to admit air.

S. Ventilating block, made five inches long, two and one-fourth inches wide, and one-half inch thick ; an aperture is made in one end, and a wire screen tacked over it ; on the side intended to be next to the hive, the wire should be sunk even with the sur-

PLATE XIII.



FIGUER 28.

PLATE XIV.

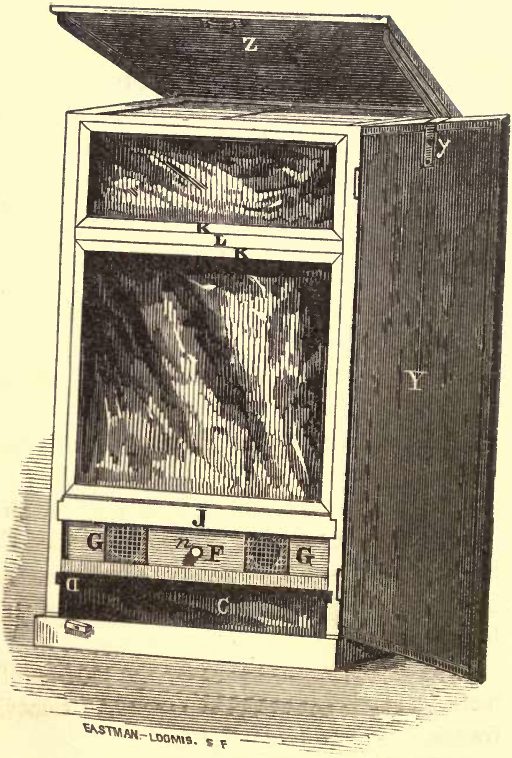


Figure 29.

face of the block, to allow it to turn smoothly; the block is attached to the hive by a screw in its center, forming a pivot, on which it turns, and in such a position that the aperture in the block will correspond with the one in the hive; it will then admit air without allowing the bees to pass; reverse the ends and the air is excluded, and by turning it half round, a passage is opened for the bees.

K. Apertures in the sides or stiles *X*—one seen and one unseen; they are used for upward ventilation.

L. Apertures the same as above, but made to admit air into the ventilating chamber.

All the apertures in the hive and all the ventilating blocks are made of the same size.

Z. Lid, attached by hinges *x x* to main front board *W*.

Plate XIV, fig. 29, rear view, showing the hive open.

D. A wire, to which is attached a curtain *C*, which is used to prevent light passing from the ventilating chamber through the passage, admitting air to the bees.

F. Cross piece, movable, for the purpose of examination and cleaning the hive, without removing the frames.

n. Knob, projecting one-half inch, so as to touch the door when closed.

G. An aperture one and a half inches in diameter, covered with screens, through which air finally reaches the bees.

J. Sill let into the sides of the hives; gains are cut into it, to admit the tenon of the comb frames *K;* gains are also cut in the front board *W*, for the upper corner of the frame to rest in, as shown in plate XXXIX.

kk. Glass frames, enclosing the main frames and surplus honey-boxes.

Y. Door, attached by hinges; the hinges, both of the lid and door, should be narrow two-inch wrought butts; *y*, hook (made of hoop iron) fastened to the door, so as to enter the staple *z*, (also made of hoop iron) and hold the lid down. A button is attached to the upper corner of the door, and turns into a groove in the lid. There is also a button attached to the lower corner of the hive, so as to turn on the door; these buttons serve to keep the hive closed.

Plate XV, fig. 30, side section view.

B. Ventilating chamber, being the space between the inclined bottom board *A*, and stand.

E. Air passage, being a space of half an inch between the door and the inclined bottom *A*, curtain *c*, and cross piece *F*.

K. Comb frame.

L. Chamber floor.

Plate XVI, fig. 31, represents one of the stiles. (There are two, a right and left.) The dimensions and position of each part are given.

U. Gain one and three-eighths by one and three-eighths, and half an inch deep, for sill to rest in.

PLATE XV.

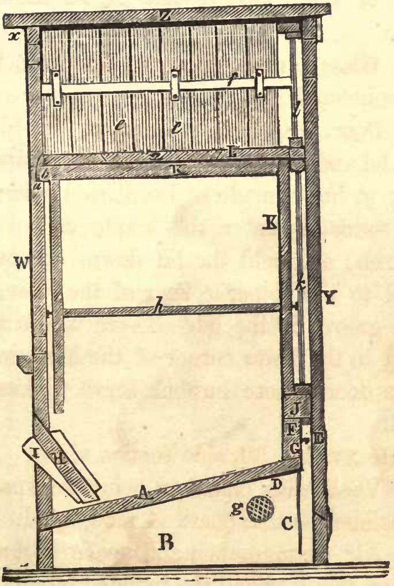


FIGURE 30.

PLATE XVI.

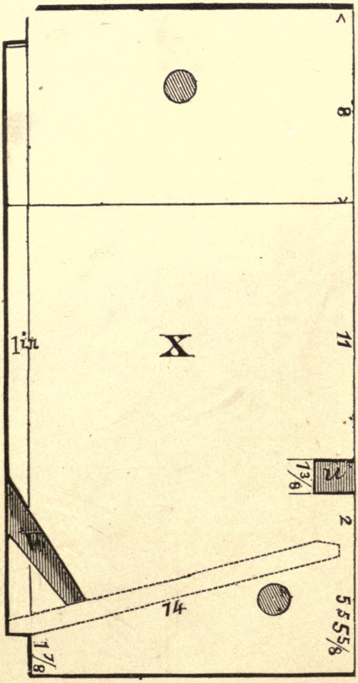


FIGURE 31.

PLATE XVII.

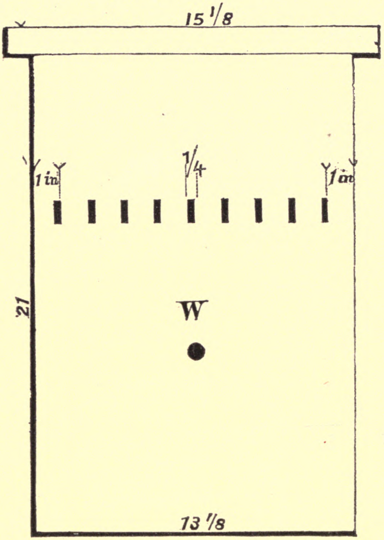


FIGURE 32.

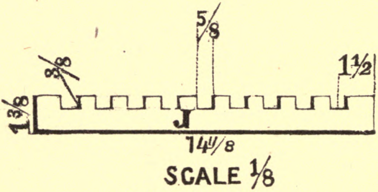


FIGURE 33.

PLATE XVIII.

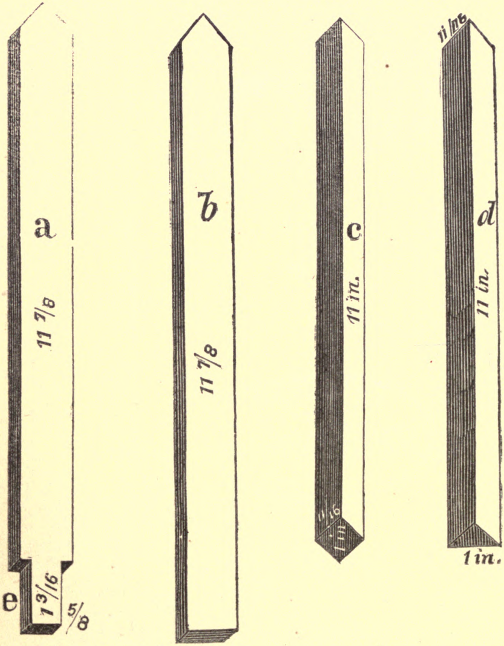


FIGURE 34.

PLATE XIX.

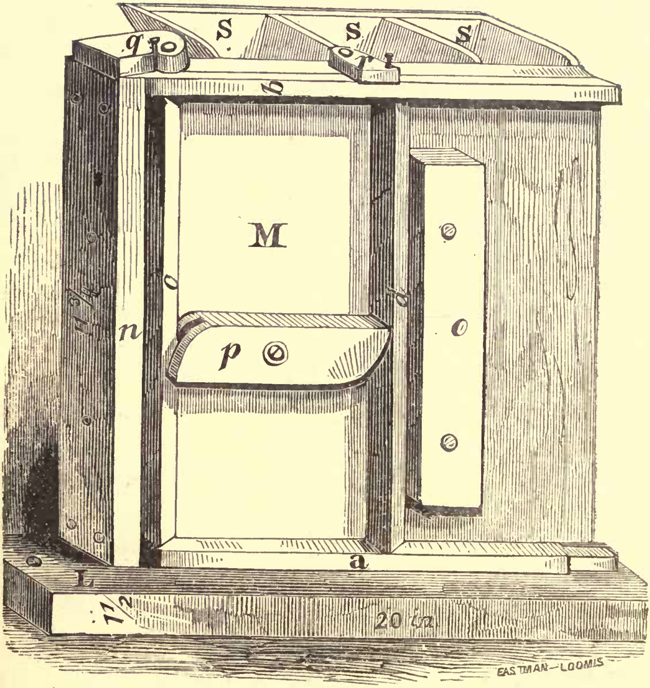


FIGURE 35.

V. Gain for receiving slide *H*. Scale one-eighth of an inch.

Plate XVII, fig. 32, represents the front board *W*.

Fig. 33, sill *J*. The dimensions and position of each part are given.

Plate XVIII, fig. 34, represents the parts composing the comb frame *K*.

a and *b* are the vertical legs, eleven and seven-eighths inches long, one inch wide and three-eighths of an inch thick.

e is a tenon, one and three-sixteenths inches long by five-eighths inch wide.

c is the top piece, eleven inches long by eleven-sixteenths of an inch square.

Plate XIX, fig. 35, represents a gauge on which to nail the parts composing the comb frame *K* together.

L. The base, twenty inches long, ten inches wide and one and one-half inches thick.

M. The upright, twelve inches long, eleven and three-fourths inches high, and one and one-half inches thick.

n is a batten forming a stop for the top piece *c* of the frame.

o. A batten placed parallel with the first, and for the center bar of frame to rest against.

P. Is a button to hold the top piece and center bar in place while the legs are being nailed to them. The leg *a* is nailed first, the frame is then turned and leg *d* fastened in like manner, a sixpenny nail is to be driven into the upper corner, and allowed to project three-fourths of an inch, as shown at *f*, fig. 36, in place of a tenon, as heretofore used. The projection of the nail is gauged by the button *q*.

A nail (*s*, fig. 36) is allowed to project three-eighths of an inch, at the end of the center bar, on the same side and in like manner as the above, the projection of the nail is gauged by the button *r*.

s s s are boxes to hold the different sized nails.

Plate XX, fig. 36, shows the comb frame *K* complete.

Fig. 37, shows the parts composing a section of the honey box, together with the dimensions of each part; *w* the top piece, with comb guide *v* attached, *x x* the sides, and *y* bottom piece or diamond bar.

Plate XXI, fig. 38, gauge for nailing the sections of honey box (*e*) together, made as follows:

F. Base, one and one-half inch plank, twenty inches long and nine inches wide.

G. Upright, six inches high, same length and thickness as the base.

h. Place for nailing comb guide *v* in center of top piece *w*. (See fig. 37.)

i. Place for nailing on the tins, sheet iron being underlaid to clinch the nails.

j j. Gains for holding the sides (*x x*) while nailing the top piece to them.

k. A jaw fastened by hinge *l*.

m. Eccentric lever fastened by a pivot, and used to move the jaw to or from the section while nailing in the diamond bar *y*.

PLATE XX.

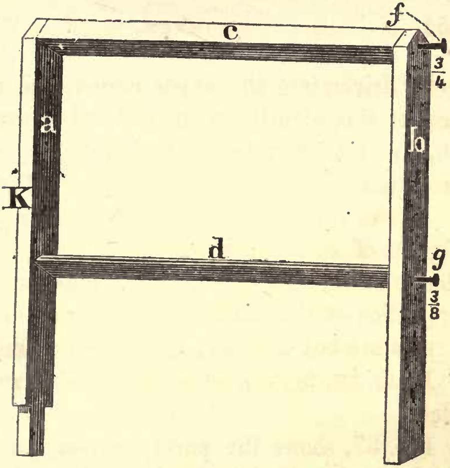


FIGURE 36.

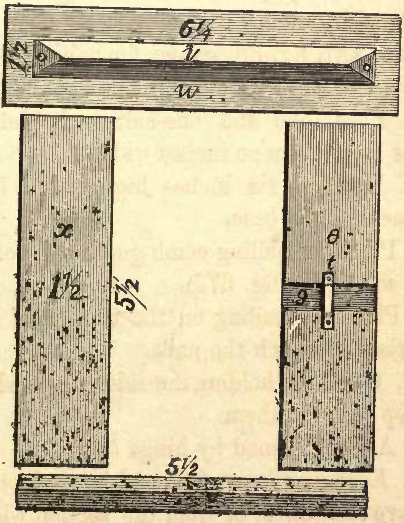


FIGURE 37.

PLATE XXI.

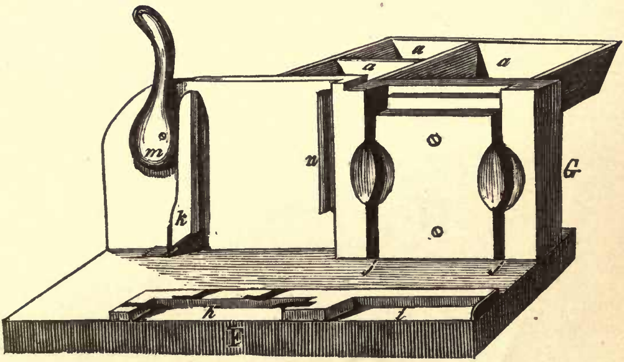


FIGURE 38.

PLATE XXII.

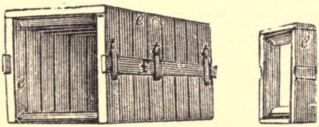


FIGURE 39.

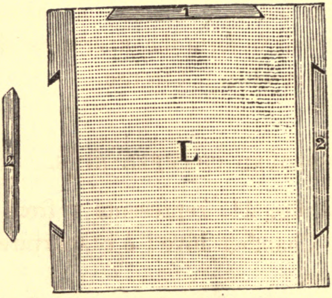


FIG. 40.

Plate XXII, fig. 39, represents a section honey box *e*, composed of square rings or sections (one of which is shown separately).

The sections are held together by coupling straps (*f*) inserted into grooves cut in the sides.

t t are tins nailed on the sections to retain the coupling strap in its place.

Fig. 40, honey-board or chamber floor *L*, (see plate XIV) made of five-eighths inch lumber, cut ten inches long, thirteen inches wide; battens one and one-half inches wide are nailed on the ends, to prevent warping, making it thirteen inches square.

There are three apertures cut in its edges, through which the bees ascend to the honey boxes. It is placed in the hive so that one of the apertures is next to the front board, (*W*) and one at each side. The pieces cut out to form the apertures should be kept to close them when not in use.

IMPROVED CHAMBER HIVE.

Plate XXIII, fig., 41, represents a front view of the Improved Chamber hive; *b c* apertures for ingress and egress.

Plate XXIV, fig. 42, side view; *e* ventilating apertures, and may also be used for egress and ingress. The dotted line *f* shows the position of the chamber floor.

Plate XXV, fig. 43, rear view; *h* the lid partially elevated, and *i* shutter partly turned down, showing the section honey boxes *e e*. Both the lid and shutter are attached by hinges, and when closed are held in place by fastenings *j*.

Plate XXVI, fig. 44, chamber floor thirteen and one-eighth inches by thirteen and one-eighth inches. *l l l l* are holes for the passage of the bees; *m* are comb guides, the under side of the floor being upwards.

Fig. 45, honey box, (shown bottom upwards) made of three-eighths inch lumber, twelve and seven-eighths inches long by six and one-fourth inches square; either the sides or ends may be made of glass, as suits the convenience of the bee-keeper.

STORIFYING HIVE.

Plate XXVII, fig. 46, Storifying hive. The frames and their adjustments are the same as the California hive. It is made open at the bottom, the same as an ordinary chamber or box hive, and without chamber for surplus honey boxes.

In this shape it is designed to be used as a hive on which to set any open bottom hive which is full and in need of additional room. When this is done at a time when pasturage is abundant, the bees proceed to fill it with combs. As soon as full, the top one may be removed for its honey, which may be strained from the combs, and the refuse given to the bees.

Two or more of these hives may be used, as shown

PLATE XXIII.

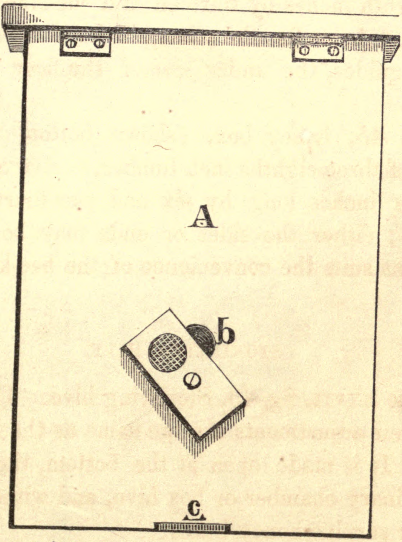


FIGURE 41.

PLATE XXIV.

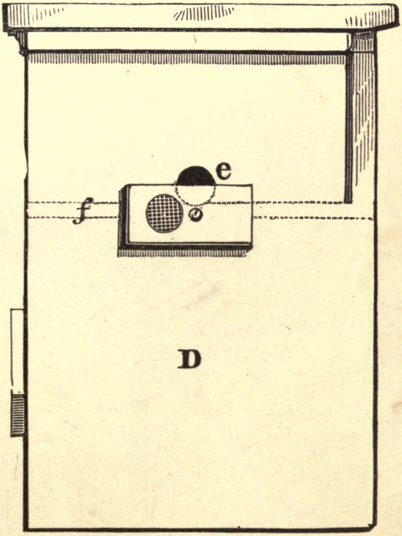


FIGURE 42.

PLATE XXVI.

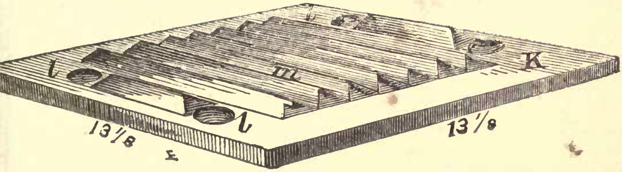


FIGURE 44

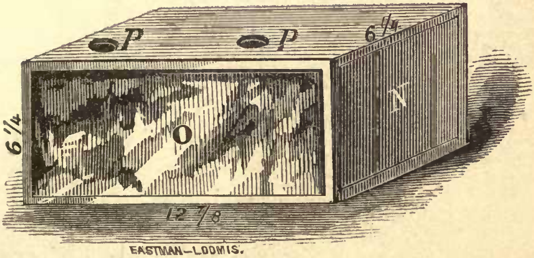


FIGURE 45.

PLATE XXVII.

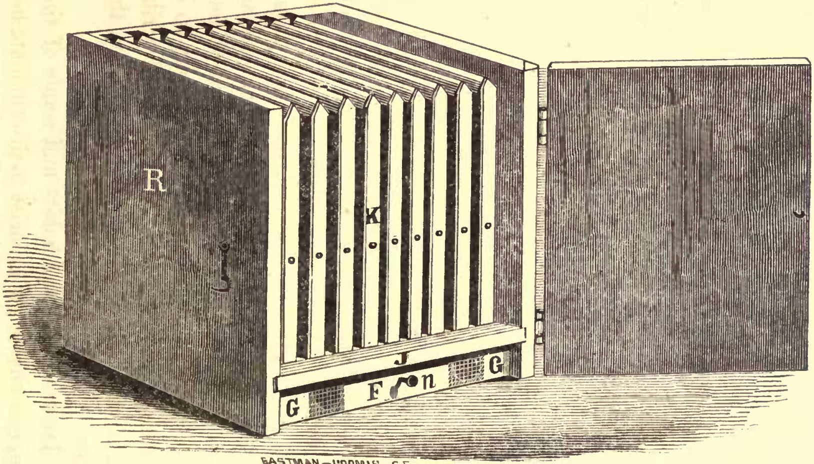


FIGURE 46.

in plate x, fig. 25; or honey boxes with caps may be placed on a single one, for the purpose of procuring pure surplus honey.

As a cheap and universal hive for all purposes, this one possesses more advantages than any other of equal cost.

Hives should be made out of clear seasoned lumber, and the heart side outwards, which, in a great measure, prevents both capping and splitting of the different parts. The same remarks hold good in siding buildings, nailing on fence boards, etc., etc.

It has been my aim in this chapter to trace the bee-hive through all the real improvements that have been made from time to time, thus affording each bee-keeper the means of selecting a hive that suits his fancy. It must be borne in mind, however, that uniformity in hives is a desideratum in bee-keeping. There are hundreds of hives that have, from time to time, been brought before the public, claiming to be new inventions and the *ne plus ultra* of improvements; they are, however, almost without an exception, mere variations from those I have described, or fanciful contrivances, that serve to confuse the bee-keeper.

A knowledge of the habits and wants of the bee, alone, can enable the apiarist to discriminate between the good and the bad, and will result in a more systematic and successful management of the apiary than has heretofore been attained.

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CHAPTER VIII

CHOICE OF STOCK.

In order to establish an apiary successfully, much caution is necessary in the choice of stock. There is as much difference in the relative value of hives of bees as there is in that of animals from which to stock a farm. The following suggestions will be of service to new beginners in making their selections.

THE KIND OF HIVE.

The first question to determine is the kind of hive to adopt; then, if possible, buy bees already in the favorite hive. By so doing, the expense of an extra hive, as well as a delicate operation to a beginner, in transferring them, is avoided. See that the hives are well made, as a small defect frequently causes the loss of a good swarm of bees.

SIZE OF HIVE.

The main apartment, for breeding and winter stores, should contain two thousand, two hundred cubic inches, with a chamber for the reception of surplus honey,

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SIZE OF HIVE.

The main apartment, for breeding and winter stores, should contain two thousand, two hundred cubic inches, with a chamber for the reception of surplus honey, to contain one thousand, one hundred cubic inches, in addition. This size is the most profitable, as it is found to develop the capacities of the swarm in a greater degree; hence, more honey is obtained, and less risk is incurred from starvation; this will hold good both in the Pacific and Atlantic States, with but slight exceptions.

CONDITION OF COMB.

The main apartment should be full of worker comb, except one, which should be drone cells. The combs should be straight and of even thickness. If of a yellow color, they are new, and hence, to be preferred. The combs should be carefully examined as to their condition. (See Chapter on Combs.)

HONEY AND POLLEN.

If in the fall or winter, most of the comb should be stored full of honey and pollen; the former should be clear and of a yellow color, and nearly all sealed over.

PROLIFIC QUEEN.

A prolific queen lays her eggs in regular order, commencing at a point and distributing them in circles, each surrounding the first, and on both sides exactly alike. An old queen of a previous year is usually more prolific previous to July, than a young one of the current year; but a hive with the latter is found to have more brood, after this time, and continues to breed later in the season than the former.

The sealed worker brood should present a regular, smooth surface. An irregular brood denotes an unprolific queen; a portion of raised oval cells is also objectionable, all the cells being raised. Plate II shows a drone-laying queen.

If a fertile queen is present, eggs or larvæ will be found in the comb at all times from February till October. There is no certain test, after they cease breeding in the fall, till they again commence in the spring.

BROOD.

Breeding commences in the best hives usually in the month of January,* and constantly increases in amount till the time of swarming, when a large quantity of brood should exist.

The first indication that breeding has commenced, is the appearance of scales of new wax and eggs found on the bottom board; mutilated remains of young, found there, or cast out of the hive at a later period, show the age to which the brood has arrived.

THE NUMBER OF BEES.

The combs should all be covered, and the spaces

* This is the case both in Pennsylvania and California, and probably throughout the North Temperate Zone.

between them full of bees, which should be in CLOSE MASSES, *and not spread thinly over them* ; the numbers can best be determined by turning the hive up and looking at the lower ends of the combs, or removing the front slide. If worms exist, their presence will be detected at the same time.

An examination at the top of a hive is NOT SUFFICIENT to determine either of these points, unless all the combs are taken out, which can only be done when movable frames are used.

Late in the fall and during the winter, the bees draw together in a cluster at the lower ends of the combs, leaving the upper portion of them bare ; hence, the above examination is necessary to learn their true state.

BEWARE OF DISEASE.

It is not safe to purchase bees bred from stocks in which foul brood has ever existed, as it is hereditary, and reäppears at intervals longer or shorter, according to the presence of exciting causes.

DIFFERENCE IN SWARMS.

In buying swarms, at the time of hiving, be particular to specify whether it shall be the first swarm of the season or a subsequent one, from the same hive.

A first swarm usually has twice as many bees as the second, and having a fertile queen from the first, the combs are furnished with eggs as fast as built. The first swarm is worth three after swarms, they being small in comparison, and having queens not yet fertile, no eggs are laid for a period of at least eight days after being hived; thus losing considerable time before their numbers commence to increase. The parent hive, having a queen of nearly the same age as that of a second or last swarm departing from it, will also require a like period to become fertile.

The period that intervenes between the first and second swarms departing, usually affords the best pasturage of the season; hence, the former are enabled to accumulate a considerable amount of stores before the latter have commenced.

The assertion that "a second swarm is just as good as the first," is frequently made, but it is only true when both are put into hives *seven by ten;* the latter is then sure to fill its hive, and the former (if let alone) can do no more.

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CHAPTER IX.

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CHAPTER IX.

PASTURAGE.

The existence of all animated nature depends on the earth's yielding her fruits in their appointed seasons. The increase and decrease of every race and class of the animal and insect kingdom are governed by the same. Hence we find the bee to increase most and flourish best, where the earth yields the greatest profusion of flowers through the greatest number of months in the year.

New countries, where the natural luxuriance of plants is not checked by the grazing of domestic animals, are particularly favorable to bee culture. But as domestic animals increase and consume the herbage, bee pasture must decrease. Large tracts of land cultivated in grain also lessen the supply. Notwithstanding these drawbacks, each locality that will supply food for man will also support a certain number of bees with profit to their owners. In portions of the country the season of flowers is short, yet very rich in honey, while the balance of the year furnishes very little. In such places, bees will store largely from the flowers, but need large quantities to sustain them through the long seasons of scarcity; hence, in such localities, bees can only be kept profitably by providing artificial pasture when the natural fails. This may be done by planting such crops as produce honey-bearing flowers. To do this to advantage it is important to know the resources afforded by nature during each month, and the time it requires for each plant or tree to mature its blossoms. The following schedule of the different trees, shrubs and plants that afford pasturage, arranged in the order of their flowering, affords valuable information to beginners.

MANZANITA, (*Little Apple*)

Is a bush abounding principally in the mountain districts, and flowering in January and February, and is rich in both honey and pollen.

WILLOWS.

The numerous family of willows affords a succession of pasturage of great value, commencing about the first of February, and continuing nearly four months; some varieties afford pollen in great abundance, while others are rich in honey.

SYCAMORE.

This well known and valuable tree is found along the banks of rivers and water courses, yielding a vast profusion of unpretending flowers, rich in honey during the latter part of March and the early part of April, and affording great attraction to bees.

TURNIP.

Turnip blossoms are eagerly sought after by bees, and afford so rich pasturage during March and April as to make it a profitable crop, if but for this purpose alone.

RAPE.

The summer rape resembles the turnip, and blooms a little later in the season, and affords quite a rich pasturage. By sowing it at different times, from the first of January to the first of April, a succession of pasturage will be afforded.

Winter Rape, which is also valuable for bee pasture, requires to be sown during the spring or summer, so as to make a growth and be prepared to bloom early in the following spring. This variety is cultivated to a considerable extent in some countries, (particularly in Germany) both for bee pasture, and for seed.

The latter is used for making oil, and for bird feed. Several tons are annually imported into California for the latter purpose.

CABBAGE.

Cabbage blossoms afford a considerable amount of honey, of a fine quality and flavor.

ALFILARELA.

This plant yields large quantities of pollen for about three months, commencing in March and ending in June.

FRUIT TREES.

Apricot, nectarine, peach, and cherry trees bloom in March, and if the weather is favorable, considerable quantities of honey are stored from them.

Pear and apple blossoms are very valuable as pasture ; they appear in April.

OAK.

Oak affords abundance of pollen during the month of April.

RASPBERRY.

The raspberry flowers are special favorites with the bee, and yield a very superior honey.

BLACKBERRY

Commences to bloom about the twentieth of March, and continues through April, affording honey constantly.

WILD FLOWERS

Of various kinds abound on the plains during the months of March, April and May. Most of them are rich either in pollen or honey.

LOCUST TREES

Yield a profusion of white flowers, about the last of April, affording a very fine quality of honey.

WILD CLOVER.

Of the varieties of wild clover in California, some afford pollen; but I am not aware that any of them are rich in honey.

WHITE CLOVER.

This is the great dependence for honey in the Atlantic States. It will flourish in moist lands in California.

BUCKWHEAT

Is a great source of both honey and pollen. It may be sown at any time after the frosts are past. The blossoms are so that the bees commence gathering from them in about thirty days after it is sown, and it continues in bloom for four or five weeks. Buckwheat can be made to fill any vacancies that occur during the summer, provided it is sown on lands sufficiently moist to insure its growth. The honey gathered from it is of a reddish color and fine flavor, and is preferred by many persons to that gathered from white clover.

MIGNONETTE

Is a great favorite with the bees. It is rich in both honey and pollen. When sown early, it commences to bloom in May, and continues until hard freezing kills it. Being a trailing, annual plant, it may be sown in orchards to good advantage. It is one of the best plants to cultivate for bees.

MUSTARD.

Mustard affords a larger amount of valuable pasturage to the acre than almost any other plant. It blooms throughout the month of May, and part of June. During this time, bees increase in numbers, and store from it large quantities of honey of a clear yellowish color, but partaking slightly of the taste of the plant.

BUCKEYE.

The buckeye of California is usually a large shrub, but occasionally attains the size of a small tree. It abounds in most of the mountain districts, and is also found along the borders of streams, and occasionally on the plains. It commences to bloom in May and continues for nearly three months. It yields a large supply of honey of a superior quality.

POPLAR OR WHITEWOOD. (*Liriodendron.*)

This noble tree is not found to thrive in this vicinity, (Sacramento) but doubtless would flourish near the sea-coast and in the mountains, where a lower range of temperature prevails. It thrives best on rich, moist lands. In some of the Atlantic States it is one of the principal sources of superior honey. It flowers in the month of June.

LINDEN, OR BASSWOOD, (*Tilia Americana*)

Is found to grow well on the moist lands of California, and affords a rich crop of honey at a time when there is a scarcity of other pasturage. It is a great acquisition. The season of bloom will be in June. (In the Northern States it blooms in July.)

SUMACH, (*Rhus Glabra*)

Will flourish on the moist lands bordering our streams. It blooms a little later than the Linden, and affords a large quantity of honey.

CEPHALANTHUS OCCIDENTALIS.

As a source of superior quality and quantity of honey, the Button-bush, Cephalanthus Occidentalis, stands unrivaled.

It is found in various parts of the United States, and particularly in California; abounding on marshy lands, and along the margins of rivers, and sloughs, and lakes. It attains a height of from ten to fifteen feet, and a diameter varying from one to three or four inches, there being a number of crooked, irregular stalks growing out of the same root. It propagates either by seed, layers or cuttings, and is a vigorous grower and perfectly hardy. The wood is short jointed, having three leaves growing out of each, forming a triangle. The leaves are about four inches long, by one and one-half wide, and tapering at both ends. The color is a lively green, of waxen appearance. The flowers are formed at the termination of the current year's growth, globe shaped and about one inch in diameter; being composed of numerous flowerets, thrown out of the seed-vessel, of the same shape and about one-third the size of the expanded flower. These are placed in threes, opposite each other, the same as the leaves, there being generally either two or three sets, terminated by a single one, making either four, seven, or ten on each terminal branch, according as it is more or less thrifty. They are of a creamy white color and emit a pleasant fragrance. Where a portion of this shrub is submerged till late in the spring, it retards the season of bloom; the first flowers appearing about the first of July and continuing in succession for full two months, affording an abundant supply of honey during the season it is in bloom. Strong colonies will store from one to three pounds of surplus honey per day, besides the amount deposited in the main apartment, to be consumed by the bees.

There are places where large quantities of this bush grow, that should not only be preserved, but additional grounds planted; it will be found a paying investment, perhaps equal to a sugar plantation.

ÆSCALONIA.

The Æscalonia is an evergreen shrub, much used for ornamental hedges. It grows along the borders of streams. In California it blooms late in October, and continues through most of December, affording considerable pollen and probably some honey, and affords the last pasturage of the year.

The above list comprises many valuable flowers, as bee pasturage; but among the numerous flora of California, there will doubtless be others found of equal value.

CHAPTER X.

THE APIARY.

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CHAPTER X.

THE APIARY.

LOCATION OF THE APIARY.

THE best localities for bee-keeping in the drought of summer are along rivers, sloughs, and lakes. In the spring, the plains—the home of Flora—afford richer pasturage; hence, locations affording access to both are superior to all others.*

In our California mountain districts there is a long succession of rich pasturage from the flowering shrubs and trees, which seem to defy all drought. The bees thus far introduced into those regions, have done remarkably well.

I would here suggest that all persons interested in bee culture make careful observations, and note the

* "To those who reside in towns and may consider it indispensable to the success of an apiary, that it should be closely surrounded by good pasturage, and are thereby deterred from benefiting and amusing themselves by keeping bees, it may be satisfactory to learn that the apiary of the celebrated Bonner was situated in a garret, in the center of Glasgow, where it flourished for several years, and furnished him with the means of making many interesting and valuable observations, which he gave to the world about fifty years ago "(1795).—*Bevan.*

kinds and the time of flowering of such plants, shrubs and trees as afford bee pasturage; such knowledge will be valuable hereafter.

CHOICE OF GROUND.

If possible, choose a situation sufficiently elevated to avoid undue moisture,* and at the same time protected by a grove or other natural object from the strong winds. In the absence of natural protection, it is well to erect a break-wind. A close board fence, five feet high, is the most effective. This should inclose a space sufficiently large to allow the sun to shine on the hives when wanted—especially in front of them, to warm and dry the ground. This will enable many of the exhausted bees to revive and regain their hive. *It is better to have bees stand exposed* to winds and storms in a dry location, than in a damp, shaded place well protected from winds.

BEE SHADES.

One of the best and cheapest shades is made by taking eight-feet posts, of large size and durable wood,

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* I have noticed the location of more than one hundred bee trees, and have almost invariably found them to occupy elevated positions, and to be on the dryest land. They are also more frequently found on a southern or western exposure, and the bees to enter the cavities through apertures open towards the same points of the compass.

PLATE XXVIII.

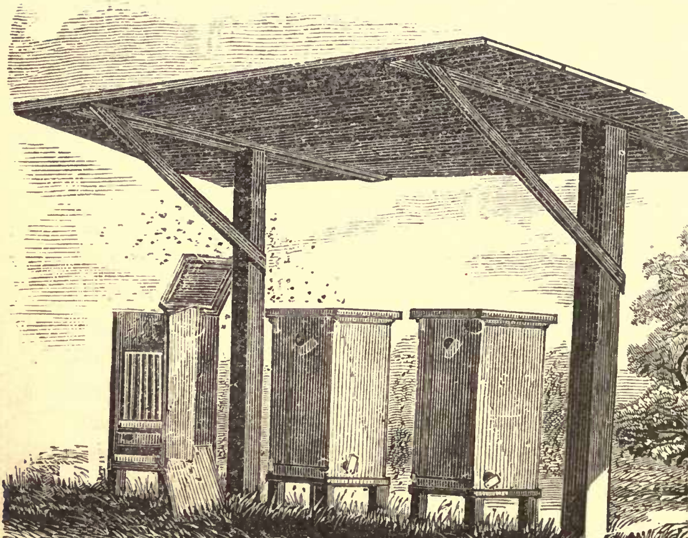


FIGURE 47.

and setting them three feet in the ground, six feet apart; then take a piece of scantling three by four, and six feet long, and spike across the top of each, at an angle of about fifteen degrees from the horizon; then nail a strip of board upon the side of the post two feet from the top, and upon the cap near its end, for a brace; upon these caps broad boards are laid the whole length of the row. The first season, these boards will need to be turned over frequently, to avoid warping; after that, they will need little attention, and will last several years. For manner of construction, see plate XXVIII.

Where it is convenient, it will take less lumber to make the necessary shade, if the row is set east and west, with the hives facing the south. This aspect gives the bees the influence of the sun, at the pleasure of the keeper, with very little trouble in changing the covering.

This form of shade combines the protection of the bees when at work, and that of the apiarist when transferring, colonizing, changing or removing comb, etc.

About the first of November, or as soon as *hot* weather is over, the boards should be removed and placed upon the top of the hives, in such a way as to shed the rain, and securely fastened, so as not to be blown off or otherwise disturbed.

By about the first of April, they should again be placed upon the frame, as shown in the plate.

Where rains are frequent during the whole year, permanent shades should be erected, and the stands so constructed as to admit the hives being moved forward, to allow the sun to shine on them when the weather is cool, or moved backwards when warm.

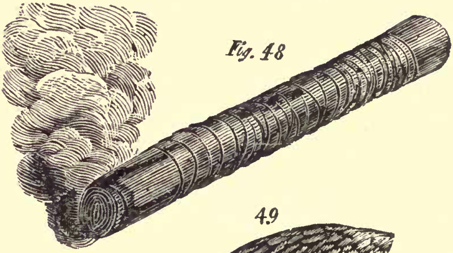
STANDS FOR HIVES.

Stools, made sixteen inches square and twelve inches high, are the most convenient stands for setting hives upon, as they admit of easy removal. There should be two narrow boards bedded down in the ground, for the stools to stand upon; care should be taken in all cases to have the hives kept perfectly plumb, as the bees are then enabled to construct their combs within the frames and parallel with the sides of the hives. In dry situations, a board may be laid on the ground, or elevated a few inches, for the hives to stand upon.

A stand made as follows, answers the purpose well. For one twelve feet long, prepare ten stakes, made of durable timber—make them thirty inches long and three inches in diameter—sharpen one end and leave the other square; they are then to be driven into the ground eighteen inches, set in pairs three feet apart, and eighteen inches between stakes, forming two parallel lines; a cap, three inches wide, one inch thick, and twenty inches long, is nailed on the top of each pair, making five bearings; a plank, twelve feet long, sixteen inches wide, and one inch thick, is then laid on them—thus forming a stand for either five or six hives.

PLATE XXIX.

Fig. 48



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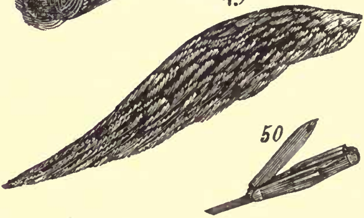

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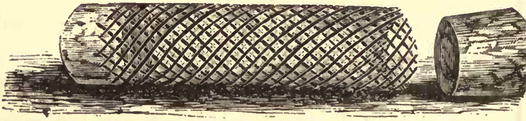
Fig. 52



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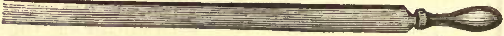

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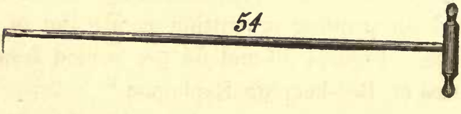

The only objection to this kind of stand is the facility which it affords the bees to run from one hive to another; which they often do during the working season. This difficulty may, however, be overcome by placing the hives wide apart.

MISCELLANEOUS.

Plate XXIX, fig. 48, represents a roll of cotton stuff, wrapped with twine, and one end on fire, the smoke of which is used to fumigate the bees, either to conquer them or to drive them wherever desired.

Fig. 49. A wing used for brushing the bees either off the combs or otherwise.

Fig. 50. A pocket-knife is an indispensable article.

Fig. 51. Carving-knife, used for cutting or straightening comb.

Fig. 52. Queen cage, made of wire cloth, three inches long and one inch in diameter; the ends closed by corks.

Fig. 53. A steel blade one and one-half inches wide and twenty inches long—sharp at the point; used for cutting or pruning combs out of chamber hives.

Fig. 54. A steel rod, with cutter on the end; also used for pruning or cutting combs out of chamber hives. Figures 53 and 54 are copied from "Mysteries of Bee-keeping Explained."

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CHAPTER XI.

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CHAPTER XI.

HONEY.

"HONEY is a well known sweet, tenacious substance, which in fine weather is continually secreting in the nectaries of flowers, chiefly from certain vesicles or glands situated near the basis of every petal from whence it is collected by bees and other insects. The domestic honey bees consume a portion of this honey for food at or near the time of gathering, but the principal part of what they collect is regurgitated and poured into the cells of the hives for the use of the community in winter; so very abundant are these collections in favorable seasons as to afford the apiarian an extensive share of them without distressing the provident hoarders. Mr. Wildman states that in the year 1789 he purchased a glass filled with exceedingly fine honey-combs, weighing sixty-three pounds, which had been collected within a month, and that the hive which it had surmounted, still contained a full supply for the winter's consumption of the bees.

"The honey intended for early use, and for the nursing bees and drones, is deposited in cells which are allowed to remain open; whilst the finest honey, which is laid up in store for winter, is placed in the most inaccessible parts of the hive, and closed in the cells with waxen lids."

"In the Philosophical Transactions for 1792, Mr. Hunter has stated that whatever time the contents of the honey bags may be retained, they still remain pure and unaltered by the digestive process. Mr. Polhill, a gentleman to whom the public are indebted for several articles in Rees's Cyclopedia appertaining to bees, is also of this opinion. Messrs. Kirby and Spence do not admit this statement; as the nectar of flowers is not of so thick a consistency as honey, they think *it must undergo some change in the stomach of the bee.* They are countenanced in this opinion by Swammerdam and Reaumur; the latter has observed that if there was a deficiency of flowers at the season of honey-gathering, and the bees were furnished with sugar, they filled their cells with honey differing in no other respect from honey collected in the usual way, but in its possessing a somewhat higher flavor, and in its never candying nor even losing its fluidity by long keeping.

"The naturalists just named, highly and deservedly as they are celebrated, are not borne out in their opinions, either by my own experiments or those of my apiarian correspondents; we have each tried supplying bees with syrup of sugar as a resource for winter, without finding any material change in it after it was stored. It might be somewhat clearer, but no other difference whatever was perceptible."—*Bevan.*

I here agree with Mr. Bevan, but will add that the bees impart a peculiar musk which gives the honey a sharpish, pungent taste found in no other sweet. This is more perceptible in honey made in cold climates than that made in warm; the reason is, the bees are compelled to cluster in large masses in the former in order to maintain animal heat; this process also creates the musk thus imparted, while in the latter, where a high temperature prevails, they are enabled to build comb with scarcely any cluster surrounding; in this case but little musk is imparted to the honey.

This musk is the probable cause of honey inducing colic in some persons, so that they cannot use it when new; but after it has attained age, it loses this effect, proving to my mind that the musk is the cause.

"The power of *regurgitation* in the bee is very remarkable; its alimentary organs, like those of the pigeon, besides being subservient to the purposes of nutriment, afford a temporary store-room, or reservoir. Ruminating animals may be considered as regurgitating animals, though in them the operation is performed for different purposes. In some it is exercised for the purpose of digesting the food, in others for feeding the young; but in bees its use is to enable them to disburden themselves of the honey which they gather for the winter's store of the community."

"*The finest flavored* and *most delicate* honey is that which *is collected from aromatic plants* and has been stored in clean, new cells; it has been usually called *virgin honey*, as though it were elaborated by a fresh swarm of bees; but this is not essential to the perfection of honey, for, provided the cells in which it is deposited have never contained either brood or farina, it is not material whether it have been collected by swarms or by stocks; the season and the flowers having been the same, the quality of the honey will in both cases be alike."

"*Prime honey* possesses a whitish color, an agreeable smell, a pleasant taste, and a thick consistency. When taken from the combs it is in a fluid state, but gradually thickens by age, and in cold weather there will be deposited, if the quality be genuine, a firm and solid mass of honey, which it may be unnecessary to state is of more value than the softer portion which rises to the top. In England, honey has seldom been known to assume a solid state while in the hives; and even out of them, if it remain in the combs, it will preserve its fluidity, clearness and fine flavor for at least a year, if not exposed to a low temperature. The honey of tropical climates is always in a fluid state."

When honey is first gathered from flowers it is quite thin. The cells are only partly filled at first, and are then left so for some time, to allow the watery particles to evaporate, after which they are filled up, and when the honey is of proper consistency it is sealed over with wax, and remains without further diminution.

The manner of placing the honey in the cell is as follows: The loaded bee enters the cell head foremost, it then commences to regurgitate, and as the honey passes from the proboscis, it is kept in motion, brushing it first on the bottom of the cell, then advancing it regularly on all sides so that the air is expelled, and the honey is kept concave and in its place, by the pressure of the atmosphere. In this manner the bees will fill the underside of a comb when the mouths of the cells are placed downwards, without the honey running out.

This very interesting operation may be witnessed through glass, when the bees join their comb to it and make it serve as a portion of the wall of a cell.

In California the quantity of honey gathered by a single hive in a year, is greater, and the quality better than is usually found in any other country. Owing to the peculiarly dry climate the honey is more dense, weighing nearly one pound more per gallon than that usually made in the Atlantic States; in consequence of which it will keep good for years, and can be transported to the Atlantic cities and to Europe in prime order, and at a profit to the producer. And the time is not distant when, if the business of bee-raising receives the attention it deserves, the export of honey and bees-wax will be no inconsiderable item of revenue to the apiarists of the Pacific coast. The mountain honey will probably take the lead, both for beauty and excellence of flavor.

Honey gathered on the plains and in the valleys previous to July, is of good flavor and of various shades of color, that from mustard being whiter than any other; the prevailing color is, however, a dark yellow, with occasionally a reddish tint. But the honey most esteemed for both flavor and density is that gathered from the Cephalanthus in the months of July and August. It is of a golden yellow color and transparent, while most of that gathered from other sources at a later period, is of dark color, resembling Orleans molasses, and is in flavor or density but little better; the amount gathered of the latter, however, is not usually large. When buying honey, choose that which is of a clear color (yellow to be preferred) and thick consistency. All red or dark honey should be tested before buying, unless it is warranted by responsible parties.

In the Atlantic States the principal sources whence honey is obtained are white clover, poplar, (or white-wood) chestnut, linden (or bass-wood) and buckwheat.

The honey from the two former is of nearly the same quality, and is gathered during the same period, which is June and part of July. It is nearly white and transparent, and is considered the standard of excellence.

The chestnut and linden bloom together, from the first to the twentieth of July, and afford honey of a much darker color, and not as fine flavored as the above.

Honey from buckwheat is of a reddish color and fine flavor, preferred by some, even, to that from white clover.

In some of the western States, the golden rod and other wild flowers afford large quantities of honey of good quality.

PRODUCTION OF HONEY.

The production of honey, which is the most desirable, and at the same time the most remunerative product of the bee, should be the aim of every beekeeper; hence, to so manage the apiary that the largest possible yield of the precious nectar is obtained, and at the same time leave the stock in good condition at the close of the season, is the great desideratum in bee-keeping.

This result can be secured with the greatest certainty by making a small increase in the number of stock each year. This increase may be either by artificial colonization or natural swarming, as suits the owner's convenience. Thus, if a watch can be kept so as to secure the swarms when they issue, it is best to let them stand until they fill one set of boxes; (which a part of the stocks usually do before swarming, while others only partially fill them) these are then to be taken out, and if increase is preferred to honey, then form a colony as directed in Chap. XVII. Then after one interchange of combs between the colony and the parent hive, place other honey boxes in the chamber, to allow them to resume storing honey, which they do as soon as the main apartment of the hive is full, provided there is ample pasturage.

If only one swarm increase is wanted from a hive during a season, proceed as follows: on the fifth or sixth day after a swarm issues from a hive, open it and remove all the queen cells but one. A better plan, however, is to procure a fertile queen, (from a colony prepared for that purpose, as directed in Chap. XVII) and introduce her into the hive that has sent out the swarm; this may be done at any time within six days from the time the swarm leaves, at which time all the queen cells should be removed, if wanted for use. (If the queen cells are not removed, it is possible that the queen so introduced would lead another swarm.) This will effectually prevent after swarming, at least for fifty days thereafter.

But should an increase of two or more swarms or colonies be wanted, then on the fifth or sixth day as above, the combs and bees of the parent hive are to be equally divided, one part being placed in a new hive; see that each have one embryo queen; all others are to be removed, else when they emerge, there is danger of a swarm departing, although the hive be not half full of comb or bees. These divisions are to be managed as directed in the Chapter on Formation of Colonies.

There is no certain way to keep bees from swarming during the natural period thereof, but to divide them just previous to their swarming, and remove the supernumerary queen cells from the queenless division on the ninth or tenth day from the time of making the division.

Then, by making one interchange of comb on the fourteenth to the sixteenth day, by the time either hive would be full the propensity to swarm would be abated; honey boxes might then be put in with tolerable safety from further swarming, yet the chances to get the boxes filled would not be as good as at an earlier period.

The aim of every bee-keeper (who understands his business) will always be to keep his stock in such a shape that he can have his hives full and ready to store surplus honey at the commencement of a harvest of flowers that are known to bloom at a certain time. This object is to be accomplished by keeping the stocks strong; also by furnishing pasture, or feeding at a time when nature does not afford a sufficient supply.

I will here describe a peculiarity of the honey bee, or rather, a provision of nature to guard against over-population. This feature seems not to have been noticed by any previous author. Where bees are sparsely scattered over a country having abundant pasturage, the propensity to swarm is very great; so much so, that from three to four-fold increase per year can be counted on with tolerable certainty. (There are instances where more than twice this increase has been attained.) But as the same country becomes largely populated with bees, the number of swarms departing is gradually lessened, till finally there will not be more than enough to keep the numbers of the stock whole. When this point is attained, it is certain that the locality is fully stocked, and that an increase over that number can only be made with safety by increasing the pasture in an equal ratio, or by liberal feeding during such portions of the year as do not afford enough food for the stock.

Such feeding, however, can only be made profitable where a certain and sufficiently abundant pasturage can be depended on at a given time to ensure a large yield of surplus honey.

Hence it is apparent that a certain number of bees kept in a place will yield a profit to their owner; but go beyond that and it will require all the gatherings to sustain themselves. However, as there are no two seasons in succession alike in productiveness, it will readily occur to every thinking mind, that where a population of bees exists equal to the resources of the neighborhood for an ordinary season, a more productive one will increase the number of colonies, while a less productive one will again diminish them, unless special provisions are made for their subsistence.

A knowledge of the above facts will prove valuable to all persons interested in bee culture, showing as it does the impropriety of a rapid multiplication of colonies after a neighborhood has become sufficiently populated, but instead thereof to produce merchantable honey.

There are usually two short periods in each year, when flowers are so abundant and rich in honey that

PLATE XXX.

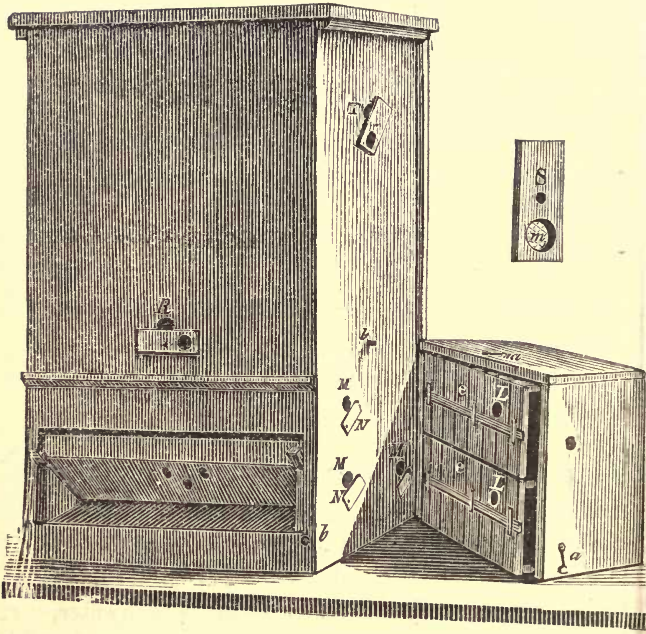

FIGURE 55.

bees are enabled to fill their storehouses in an incredibly short time. When this occurs in the spring or early part of summer, it is usual for them to swarm, unless there is an over-population as before shown.

There are always some hives, however, amongst all stocks, that have so many bees that all cannot enter the hive, but remain clustered on the outside, without sending out a single swarm during the whole season. Again; in many districts, bees are afforded a very abundant harvest of honey after the twentieth of July, yet it is but seldom that any swarm after that time, consequently some hives become excessively crowded and cluster on the outside of the hive in large masses; (this is sometimes the case when the hive is not entirely full, being occasioned by heat; to relieve them, more ventilation should be given and the hive well shaded) in which case, more room should be given to them in the following manner: First place suitable boxes for receiving surplus honey in the chamber made for that purpose; should these still not afford sufficient room for all the bees to enter, then add collateral boxes, as shown in plate XXX, fig. 55. *e e* are two boxes, same as used in the chamber with an aperture *L* one and one-half inches in diameter. In each, corresponding holes are made in the sides of the hive as shown at *M*; tin caps are attached as shown at *N*, for the purpose of keeping the holes closed while the boxes are removed; *O* is an outer case to cover the boxes *e e*, made twelve and one-half by twelve and one-half inches, in the clear, in height and depth, and six and one-half inches wide; this case is composed of four boards, leaving one side and the bottom open, the hive and stand serving instead. When in use the boxes, together with the case, are brought in contact with the hive and held in place by means of hooks and staples *b b*. If guide combs are attached in these boxes it will induce the bees to enter them more readily. As soon as the boxes in the chamber are full and the comb properly sealed over, they should be removed, and if any combs have been built in the collateral boxes, gently move them with their contents into the chamber and supply empty boxes in their stead. Although these side boxes may never be entirely filled while in that position, yet there is a gain if even partially so, as the bees complete them in a short time when placed in the chamber.

As soon as the bees cease to make comb or store honey in the side boxes, they should be removed to a dry and safe place till again wanted; otherwise, if they remain when not actually needed, they form a harbor for worms.

Various kinds of collateral boxes have been used by different bee-keepers at various times, occasionally with success, but oftener resulting in failure. Many people, for the want of the necessary knowledge of the habits of the bee, as well as the resources of pasturage at the different seasons, frequently defer supplying boxes till it is too late, or supply them to hives perhaps not half full either of comb or bees, and vainly expect to get them filled with delicious honey within a short time; failing in this, they are apt to attribute it to a wrong cause.

REQUISITES FOR OBTAINING HONEY.

There are three requisites necessary to obtain surplus honey; the first of which is, a hive with the main apartment full of comb, with the interspace full of bees; (*no danger of there being too many*) the second, abundant pasturage, and the third, favorable weather; with these three requisites, boxes for the reception of surplus honey may be added, with the assurance that they will be filled in due time. When full, the combs present an even surface, all the cells being sealed over with wax, and they are ready for removal.

HOW TO REMOVE BOXES WHEN FULL.

Open the hive and remove the glass frame and blow in a little smoke; then take a chisel or knife and loosen the boxes; after giving the bees four or five minutes to descend, take out the boxes, and as the bees emerge from them, brush them off at the entrance of the hive. Or the boxes may be set in a dark room, leaving one window open for the bees to fly out and return to their hive, which they will do after they have filled their sacs with honey. If there are many young bees in the boxes, they are apt to remain, as they do not know where to go, in which case they should be brushed out and returned to the hive.

In removing boxes filled in the early part of the season, they should be carefully examined, to ascertain if there is any brood in them;* this being frequently the case, particularly in boxes filled in small hives, or such as have the bees to enter the boxes near the center of the hive. If brood is found, either cut it out, or return the box until the brood emerges.

A sure preventive, is to have hives of a proper size, and only permit the bees to enter the boxes from the side spaces, away from the brood, in the main apartment.

The boxes of honey should be kept either with the top or bottom uppermost, so that the combs remain on their edges.

WHERE HONEY SHOULD BE KEPT.

As soon as all the bees are out, the boxes of honey should be placed in a dry room, from which the bees, as well other insects, are excluded; or they may be placed in pack-boxes, as hereafter directed, and kept in a dry place, (a cool one if possible) where it should remain, ready to transport to market at any time.

---

* It is seldom that any but drone brood is found in the top, or surplus boxes.

PACK-BOXES FOR CARRYING HONEY TO MARKET.

Pack-boxes, for carrying honey to market, should be made out of sound inch lumber, and of a size convenient for handling. One that will hold ten boxes of honey, (which is a suitable size for two persons to handle) should be thirteen and one-half inches square in the clear, and thirty-three inches long in the clear; a strip should be nailed on each side two-thirds of the distance from the bottom, and extending at either end to form handles to lift by.

HOW HONEY SHOULD BE PACKED.

The boxes of honey should be packed in the pack-box crosswise and with the bottom side uppermost; when full, they should be firmly wedged together, as it serves to prevent breakage; the lid should then be fastened and prominently marked: "THIS SIDE UP, WITH CARE;" and if kept so, will carry safely any desired distance; while if changed, with a different side up, the honey-combs are sure to be broken, which not only damages its appearance, but causes the honey to run out, resulting in great loss.

WORMS IN HONEY.

In the Atlantic States, it is a thing of common occurrence to find bee-worms in boxes of honey that are filled in the early part of the season. The eggs from which they hatch are evidently in the boxes at the time they are removed from the hive, being laid there by the miller herself, or accidentally carried there by the bees from some other place of deposit. Several days of warm weather must elapse, after the honey is removed from the hive, before the worms are hatched and sufficiently developed to be noticed. Mr. Quinby describes their progress as follows:

"In a few days, I could see at first a little white dust, like flour, on the sides of the combs, and on the bottom of the jar. As the worms grew larger, this dust was coarser. By looking closely at the combs, a small white thread-like line was first perceptible—enlarging as the worms progressed."

When combs are filled with honey, the worms go only on the surface; seldom penetrating to the center, unless they find an empty cell.

Disgusting as they seem to be, they dislike being daubed with honey. "*Wax, and not honey, is their food*," is the opinion that mostly prevails; yet, I believe that a portion of honey and also of pollen is consumed by the worms.

If the honey is left in the care of the bees, it is not disturbed by worms, while there is a numerous swarm to protect it; but if the hive once becomes weak, the *furniture* in it is usually soon eaten up by the worms.

TO PREVENT MOTH-EGGS IN HONEY FROM HATCHING.

The honey should be kept in a place where the temperature is permanently below sixty degrees; it must, however, be a dry one, as dampness injures the quality of the honey.

If a cool and dry place, in which to keep honey, cannot be had, the boxes should be taken (after the bees are all out of them) and closely covered over, and after one week elapses, they should be frequently examined, and if any worms are found, they should be removed without breaking the comb. This can easily be done in the section honey box; but if the ordinary boxes are used, the bottom of the box should be drawn, in order to remove the worms. Where the combs become much mutilated or soiled with honey, I have frequently put the box into a hive of bees, and let it remain for ten hours, and sometimes longer, to allow them to lick up the daubed honey; as soon as they do so, the box should be taken out, Mr. Quinby's "Method of Killing Worms in Boxes:" "Perhaps you may find one box in ten that will have no worms about it; others may contain from one to twenty, when they have been off a week or more.

"All the eggs should have a chance to hatch, which, in cool weather, may be three weeks. They should be watched, that no worms get large enough to injure the combs much, before they are destroyed.

"Get a close barrel or box, that will exclude the air as much as possible; in this put the boxes, with the holes in the bottom open; in one corner leave a place for a cup or dish of some kind to hold some sulphur matches, while burning. (They are made by

CHAPTER XII.

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CHAPTER XII.

POLLEN, OR BEE-BREAD.

"POLLEN is the fine fecundating dust or fine substance, like flour or meal, contained in the anther of flowers, which is dispersed on the stigma for impregnation."*

Bees collect large quantities of this substance and store it in their combs: to do this, they fly from flower to flower, gathering and forming the fine flour-like substance into two pellets in their fossæ (or basket) which is a slight indentation, surrounded by short hairs, on their hind legs. In doing this the particles are first gathered in their mandible and then slightly moistened and compressed; it is then taken in small particles with the fore feet and constantly passed back as gathered, and made to adhere in the fossæ till finally their load is completed, presenting the appearance as shown in plate I, fig. 9. They then return to their hives and either use it immediately or deposit it in their cells, each of which they only partly fill: much of it is suffered to remain unsealed

* N. Webster.

for immediate use, while a considerable portion is sealed over, after having each cell filled out with honey: it will then keep good for winter use, and frequently remains so for years.

This deposit is usually made in worker cells. It is true that bees sometimes are seen entering their hives, covered with the dust-like pollen of flowers without any pellets of the same, but they are invariably laden with honey, their excursion being only for the latter.

This dust is brushed off their bodies and is mostly found on the bottom of the hive, (if flat) where it serves as food for worms as well as a favorite lurking place for them.

A bee will confine itself to one kind of flower while collecting a load, either of honey or pollen; and if both are found in the same flower, they load partly with each.

The color of pollen is always the same in the same kind of flower, hence the load of a bee is of the same color as that from which it is gathered. And as flowers are found of every color, so we see the bees returning to their homes each laden with pollen of a different hue. Even the honey is tinged from the same cause.

USE OF POLLEN.

Pollen is used solely as food. In connection with honey, it is indispensable for the nutrition of the young. It is also consumed by the adult bees; yet they will survive through the winter without it, while if fed on it alone they soon die. The amount consumed by the bees of a single hive is very large, probably as high as thirty or forty pounds in a single year.

RYE MEAL AS A SUBSTITUTE.

"Though the importance of pollen has long been know, it is only of late that any attempts have been made to furnish a *substitute.* Dzierzon, early in the spring, observed his bees bringing rye meal to their hives from a neighboring mill, before they could procure any pollen from natural supplies. The hint was not lost; and it is now a common practice in Europe, where bee-keeping is extensively carried on, to supply the bees early in the season with this article. Shallow troughs are set in front of the apiaries, filled about two inches deep with *finely ground dry unbolted rye meal.* Thousands of bees, when the weather is favorable, resort eagerly to them, and, rolling themselves in the meal, return heavily laden to their hives. In fine, mild weather, they labor at this work with great industry, preferring the meal to the *old* pollen stored in their combs. They thus breed early, and rapidly recruit their numbers. The feeding is continued till the blossoms furnishing a preferable article they cease to carry off the meal. The average consumption of each colony is about two pounds."*

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* Langstroth.

I have fed my bees with rye meal and find it beneficial, particularly in a cold, backward spring. Some bee-keepers *find fault* that their bees store *too much pollen*; this I believe but seldom occurs, *at least, it never has with mine.*

BEES AID IN FERTILIZING PLANTS.

"The value of hymenopterous insects as agents in fertilizing plants, has many times been demonstrated by experiment. We recollect an instance of this, which transpired many years ago, so connected with pleasant associations that it made a striking impression. While on a journey from St. Petersburg to the transcaucasian provinces, in the month of February, 1825, we were obliged, on account of the intense cold, to stop in the government of Twer, on the estate of our friend Gregor Wasiliewitsch Lihatchef, colonel in the Imperial Gards-á-Cheval. There we were shown a very spacious hot-house, full of fine flowering plants; and also, among others, about fifteen cherry trees, covered with blossoms. We congratulated Lady Lihatchef upon the prospect of a large crop of fruit, when she informed us that her gardiner had never succeeded in raising more than one dish-full of fruit from all those trees. We assured her that if she would place in her green-house a few full bee-hives, there would be a charm about them that would insure her an abundant harvest of fruit. Two years afterward we visited that lady in

Moscow, on our return from the Caucasus, when she desired an explanation of the charm connected with the bee-hive; 'for,' said she, 'since they were placed in the hot-house, all the trees have produced fruit in abundance.' We then explained to her that the bees collect the pollen of the flowers, and, at the same time, bring this fertilizing farina of the stamens in contact with the germ, which then produces the fruit."*

"While the honey bee is regarded by the best informed horticulturists as a friend, a strong prejudice has been excited against it by many fruit-growers in this country; and in some communities, a man who keeps bees, is considered as bad a neighbor as one who allows his poultry to despoil the gardens of others. Even the warmest friends of the 'busy bee' may be heard lamenting its propensity to banquet on their beautiful peaches and pears, and choicest grapes."

BEES NOT INJURIOUS TO GRAPES.

"In conversation with a gentleman, I once assigned three reasons why the bees could not inflict any extensive injury upon his grapes. *First:* that as the Creator appears to have intended both the honey bee and fruit for the comfort of man, it was difficult to conceive that he would have made one the natural

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* *The Life of North American Insects*, by B. Jaeger.

enemy of the other. *Second:* that as the supplies of honey from the blossoms had entirely failed, the season (1854) being exceedingly dry, if the numerous colonies in his vicinity had been able to help themselves to his sound grapes, they would have entirely devoured the fruit of his vines. *Third:* that the jaws of the bee, being adapted chiefly to the manipulation of wax, were too feeble to enable them to puncture the skin of his most delicate grapes.

"In reply to these arguments, being invited to go to his vines, and see the depredators in the very act, the result justified my anticipations. Though many bees were seen banqueting on grapes, not one was doing any mischief to the *sound* fruit. Grapes which were bruised on the vines, or lying on the ground, and the moist stems from which grapes had recently been plucked, were covered with bees; while other bees were observed to alight upon bunches, which, when found by careful inspection to be sound, they left with evident disappointment.

"Wasps and hornets, which secrete no wax, being furnished with strong, saw-like jaws, for cutting the woody fiber with which they build their combs, can easily penetrate the skin of the toughest fruits: while the bees, therefore, appeared to be comparatively innocent, multitudes of these depredators were seen helping themselves to the best of the grapes. Occasionally a bee would presume to alight upon a bunch where one of these pests was operating for his own benefit, when the latter would turn and 'show fight,' much after the fashion of a snarling dog, molested by another of his species while daintily discussing his own private bone.

"After the mischief has been *begun* by other insects, or wherever a *crack* or a spot of *decay* is seen, the honey bee hastens to help itself, on the principle of 'gathering up the fragments, that nothing may be lost.' In this way, they undoubtedly do some mischief; but before war is declared against them, let every fruit-grower inquire if, on the whole, they are not far more useful than injurious. As bees carry on their bodies the pollen, or fertilizing substance, they aid most powerfully in the impregnation of plants, while prying into the blossoms in search of honey or bee-bread. In genial seasons, fruit will often set abundantly, even if no bees are kept in its vicinity; but many springs are so unpropitious, that often during the critical period of blossoming, the sun shines for only a few hours, so that those only can reasonably expect a remunerative crop whose trees are all murmuring with the pleasant hum of bees.

"A large fruit-grower told me that his cherries were a very uncertain crop, a cold north-east storm frequently prevailing when they were in blossom; he had noticed that if the sun shone only for a couple of hours, the bees secured him a crop.

"If the horticulturists who regard the bee as an enemy, could exterminate the race, they would act with as little wisdom as those who attempt to banish from their inhospitable premises every insectiverous bird, which helps itself to a small part of the abundance it has aided in producing. By making judicious efforts early in the spring to entrap the mother-wasps and hornets, which alone survive the winter, an effectual blow may be struck at some of the worst pests of the orchard and garden. In Europe, those engaged extensively in the cultivation of fruit, often pay a small sum in the spring for all wasps and hornets destroyed in their vicinity."*

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* Langstroth.

CHAPTER XIII.

PROPOLIS.

CHAPTER XIII.

PROPOLIS.

PROPOLIS is a resinous gum, gathered by the bees from the buds and leaves of trees and plants.

The principal time of gathering it is during the months of July, August and September.

It is used by the bees to plaster the inside walls of their habitation, and stop cracks or crevices in it which they cannot pass through; also, to coat over anything offensive which they cannot remove from their hive. Some authors assert that it is used to strengthen their combs; this is more fanciful than real; it is true, there are occasionally some combs found having it on them, but this is apparently accidental.

During some seasons there are large quantities of it gathered, while in others there is but little.

Its accumulation indicates a favorable season both for honey and swarms, as well as prosperity within the hive. In the spring of the year, bees will sometimes use for the same purpose grafting wax, varnish, and even white lead (if free from the spirits of turpentine) from partially dried work. The number found carrying these substitutes is, however, very small, yet enough to show that *even bees try experiments.*

CHAPTER XIV.

BEES-WAX.

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CHAPTER XIV.

BEES-WAX.

BEES-WAX is a solid, compact, unctuous substance, usually of a yellow color.

" Bees-wax may be said to be a concrete animal oil, holding the same relation to the fixed oils that resin does to the essential oils.

" Prime wax is of a bright yellow color, and an agreeable odor," which is most perceptible on burning a portion of it. The best is procured from new combs that have never been used for breeding purposes.

Another test by which to judge the quality of wax " is to pass the thumb nail forcibly over its surface; if good, the nail will pass with a kind of jerk; but if no obstruction be felt, the wax may be looked upon as adulterated with suet or some similar substance.

" White wax is nothing more than the yellow wax that has been exposed in thin flakes or shreds to the action of the sun and air. There is an apparatus for melting and reducing the wax into shreds or ribbons, but the process of conversion under any circumstances is tedious and dependent on the weather. "The following" says Mr. Parks, in his Chemical Essays, "is the usual process as it is conducted in England. Common bees-wax is melted upon hot water; and when in a fluid state it is laded out of the copper, together with a part of the water, into a wooden vessel, and in this it is allowed to remain a few hours for the impurities to subside from it. The purified wax is then put, while still hot, into a colander full of holes, through which it runs and falls upon a revolving metallic roller, which dips into cold water contained in a vessel placed underneath. As the melted wax runs through the colander upon the revolving roller, the motion of the cylinder forms it into thin shavings, which cool as they come in contact with the water, and in an accumulated heap into the water below. These shavings of wax being now in a suitable form for absorbing oxygen, are taken out of the tub and exposed in a field to the action of the atmosphere, till they become sufficiently white."

USES OF WAX.

"In some countries, bees-wax is very extensively employed in religious ceremonies of the inhabitants." It is also much used in the arts. To the nurseryman and orchardist it is invaluable.

"The use of wax in making candles, ointments, etc., is well known. The house-wives of this and other countries employ it to prevent bed ticks from losing their feathers; they spread the ticking on a table and well rub its inner surface with a lump of wax; to spread it equally, and to cause it to enter into the tissue of the fabric, it is polished by a vigorous friction with a ball of solid glass or the bottom of a bottle.

According to Buffon, the bees-wax of tropical climates is too soft for any but medicinal purposes. Bevan gives the following

ANALYSIS OF WAX.

Carbon	81,79.
Oxygen	5,54.
Hydrogen	12,67.

HOW WAX IS OBTAINED.

The bees-wax of commerce is obtained by melting such combs as are only fit for that purpose. This is done after the honey has been drained from them; the usual method is as follows:

Have ready a vessel of a size suited to the quantity of comb to be rendered; place it over a slow fire; fill it about one-third full of water; as soon as it reaches the boiling point, drop in the combs and press them down, and as they melt, stir the mass till it is thoroughly melted; a follower, to fit inside of the boiling vessel, is made by fastening a wire screen to a ring or hoop; this is to be placed on the top of the melted combs and heavily weighted down, causing the wax to rise to the top, while the offal is pressed to the bottom. A tub or other vessel, half full of clear, cold water, is to be ready, into which the wax is to be removed with a dipper, as it rises through the follower. Add more water from time to time, and continue to boil and stir, and lade out the wax as long as any rises. The debris in the vessel may then be thrown away as useless.

Remelt the wax, adding water as at first. Have at hand a deep dish, pan, or other vessel; grease the bottom and sides, to cause the cake to part freely when cold.

Strain the wax through a fine wire screen or coarse open cloth, into the receiving vessels, and then set them away till cold. When taken out, it is fit for market.

A press, suited to the purpose of rendering wax, might be made, so as to save time and labor.

QUANTITY OBTAINED FROM A HIVE.

The quantity of wax obtained from different hives varies; a fair average, however, is about two and a half pounds to a hive containing two thousand and two hundred cubic inches in the clear.

WAX AN ARTICLE OF COMMERCE.

"Bees-wax forms a considerable article of commerce.

"The principal supplies are derived from the Baltic, the Levant, the Barbary coast, and North America.

"Humboldt informs us that upwards of eighty thousand pounds' worth is annually imported from Cuba to New Spain, and that the total export from that island in 1803, was worth upwards of one hundred and thirty thousand pounds. Upon this subject, an English writer, after lamenting the increasing neglect of bee culture in that country, says: 'There is hardly bees-wax enough produced in England to answer the demand for lip salve alone; but importations from America supply all our wants.'

"The demand for bees-wax has been constantly increasing, while the supply has been decreasing—the result is, that prices have advanced, with no prospect that there will ever be an over supply of that article."

CHAPTER XV.

SWARMING.

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CHAPTER XV.

SWARMING.

"THE cause or causes which determine the issue of a swarm seem to be enveloped in obscurity; probably there are none which can be said to determine the point absolutely. The crowded state of the hives in hot weather has been generally considered as sufficient to account for the issue of swarms; but on the one hand bees, as is well known, will cluster out sometimes for weeks during the height of summer without swarming at all; and on the other hand, affording room in whatever direction will not certainly prevent an issue, neither will it always encourage comb-building. This latter will depend upon the productiveness of the gathering season; for, if the hive contain a sufficiency of cells for the reception of eggs, and the prospect of the honey harvest is not such as will require additional store-houses, no fresh combs will in all probability be constructed. Looking at these two well-known facts, viz: the uncertain result of clustering, as well as of affording room, I was led to think, in common with some of my apiarian friends, that some preliminary steps were adopted by the bees in contemplation of swarming, which determined the point so absolutely that no after proceeding on the part of the proprietor could arrest its progress; that if this step were not taken, neither a crowded population nor a high temperature would induce a swarm to issue; and that if it were taken, no accommodation in point of room would prevent it. This theory, which, had it been correct, would probably have led to important practical results, must however be abandoned, for subsequent reflection and experience have shown that it is not well founded."

The experience of Bevan, which is that of every practical *bee-keeper*, very forcibly illustrates the uncertainty attending natural swarming. The following experiments will in some measure solve the mystery and illustrate the principle.

Take a number of acorns, and plant some in soil having all the elements necessary to induce germination, except that of water; let others be planted with this element added, but at an undue depth; this would partially deprive them of air and heat; others again are planted at midsummer, in conditions that would seem to insure their growing, except that it is out of season; while others are planted so that they have the combined advantages of season, soil and location; the result is that only the latter planting grow, showing clearly that all things are governed by natural laws, which cannot be violated without failure. Swarming is the result of natural laws, but it only occurs with a favorable combination of those laws.

The question might here be asked: Is not the system of dividing bees a departure? We answer that the transferring of a *tree* is a departure from those laws, but it is done successfully if nature's laws are properly observed; so with that of dividing a family of bees.

CONDITIONS REQUISITE TO SWARMING.

When the hive is full of comb, with a large proportion of it full of brood, and all the spaces within the hive crowded with bees, if the pasturage is abundant and drones have made their appearance, swarms may be expected at almost any time. (I have in a few instances known them to swarm when their hive was not over half full of comb and bees in proportion.) These, however, are exceptions to the general rule. During the summer of 1858, I had two swarms issue under the above circumstances, out of one hundred hives; but in 1859, out of four hundred colonies formed, not a single swarm issued in the natural way, either from full or partly filled hives.

NATURAL PERIOD OF SWARMING.

The natural period of commencing to swarm in this vicinity, (Sacramento) is from the first to the twentieth of April; but in some very favorable localities they will occasionally swarm earlier. First swarms usually send one or more swarms during the same season, and instances have occurred where still another generation has appeared.

The main swarming season usually terminates by the 20th of July,* but where late pasture abounds, it sometimes continues later.

SIGNS PRECEDING FIRST-SWARMING.

For some days before the time of swarming, the bees may be seen clustering at the entrance of their hive mornings and evenings, at first in small numbers, and finally in large clusters.† A swarm may now be expected at any time, except in the months of July and August, when it is usual for them to

*The swarming is mostly over by the 10th of June, except swarms from swarms. As there occurs a scarcity of pasture from this time till the second week in July, few, if any, swarms will issue. About the middle of July, the young swarms are in condition to swarm, and if any old hives intend to do so at a second period, it may now be expected.

†This clustering preparatory to swarming is mainly for the purpose of secretion of wax, of which large quantities are immediately required to construct combs as soon as the bees become located in their new habitation.

If, during the natural period of swarming, any hive that is crowded with bees is observed to remain clustered in a quiet manner, with but few going forth to labor, while those of other hives are working and storing honey diligently, it is an indication that it is preparing to swarm, and may be expected to do so at any time.

cluster on the outside of the hive during the very warm weather, yet it does not indicate swarming.

SIGNS OF AFTER-SWARMING.

There is but one sign or indication of after-swarming that proves true in a majority of cases, and that is "piping." On the seventh or eighth day after the first has departed, on applying the ear to the hive, the piping of a young queen is heard, resembling the sound of the words *pea-pe-pe-pe*, spoken in succession in a pitiful manner: sometimes two, or even three may be heard at a time. When this piping is heard, it is usual for a hive to swarm in from one to three days.

PREPARATIONS FOR HIVING.

Hives should always be in readiness and at hand during the swarming season. Care should be taken to have them clean and free from any offensive smell which may exist when they have stood for any length of time unoccupied; this is best done by scalding them effectually, which will not only purify, but will also destroy all insects and eggs which may exist in their interior.

A stool about two feet square, and fifteen inches high, is the most convenient thing to place the hive upon while gathering the swarm into it; in the absence of which, a broad board or a sheet spread upon the ground, will answer a very good purpose.

A light box or basket should be in readiness, to brush the bees into when removing the swarm from the place of clustering to the hive.

Have also a wing, as the most suitable thing for brushing the bees, either from the tree or to cause them to enter the hive.

A pail of water should also be at hand to sprinkle them with, to facilitate their entering the hive and prevent the issuing of any other swarms while disposing of the first.

DESCRIPTION OF A SWARM.

For some time previous to the departure of a swarm, the bees cease their labors in a great measure; but few are seen to leave the hive, and they, after flying for a few seconds, return again, doubtless to give intelligence to the organizing swarm that the day is fine, and that they can depart in safety. The bees that are clustered on the outside, remain tranquil, while within an unusual movement is perceptible; the sound is changed from a steady roar, as of a distant water-fall, to a sharp and shrill tone; the movements within become more rapid, till finally a rush is made from the entrance. THE BEES ARE SWARMING! Mounting on the wing, each bee describes a circle, and circle redoubled on circle, they spread, until many thousands are seen in the air. This they continue from five to fifteen minutes, till finally they collect together and alight in a cluster, usually on the

PLATE XXXI.

FIGURE 56.

branch of a tree. (See plate XXXI, fig. 56.) They remain thus in a body for about one or two hours, during which time only a few bees are seen to depart; these probably go to seek out a residence for the swarm in the forest; soon after the scouts return, whether successful in their search or not, the swarm leaves, in a direct line. They doubtless alight repeatedly until a home is found. Thus, long distances are frequently traversed by a swarm before a permanent location is made.

Not unfrequently swarms, after issuing and flying for a few minutes, and sometimes even clustering on a tree, suddenly return to the parent hive; the cause of which is, that the queen has either not left the hive with the swarm, or after she has left, finds herslf unable to continue her flight and sinks to the earth, and is lost. In the former case, the swarm again issues within one or two days after its return; but in the latter, not till the ninth day, and is then accompanied by a young, unfertile queen; it being the one that would have accompanied an after swarm. (This applies only to first swarms.)

In all cases where a returned swarm is delayed nine days, as above, an after swarm usually issues about the third day after the former has finally left.

HIVING OF SWARMS.

As soon as the swarm is all out of the parent hive, open it and take out one of the side combs, containing honey; brush off the bees, and place it in the empty hive that is to receive the swarm, (this will prevent their leaving) occupying the same position in the new hive that it did in the old one; then arrange the hive, with the frames all in place and the honey-board on, to prevent the bees ascending; raise the front slide two inches and open the upper entrance, to allow ample room for the bees to enter; the stool should be set as near the place of alighting as convenient, and the hive, as prepared, set on it;—all is now ready to hive the swarm. The preparations should be made, as much as possible, beforehand. It is well to sprinkle a little cold water on the cluster, after a part of the swarm alights, as it serves to tame the bees and prevents the tendency to fly away. The branch that they cluster on may be cut off, and, with its burthen, laid at the entrance of the hive; or, if they are on a valuable tree, from which it is undesirable to cut a limb, take a shallow, light box or basket, and either shake or brush the bees from the limb into it, and pour them out at the entrance of the hive; (this is done when only a small part of the bees have alighted) most of them will again take wing. Repeat this shaking two or three times, or until many bees are found in the hive and on the stool in front of it. The tree or branch that they alight on is kept shaking, and a smoke is made, or a cloth saturated with turpentine (wormwood or other bitter herbs have the same effect) is put where the bees are reälighting; this drives them away, and they then enter the hive. The bees that collect on the stool and sides of the hive should be disturbed by brushing or sprinkling water upon them, to facilitate their entering. By following the preceding directions, most of the swarm is caused to alight and enter the hive at once; so that all are fairly within by the time they would have settled on the tree, thus saving fully one-half the time usually spent to accomplish the object. Should the swarm choose a place to alight inconvenient of access, such as a high tree, then resort must be had either to ascending, and cutting off and lowering the limb to an assistant, or to the use of a box, and light poles of suitable length, on which to attach it to be elevated; then, with a hook shake off the bees within the box, and lower them, and hive as before. A net might be constructed to answer the same purpose.

When the principal part of the bees have entered, the front slide is to be lowered, leaving half an inch space, and the upper aperture left partly open. There will be but few bees flying, none having left the hive as yet; soon, however, numbers of them commence leaving, and after circling around, for the purpose of marking the location of their *new home*, depart to the fields to labor.

WHEN TO REMOVE THE SWARM TO THE STAND.

As soon as the swarm is hived, and before the bees commence work, they should be removed to the stand where they are to remain; any bees that are left flying, will return to the parent hive—so that there are none lost. When the swarm is left till night, as is generally the case, on the following day hundreds of bees will be seen hovering around where they had been hived, and had marked their new home, as completely as if they had never known any other.

The previous directions, if promptly followed, will enable the bee-keeper to complete the operation and have the hive on the stand within thirty minutes from the time the swarm begins to issue.

A swarm managed in this way, will seldom leave for the woods; not having received the report of the "*committee on location*," they have no desire for a change.

REGULATE THE NUMBER OF SWARMS.

If only one swarm in a season is wanted from a hive, it is to be opened on the fifth or sixth day after sending forth the swarm, and all the queen cells removed except one. Immediately after a second swarm departs, all the queen cells but one can be destroyed, to prevent a third. The one left in either case is to supply the parent hive.

AFTER-MANAGEMENT.

In sixteen days from the first swarm leaving, exchange the combs from which the brood has emerged in the parent hive, for new combs from the first swarm, leaving all the bees in their respective hives.

The advantages gained are as follows: the old hive has a young queen that will not be fertile for eight days, and as most of the brood have emerged by this time, the combs remain empty during that period, and much of it frequently for weeks, if the bees have swarmed off bare.

Forty days will elapse before there is any considerable accession of numbers, as the product of the young queen. This gives the moths a chance to gain a firm foothold, if not prevented by the above change or other special care. The first swarm, having the old queen, the newly built combs are supplied with eggs as fast as built, and by the sixteenth day, there is considerable sealed brood. Two or three combs of the most advanced being given to the old hive, soon add to their numbers; (these new combs *must* be handled carefully, as the least jar or turn from a perpendicular position will loosen them from their fastenings) the empty combs, being placed in the hive having the fertile queen, are soon replenished with eggs, which in due time become bees—so that both hives are benefitted by the interchange of comb.

A further gain is had from this practice: the bees are healthier, and winter better on old comb than they do on new. I will again repeat the admonition not to place more brood in a hive than there are bees to cover it, so as to prevent a chill.

PERIODS, CAUSE AND REMEDY OF DESERTING.

There are periods when swarms have a propensity to desert their hives, even after they have built some comb; they also desert habitations of their own choice in like manner; these periods occur but seldom, perhaps only once in two or three years, and only last for one, two or three days; the cause is altogether unknown; no writer that I have consulted has even noticed the fact. One of these periods occurred about the first of July, 1851. I was attending an apiary containing upwards of eighty hives; during the week, the number of swarms per day was from two to four; all were secured, and apparently did well until Saturday morning, about half past seven o'clock, a swarm that had been hived on Tuesday left their hive with the apparent determination to go to the woods. With the aid of an assistant, I succeeded, after much difficulty, in compelling them to alight, and finally rehived them, when they were restored to their stand. The indications were favorable for a number of swarms; during the day, pails of water were kept standing as was our practice, for the purpose of forcing hives to defer swarming when two or more attempted to do so at the same time. A short time after the capture of the fugitive swarm as above stated, another one, hived on the same day as the first deserter, commenced to leave in the same manner; by the aid of water, and closing the hive for a time, they were prevented from leaving. Six different swarms, hived that week, attempted to leave in like manner. I was then entirely unable to discover the cause or a remedy. The following finally occurred to my mind, and was applied promptly: Most of the hives that had sent off swarms had the top boxes full of honey, or nearly so, while there were but few bees in them. I gave one of these boxes to each of the discontented swarms, and drove a portion of the bees upward into it; after which but one of them made the attempt to leave, and that had probably failed to discover the stores given them. There was no more trouble; most of the bee-keepers in that section of the country lost more or less swarms on that and the following day. The cause I now believe was a sudden failure in the secretion of honey in the flowers, as there were but few more swarms that season. Information of the above remedy was given to neighboring bee-keepers, and it has been the means of saving large numbers of swarms,* as in no instance has the remedy been known to fail.

SWARMS FLY WESTWARD.

In the middle and western States, (and doubtless elsewhere) very nearly all the swarms seen departing for the woods fly in a westerly direction; this

*Since the above discovery was made known, most of the bee-keepers in that neighborhood (Lawrence County, Pennsylvania) practice supplying boxes or frames of honey to each swarm when hived, particularly if the weather is warm and dry.

thirty-eight swarms, in the year 1838, only one came out without being caught in the basket."*

The above plan having but lately been brought to my notice, I have not had a chance to try it. I believe, however, that it can be made to answer the following valuable purposes:

FIRST. The arresting and hiving of swarms with but little trouble, or danger of their departing for the *forest*.

SECOND. As the swarms are not permitted to take wing, there is no danger of two or more uniting, as is frequently the case when a number of hives exist in the same apiary.

With the above purposes in view, I have constructed what I shall call a *swarm net*, which is more simple and easier of management than the *swarm basket*, but on the same principle.

SWARM NET.

Plate XXXII, fig. 57, represents a side view of a *swarm net*, as affixed to a hive supposed to be swarming.

a is the net, made of white mosquito bar, or other thin, open fabric, sufficiently close in the mesh to retain the bees, yet not to exclude the light.

The dimensions of the net are, six feet long and fifteen inches in diameter; (the size can be varied

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*From the "*Newest Illustrated Bee Friend*, by Professor Morris Beyer, and J. F. O. Kuehnor." Published in Leipzig, Germany, 1852.

PLATE XXXII.

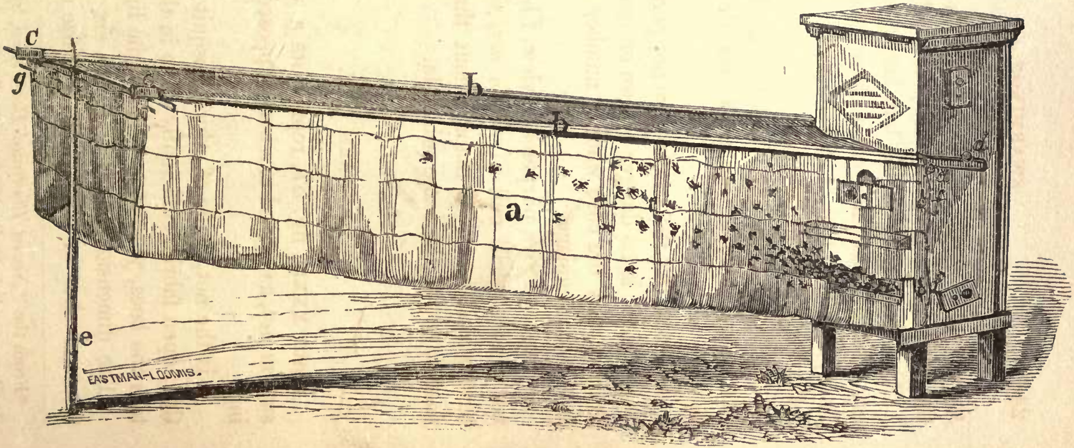

FIGURE 57.

PLATE XXXIII.

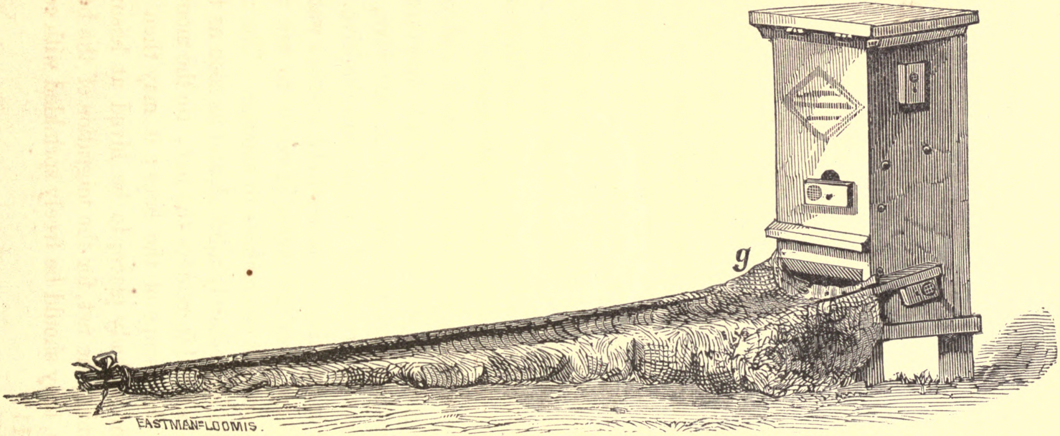

FIGURE 58.

to suit the fancy of the user) *b b* are sockets, made of cotton cloth; *c c* are sticks, seven feet long, inserted through the sockets, and extending on either side of the hive, and for the purpose of retaining the net in position; *d d* are screws (two seen and two not seen) for the ends of the sticks to rest on; *e*, a stick driven into the ground, with a cross piece on the top, to support the outer end of the net.

The mouth of the net embraces the entrance passages of the hive, and is temporarily fastened by means of buttons *f f*, whereby the bees are compelled to enter the net; *g* is an aperture in the outer end of the net, and is to be kept closed while the swarm is being caught and confined, and opened to let them out for hiving, as shown in plate XXXIII, fig. 58, which represents a hive with the slide temporarily removed, to afford the bees free entrance.

The net containing the swarm, is placed with one end on the ground, and the other (with aperture *g* open) resting against the entrance of the hive, to allow the bees to run out of the net into the hive.

In order to use the *net* successfully, a strict watch should be kept over the bees, in order to see the swarm as soon as it commences to emerge. The net is then to be immediately applied, and as soon as the swarm has entered it, remove the net; tie the mouth, to prevent the escape of the bees; it may then be set away in a shady place, to be hived at leisure. Before opening the net, for the migration of the bees to the hive, they should be freely sprinkled with cold water, which renders them more docile and less likely to take wing when set at liberty.

Mr. Quinby says that a Mr. Laucks, of Herkimer county, New York, contrived and used a swarm catcher, which, from the description given, is very similar to the swarm basket of Von Esapo.

"He (Mr. Laucks) has half a dozen of them, and says he would not do without them for one season, for fifty dollars." Mr. Quinby constructed one on the same plan, and says that, in the few trials he has given it, he succeeded without difficulty.

CHAPTER XVI.

FORCED SWARMING.

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When Successful....................................254

CHAPTER XVI.

FORCED SWARMING.*

FORCED swarming is the driving out of a large proportion of the bees from the mother hive into an empty one, and allowing them to fill it with new comb.

HOW EFFECTED.

The driving is done by inverting the old hive and setting an empty one, of the same size, on the top of it (as inverted); the lower hive is then to be jarred by striking the sides rapidly with light sticks for ten or fifteen minutes, which causes the bees to ascend into the top box, or hive. When enough to compose the swarm are out of the old hive, it should be placed on the original stand for a few minutes, to allow the bees that have returned from the fields to enter it; it is then to be placed on a distant stand, and the hive containing the forced swarm placed where the old one stood; they are then given their liberty, and are expected to quickly fill the new habitation, into which they are thus driven.

* The plan of forcing swarms was probably first practiced by the German apiarists, and has long been known.

WHEN SUCCESSFUL.

If this forcing operation is performed when the hive is about to swarm, it will generally succeed; for, at this time, a large proportion of the brood is sealed up; the hive being also well stored with provisions, leaves but little work to be done until the young queen enters upon her duties. By that time, all the brood (progeny of the previous queen) will have emerged, and will be of age to assume the duties of nurses, etc., of the young progeny. The bees composing the forced swarm being removed at this time, will be well provided with wax, and if pasturage is abundant, will thrive equally as well as a natural swarm.

But where a forced swarm is made from a hive not prepared to swarm, and having much unsealed brood, the success will be very uncertain, both as regards the old hive and driven swarm; for the young larvæ receive, as soon as hatched, a minute supply of food, and as they grow, the quantity is increased so as to exactly supply their wants.

This food is prepared by the nurses, and supplied at short intervals until they are sealed. But if this supply is interrupted, even for a short time, the young will die from starvation; or if left without the influence of the hovering bees, they are very liable to perish from exposure.

A further objection to this plan is the interruption and derangement of the division of labor.

There is always a limited number of bees secreting wax in every hive when breeding, at any season of the year; (see Note on Signs, etc., Chapter xv) and as the demand for wax with which to seal over the brood increases, so too the supply is increased; but as it requires the consumption of a large amount of honey to produce it, only an amount exactly corresponding to their immediate wants is ever produced. As soon, however, as a surplus of honey is afforded by the flowers, there is a greatly increased demand for wax, with which to repair their honey receptacles, seal them over when full, and construct new ones. Consequently, increased numbers of bees devote themselves to its production; but, as it requires probably from three to six days (instead of twenty-four hours, as is generally alleged) after a bee commences to feed, for the purpose of secreting wax, that period must elapse without an adequate supply.

Now, if a swarm is driven when only enough wax is being produced to seal the brood, the producers, remaining quiet within the hive, will most likely be driven out with the swarm; thus leaving the parent hive without an adequate supply at a time when their wants are most pressing.

It is true that the driven swarm needs all the wax, and more too, but cannot produce it in sufficient quantities to meet their wants until a certain period of time elapses, and then only by having an abundance of food; consequently, they either work to great disadvantage, or remain comparatively idle during that time; which frequently discourages, and causes them to entirely abandon their hive.

By observing to have the bees in the proper condition for forcing swarms, as heretofore shown, it can be practiced with considerable advantage; but I would not recommend its general use; *but in its stead, the formation of colonies, as directed in the following chapter.*

CHAPTER XVII.

COLONIZING.

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Time for Colonizing 260
Primary Division 262
Queen Nursery 264
Formation of Colonies 267
After-Management 271

CHAPTER XVII.

COLONIZING.

Colonizing, or propagating bees by dividing or removing a part of the contents of one hive and placing them in another, (known as the dividing or nuclei system) has long been known, and to some extent practiced, both in Europe and the United States. But owing to the bad success attendant on the practice, its use has in most cases been abandoned, and forced swarming substituted in its stead.

This has been the result of a want of information, there being no well defined instruction given in any of the works on bees with which I am acquainted, either how the thing should be done, or the results of the different modes of management. This indicates that it has not been well understood, even by professional apiarists.

In this fast age, when men need but to be sure that a certain thing has been successfully done, before they rush into it, without stopping to inquire how it is done, it is not strange that failure, general failure is the result. This fact has been amply illustrated in every department of business in California, as well as elsewhere.

If the bee-keeper, or person who proposes to become such, will first study the habits and wants of the bee—in short, commence the business as an apprentice should that of any trade or profession, determining to understand it—to such I would recommend the gradual adoption of the system of colonizing in combination with natural swarming, as laid down in this work.

HIVES FOR COLONIZING.

Frame Hives being the most suitable for the purpose of colonizing, the directions here given refer to their use; yet the *Queen Nursery* can be formed and used in any style of hive with profit.

TIME FOR COLONIZING.

The proper time to commence colonizing is from one to two weeks earlier than natural swarms leave the parent hive, and to continue two months.* This

* This is as late as it is safe to form them, unless there is abundant pasturage, or feeding is resorted to, in which case colonies may be formed to do well as late as the middle of July; also, the number of colonies that should be made from a hive depends almost entirely on the amount and continuance of pasturage. For, while in one place an increase of one or two colonies is all that can be made, there are others where from five to eight can be made, and all do well.

depends on the season, and varies in different localities; the nearest approximation to the time would be from eight to ten weeks from the time that they commence to carry in pollen from the willows and other sources of early pasturage, or as soon as drones make their appearance in considerable numbers. In Sacramento and vicinity they commence to carry in pollen about the first of February; and the first swarms for the past three years have emerged from the first to the fifteenth of April. In Oregon and Washington Territory, the commencement of the swarming season is probably from three to six weeks later, while in the latitude of Los Angeles, California, it is from two to four weeks earlier.

Suppose the owner of five hives of bees finds, on the twenty-second day of March, that his bees are becoming crowded in the hives, and from the favorableness of the season, believes they would swarm early in the following month. Then let him proceed to make a primary divide,* and form a queen nursery in the queenless division.

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* One primary divide with queen nursery formed, can be depended on to supply from four to eight embryo queens. I have had as high as fourteen in one section, and frequently nine to eleven, and as high as twenty in a hive. The number depends mainly on the proper arrangement of the comb, the age of the eggs and larvæ, as well as a numerous family of bees and abundant pasturage.

PRIMARY DIVISION.

For this purpose, choose one of the hives that is strong and likely to have the most brood. There should be at least five sheets of comb containing brood in the hive selected for this purpose.

If the hives used have their frames suspended from rabbets at the top, as the Langstroth hive, then remove the cap, also the honey boxes and honey-board. If the frames are glued fast with propolis, they are to be pried loose, and moved each a little towards one side, in order to make room for taking out the first frame. But if the frames are inserted from the side and held adjusted by means of tenons and grooves, as the California hive, open the door and lid, remove the honey boxes, chamber floor, (honey-board) and glass frame. The operator should now stand with his left side close to the hive. The front tenons of four frames are first to be raised out of the grooves in the front board; then move three of them further from the side one, to give space for it to be removed first. Then with the left hand take hold of the corner of the frame resting against the front board, and with the right hand the outer corner. Now raise the left hand, carrying the frame upwards and outwards, moving on the fulcrum, until free from its rest in the sill. The movements should be slow and gentle, yet no time should be unnecessarily wasted. Now place this frame in an empty hive ready at hand, then take hold of the second frame in the same manner as before described, and turn the comb with the left hand sufficiently to keep it from rubbing the bees and adjacent comb, then by the upward and outward movement it is freed from its rest (without jar) the same as the first one. As many others as are necessary are removed in the same manner, part being placed in the hive with the previous one, and the others are to be stepped over into the vacancies first formed.

As each comb is removed, it should be examined to find the queen; if not found by looking them once over, spread a sheet on the ground and take the combs one by one, and with a quick motion shake the bees on it. (In handling combs, care should be taken to keep them with one edge upright to prevent breaking.) The queen will most likely be found in the cluster on the sheet; sometimes she crawls off the combs and is found on the inside of the hive.* When found, place her in the new hive; then examine the combs, choose one-half of the most mature brood combs and place them in the hive with the queen.

---

* Sometimes it is difficult or requires too much time to find the queen among so large a mass of bees as should occupy a hive suitable for a primary division, in which case divide the combs so that about half of the brood as well as half of the bees are given to each hive. (Regard should also be had to a division of stores.) However, before adjusting the combs to their places, sections of combs should be arranged in each hive, as directed in page 264. This is necessary, as it is not known which hive the queen is in. The one she is in will not build any queen cells, while the other one will. Hence, on opening either hive after three days have elapsed, her whereabouts is readily determined.

One sheet of comb containing stores should be placed first at the side, and the brood placed compactly adjoining. The empty frames are added, and the hive is ready to receive its share of the bees.

The other half of the brood combs, in which are principally eggs and young larvæ, together with the remainder of the store combs, are to occupy the original hive after the vertical queen nursery is formed, as follows.

QUEEN NURSERY.

Take a comb newly built* and choose that portion of it in which eggs and a small portion of newly hatched larvæ are found, and with a knife cut out from the central portion of one or two sections, as shown in plate XXXIV, fig. 59.

h is one of the sections which is cut three inches long and seven-eighths of an inch deep. The ends

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* As it is sometimes difficult to find a newly built comb sufficiently large for turning the section in the same, it answers equally well to cut the apertures in old comb and insert sections of new built comb containing eggs taken from any other hive. In the spring of the year it would be necessary, in order to get new comb, to remove a sheet of the old, or a portion thereof, from the center of the hive, about ten days before making the primary division; this would give the bees room to build, which they would do, provided they were strong and the pasturage good. The reason why new comb is best for rearing queens in is, the absence of cocoons, on which account the bees build a much larger number than they do when compelled to use the cells containing cocoons. Eggs laid by a queen one year old are better for rearing queens from than those laid by one bred the same year.

PLATE XXXIV.

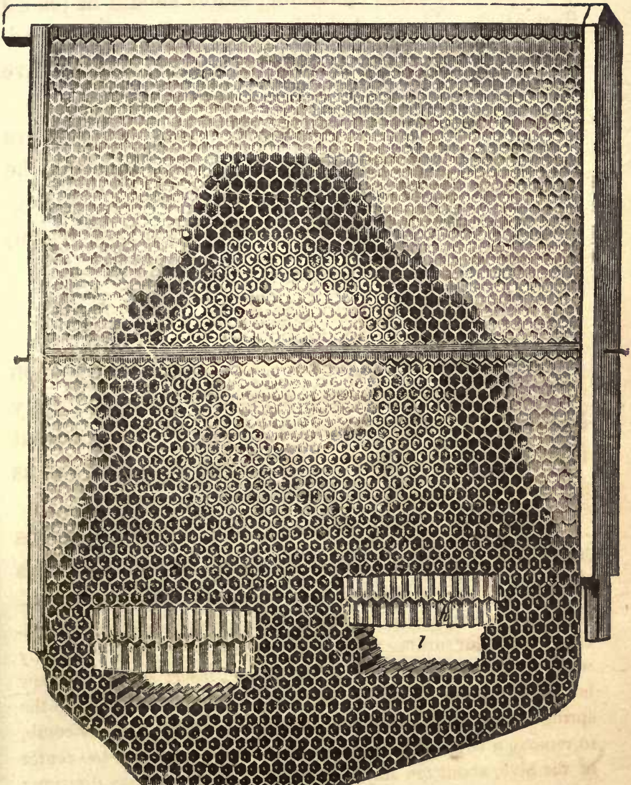

FIGURE 59.

are cut square; then, three-eighths of an inch from either end, cut down three-fourths of an inch, and take out the piece, leaving a shoulder three-eighths broad on either end for the section or nursery to rest upon. This being placed with the mouths of the cells downwards or vertically, as shown in the figure, leaving a space, as shown at *i*, which gives room for developing queens in a perfectly straight and natural position, two combs should be so prepared; then a store comb is first placed at one side of the hive and the combs, prepared as above, placed next to it, and the balance of the brood, and then the store combs next to these, in a compact manner; an empty frame is added, and the whole covered with a cloth which reaches over the top and down the sides to the bottom board.

The bees are now to be equally divided between the two hives, and the glass frame and honey-board put to their place, and the hives closed up and the apertures arranged for the egress and ingress of the bees. The hives are then to be placed within a few inches of each other; the one on the right and the other on the left of where the original one stood.

This primary divide is best performed in the evening, about one hour before sundown, yet it will do at any time of day. They should be watched for the first few hours that they fly, to see that a proper proportion of them enters each hive. If more are found to enter one than the other, move the one that most enter further away, and the other nearer to the

12

place where the original hive stood; if this still does not effect the object, close the entrance of the strong one for about two hours, and force the remaining bees to enter the weak one. When the apertures are again opened, a board or cloth may be placed so as to change the appearance of the one receiving more than its share of bees.

The bees now finding themselves without a queen, but in possession of the means to rear young ones, quickly commence to enlarge and build downwards a number of the cells containing eggs; at the same time, the young larvæ are supplied with a quantity of whitish matter, called royal jelly, which is of a slightly acid, pungent taste, and is different from the food on which the common brood are fed. These royal cells will be sealed, a part of them on the sixth, and the balance on the seventh day from the time of forming the nursery. When the cells are finished, they present the appearance shown in plate XXXV, fig. 60; *j*, queen cells, and *k*, worker brood emerging.

The queen cells are straight and occupying a pendent position, the queens are larger and more perfectly developed, and a greater number are reared by this method than when the bees are left to rear them, as shown in plate XXXVI, fig. 61; *s* represents queen cells being built outwards and downwards, so that the queens grow in a curved position; this being an unnatural shape, the queen is not as large or well developed as when raised in straight cells, as previously shown.

PLATE XXXV.

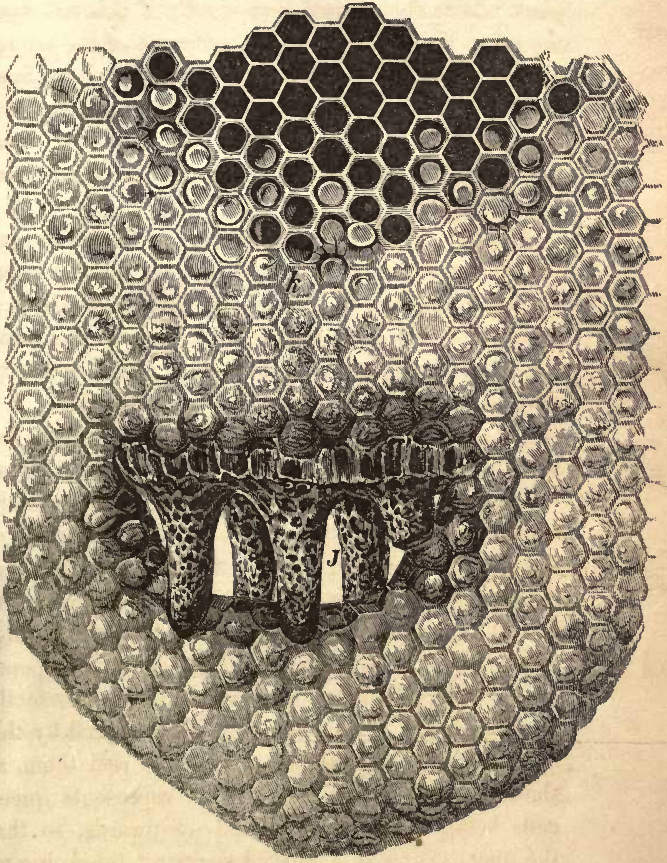

FIGURE 60.

PLATE XXXVI.

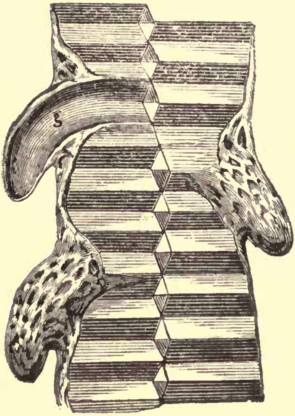

FIGURE 61.

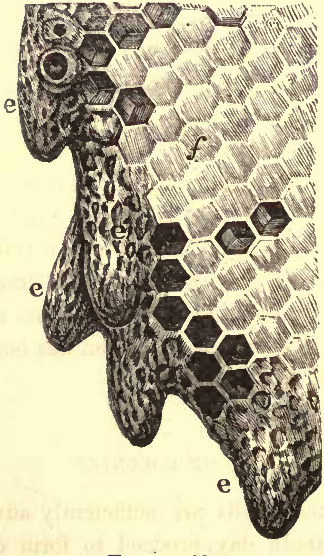

FIGURE 62.

When queen cells are built on the edge of a comb, as shown in fig. 62, they frequently suffer from cold, which retards, and in many cases entirely destroys them. This danger is avoided by the vertical nursery being arranged so that it occupies the center of the cluster of the bees, by which means a chill is avoided.

The bees seldom, if ever, remove an egg from one cell to another for the purpose of development; hence it is obvious that they are seldom in a position suitable for straight cells, unless so arranged by the bee-keeper. This plan is also found to produce more and as perfectly developed queens as if raised to supply natural swarms.

Date the hive containing the queen nursery with the day it was formed, in a conspicuous manner, and in ten days from this time the most advanced of the embryo queens are sufficiently mature to be used in colonies then to be formed, or given to hives supposed to be queenless. The less advanced ones can be used on the eleventh day. But it is not safe to let them remain for a longer period, as the first queen out destroys the remaining ones. See plate XXXVII, fig. 63; *n*, cell from whence a queen has emerged; *o*, cells destroyed by her.

FORMATION OF COLONIES.

When the queen cells are sufficiently advanced, which is on the tenth day, proceed to form colonies as follows:

First select a full and strong hive, having a large amount of brood in all stages, from which to take a colony. Open the hive thus selected, and remove the combs in the same manner as directed for the primary division.

We will suppose the frames numbered from one to nine, inclusive. An empty hive being ready at hand in which to form the colony,* proceed to take out the frames from the full hive, commencing at No. 1; being found full of stores, it is to be placed on the top of the remaining frames, or otherwise disposed of. No. 2, being also found full of stores, is to be placed in the empty hive. No. 3, or any other comb found to contain a large amount of mature brood, should be chosen and placed in the hive along with No. 2. No. 4 should contain eggs and brood in all stages.

A queen cell (fig. 64) having been taken from the nursery, make an aperture with a knife in the center of comb No. 4, and insert the queen cell. See plate XXXVIII, fig. 65, which represents a section of the comb together with the queen cell, after having remained in the colony two days. At M is seen the foundation of a new queen cell containing larvæ.

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*The hives should be cool at the time the colonies are placed in them, and particular care taken to shield them from the rays of the sun until they have their liberty. In fact, the sun should be excluded from the hives entirely, when the temperature is above seventy-five degrees. In early spring and at times when a low temperature prevails, it is best to let the sun shine directly on the hives, which will give greater vitality and assist in developing the brood.

PLATE XXXVII.

FIGURE 63.

FIGURE 64.

PLATE XXXVIII.

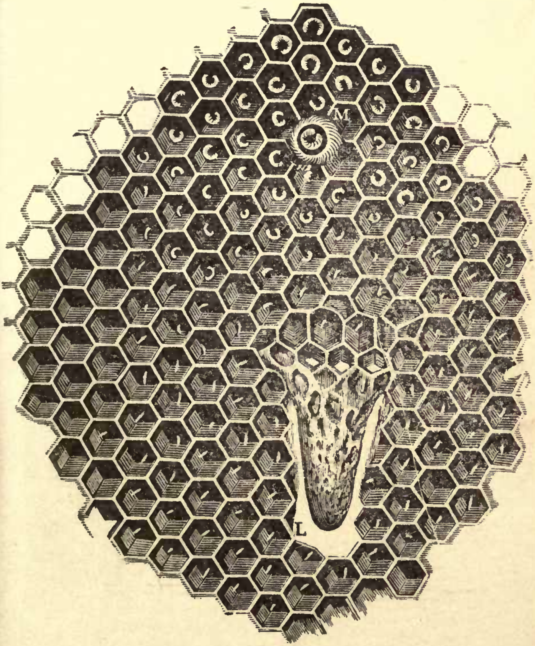

FIGURE 65.

PLATE XXXIX.

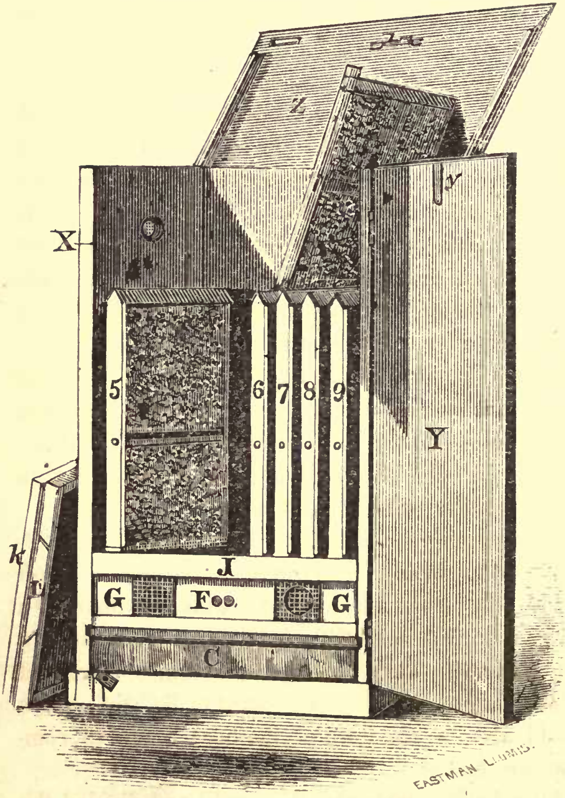

FIGURE 66.

The bees, on finding themselves queenless, and not content with one chance, almost invariably commence the construction of one or more additional cells, and rearing of young in them, and continue to nourish and protect them until the emerging of the supplied embryo queen; and in case the latter fails, then the new-built cell may be relied on to produce a queen.

Care should be taken in handling queen cells not to jar or dent them; also, not to expose them to cold, and they should be so arranged as not to come in contact with the adjoining comb.

Let the bees remain clustered on the combs, but if they are in the way of inserting the queen cell, brush them gently with a quill out of the way. Watch carefully for the queen, and if found, return her to the hive whence she was taken.

In arranging the combs in the new hive, the following order should be observed: first place No. 3 at one side of the hive, No. 4 containing the queen cell next to No. 3, No. 2 next to No. 4, and add an empty frame. There being three combs taken out of the parent hive, (plate XXXIX, fig. 66) there should also be one-third of the bees taken to compose the colony.

After having arranged the combs and divided the bees as above, the colony is to be covered with a cloth, as represented in plate XL, fig. 67. The hive should then be closed, and the apertures shut, to prevent the escape of the bees. The ventilators are then opened and the hive set in a cool and shaded place till evening, when it is to be moved to a distance of one mile or more, when the apertures for the bees' entrance are to be opened, giving them their liberty.

The *vacancy in the old hive* is filled with empty frames and then closed up, except the place for egress. If it is intended that the colony shall remain in the apiary where formed, instead of removing it to a distance, it is to be formed the same as above, except that both combs should contain mature brood instead of eggs and larvæ; the queen cell should be inserted in the center of the comb where a portion of the brood have emerged, as shown in plate XLI, fig. 68. The young bees are also to be separated from the old ones.* This is done by shaking them from the combs on a sheet; the old ones take wing and return to the parent hive, while the young ones remain on the sheet. One-third of the bees should remain, and be put in the new hive having the combs as previously arranged; before putting the bees in the hive, they are to be examined to find if the queen is among them, and if found, return her to the hive from which she was taken.

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*During the season of rapid breeding, which is in the spring and early summer, bees that are in a thrifty condition and have a fertile queen, usually occupy a large proportion of their combs with a generation of brood of nearly the same age. Hence, when they emerge, the hive is in a fit condition to form colonies from as above; while if delayed a few days later, these young bees will have marked the position of their home; consequently, if they are afterwards taken to form colonies, and left in the same apiary, they will, upon taking wing, return to the familiar spot.

PLATE XL.

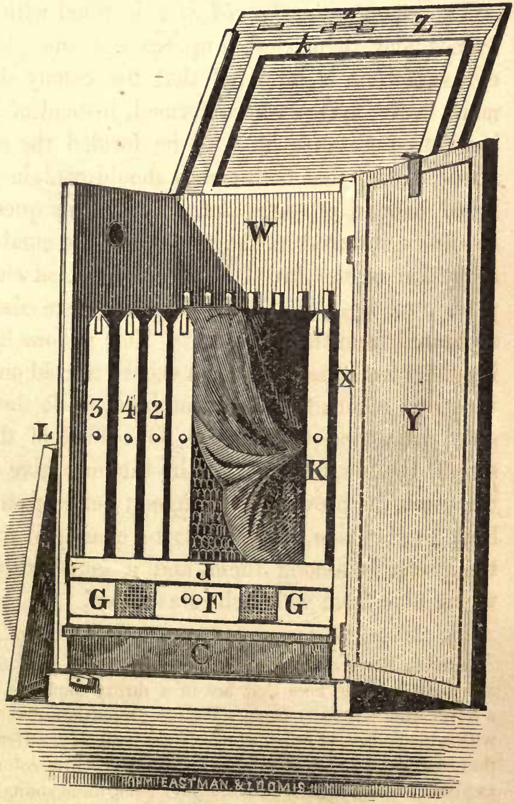

FIGURE 67.

PLATE XLI.

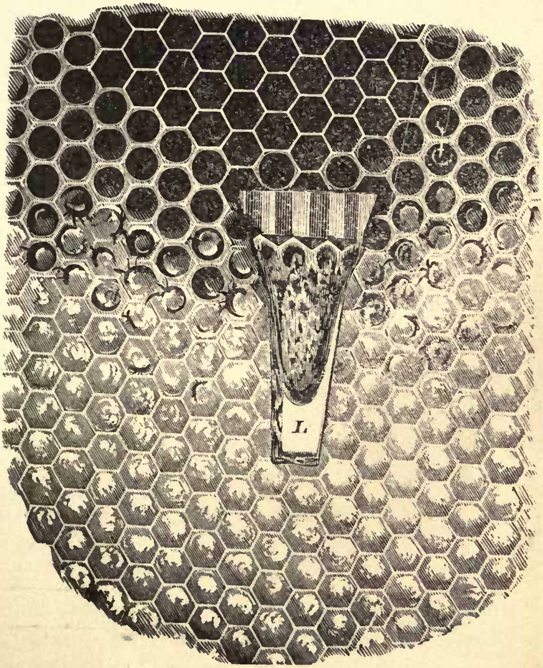

FIGURE 68.

AFTER-MANAGEMENT.

The hive containing the colony is then to be closed up, and with the ventilators open, set in a cool place as above directed. As soon as it is dark it should be set on the stand, and the apertures opened for the working of the bees. Do not open the door or remove the frames for the first six days, for if done, many of the bees will take wing and return to the parent hive. By this time the queen and most of the brood have emerged from the cells. The hive is then to be opened and all the bees are to be shaken or brushed from the two brood combs, which are now nearly empty. If many bees are found, proceed as follows: open any strong hive and choose two or three combs (according to the strength of the colony they are to be placed in) having eggs and young brood. All the bees are to be gently brushed from the combs with a wing or quill. Then after one comb containing ample stores is placed in one side of the hive containing the colony, the former are to be placed adjoining with two empty frames added, and the whole covered with a cloth and the hive closed, except the apertures for egress and ingress.

The two combs taken from the colony are put in the hive in exchange for the brood combs removed.*

*The objects of interchanging combs are 1st, to strengthen the colony. 2d. If the embryo queen supplied has failed to emerge, or is afterwards lost, it gives the bees the means of rearing another. 3d. The combs which would otherwise remain empty for a period of ten days, are immediately replenished with eggs, making a dif-

But if the colony is found to be weak, choose two combs with mature brood instead of eggs and young brood. From six to ten days after this last change, the colony will be found to have a fertile queen,† or if the first embryo queen has failed, sealed queens will be found in the combs. If found to have a fertile queen, the organization is complete, and all that is wanted afterwards is to add empty frames or suitable combs, and see that the combs are built straight.

Colonies formed and left in the same apiary do not work much for the first week; this is owing to the fact that the bees are too young to go forth to labor in the fields. As there is but little labor to be performed in the hive, all that is wanted is to maintain the animal heat to develop the brood. On the sixth day, when the combs are exchanged as directed, they will have commenced work. Receiving young brood at this time stimulates them, and gives them profitable employment. And having a young queen, before they commence comb building, (which they do about this time) they build worker cells, most of which are supplied with eggs as soon as the queen becomes fertile.

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ference of half a generation's increase. And still another advantage gained by interchanging, is the keeping the bees in the colony as profitably employed in maturing the brood as if they were in possession of a fertile queen.

†Twenty-three days (counting from the time the egg is laid) is the shortest time, and thirty is the extreme limit for a queen to become fertile.

The hive containing the *queen nursery*, having a large amount of mature workers, will build drone comb during the time they are queenless; but as soon as a queen emerges they change and build worker comb, at which time the drone comb should be removed. But the hive having the old queen continue their labors with increased vigor, and fill up the vacancy mostly with worker comb, using it both for breeding and laying up stores.

The advantages *gained by moving* colonies to a distance as previously directed, are these:

FIRST. It saves time to the bee-keeper, there being no need of separating the young bees from the old, being moved such a distance as to prevent their returning to the parent hive, which many of them do when left in the same apiary.

SECOND. The colonies can be placed some distance apart, obviating the danger of the young queen entering the wrong hive, as is frequently the case when packed closely on the stands. When the queens become fertile, these colonies may be returned to the original apiary, and placed in compact order without serious disadvantage. When formed as described above, it is safe to remove colonies a distance of from one to ten miles in a spring wagon, if deferred until the cool of the evening or morning.

The hive containing the *queen nursery*, having a large amount of bees, is suitable to divide on the tenth day from its formation. The combs from which the brood has emerged should be changed for combs having young brood. But no more should be placed in any hive than there are bees to cover, so as to prevent a chill. Divide equally, giving a royal cell to each. The hives are to be properly arranged, to allow egress and ingress, and placed near each other, one on the right and the other on the left of the original position; these subdivisions are to be treated in the same manner as directed for other colonies.

All colonies *having young queens* about to emerge and standing in the immediate vicinity of other hives, should be conspicuously marked, to enable the young queen to regain her own home on returning from her ærial amorous excursions. This takes place within from seven to ten days from her birth. The marking is best done by placing a board, one end resting on the place of alighting and the other on the ground in a slanting position. When a number of colonies are to be thus marked, let the boards be of different colors. Cloth can be used to good advantage to alternate.

As soon *as the queens are fertile*, let these marks be removed; this will show at a glance if any remain unfruitful.

To build up weak colonies at any time, take a sheet of mature brood from any hive that is full, and give to them; being sure to have all hives full of comb and stores at the close of the season.

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CHAPTER XVIII.

COMB.

"THE combs of a bee-hive," says Bevan, "comprise a congeries of hexagonal cells, formed by the bees as a receptacle for honey or embryo bees. A honey-comb is allowed to be one of the most striking achievements of insect industry, and an admirable specimen of insect architecture. It has attracted the admiration of the contemplative philosopher in all ages, and awakened speculation not only in the naturalist, but also in the mathematician; so regular, so perfect is the structure of the cells, that it satisfies every condition of a refined problem in geometry.

"*Each comb in a hive is composed of two cells, backed against each other; these cells*, looking at them as a whole, may be said to *have one common base*, though no one cell is opposed directly to another. This base, or partition between the double row of cells, is so disposed as to form a pyramidal cavity at the bottom of each cell, as will be explained presently. *The mouths of the cells*, thus ranged on each side of a comb, *open into two parallel streets;* (there being a continued series of combs in every well filled hive) these streets are sufficiently contracted to avoid waste of room and to preserve a proper warmth, yet *wide enough* to allow the passage of two bees back to back."

The width of the streets is greater adjacent to the brood combs than to the store, being almost half an inch between the former, while less than a third between the latter; the bees are thereby enabled to hover their brood, as well as to cluster together in sufficient masses to keep themselves warm during the cold weather; besides having access to their stores at all times.

"There are only three possible figures of the cells," says Dr. Reid, "which can make them all equal and similar, without any useless interstices. These are the equilateral triangle, the square, and the regular hexagon. It is well known to mathematicians that there is not a fourth way possible, in which a plane may be cut into little spaces that shall be equal, similar and regular, without leaving any interstices. Of these three geometrical figures, the hexagon most completely unites the prime requisites for insect architecture. The truth of this proposition was perceived by Pappus, an eminent Greek philosopher and mathematician, who lived at Alexandria, in the reign of Theodosius the Great, and its adoption by bees in the construction of honey-combs was noticed by that ancient geometrician. These requisites are:

"First. Economy of material. There are no useless partitions in a honey comb; each of the six lateral panels of one cell forms, also, one of the panels of an adjoining cell ; and of the three rhombs which form the pyramidal base of a cell, each contributes one-third towards the formation of the bases of three opposing cells, the bottom or center of every cell resting against the point of union of three panels, that are at the back of it.

"SECOND. Economy of room ; no interstices being left between adjoining cells.

"THIRD. The greatest possible capacity or internal space, consistent with the two former desiderata.

"FOURTH. Economy of material and economy of room, produce economy of labor. And in addition to these advantages, the cells are constructed in the strongest manner possible, considering the quantity of material employed. Both the sides and bases are so exquisitely thin, that it has been calculated that three or four, placed on each other, are not thicker than a leaf of common writing paper ; each cell separately weak, is strengthened by its coincidence with other cells."

The wax of which the combs are constructed is elaborated by the worker bee. (See Chapter III.)

COMBS SHOULD BE BUILT STRAIGHT.

Whenever bees are building comb, it is important to notice, at short intervals, whether they are making it straight. If found to deviate, proceed as follows: If slight, take a knife with a broad blade, and press the edge of the comb to the proper place, commencing at the end furthest advanced, and pressing each towards it, so that the centers of the comb correspond with the center of the frame; this can usually be done by taking out the sash and honey-board. When the object cannot be accomplished fully in this way, lift out the frames, and after straightening each comb, place a store comb at the opposite side, and then place the newly built ones next; this places the projections in contact, one against another, which will cause the bees to cut away passages, and thus make even comb. If the new comb contains brood, as well as the old, then they may be alternated; but if the new comb contains honey only, then alternate with sealed honey comb. Care must always be taken to keep the brood compact, unless the amount of bees is large; in which case, one or two empty frames may alternate. Store combs and drone combs should be moved to the sides. In changing the combs, it is desirable to present a straight surface—a sealed one to be preferred; the new one, being built parallel to it, will be straight. If the space in the hive is such that the combs are again made to diverge, then place them to the opposite side, as before. A little timely attention to this particular will ensure combs sufficiently straight for all practical purposes.*

* Some bee-keepers recommend what they erroneously call "comb guides." (A comb guide proper is a sharp edge or corner in the frame, from which the comb is to depend, the bees usually choosing to follow this edge, rather than diverge to an even

CONDITION OF THE COMB IMPORTANT.

Comb is the honey bee's *furniture*, and like all else that is perishable, will endure a longer or shorter period in proportion to the care taken of it. If kept in good condition, the bees will inhabit the same comb and continue prosperous for ten or more years. I have known them to do well for fifteen years, and instances are recorded of still greater duration.

Exposing a hive of bees to extreme heat or excessive dampness, whether in a cellar or other moist room, or in a shady place near the earth, not only injures the comb, but (as it is elsewhere shown) seriously affects the health of the bees.

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surface; portions of comb are sometimes used for the same purpose.) These so-called comb guides are sheets of zinc or thin boards, and placed so that they intervene between the combs; in this way, very straight, regular combs are made. Yet the *economical bee-keeper* cannot afford to use them, for the following reasons (besides it is a very unworkmanlike way of doing): The space between two combs is three-eighths of an inch; (if brood, honey is less,) if these so-called comb guides (which should be of wood) are used, two spaces will be necessary; together with the thickness of guide, one-eighth, will make seven-eighths of an inch, in place of three-eighths inches, between combs. The proper thickness of a comb and one space is one and seven-sixteenths inches; add to this one-half inch space and wood, and we have one and fifteen-sixteenths, over one-fourth of which is worse than useless room. For bees, in building comb, require the temperature in the hive to be ninety-four degrees, or nearly blood heat. To maintain this, requires great exertion of the bees during the cool nights, and not unfrequently during the day; hence, it is obvious that a swarm cannot do this without a much greater consumption of stores, and even then it is impossible to cover the useless space and make as great progress as when no obstacle intervenes.

This will be understood by observing the effect upon them.

The temperature steadily maintained in the midst of the cluster of bees during the season of active breeding is 94° Fahr., even though the outside temperature is below freezing point. But when the outside temperature is raised above 94°, (which is frequently done by reflection when the main temperature would not range above 75°) the bees arrange themselves in such numbers and manner, that by standing and vibrating their wings incessantly (these ventilators, as they may be called, are doubtless relieved by relays) a current of cool air is driven into the hive while the heated air is forced out. Thus a lower temperature is maintained within the hive than prevails outside. They however, if unable to keep the temperature at a sufficiently low point, leave the interior and cluster on the outside, seeking to get in the shade, not many remaining inside, except those engaged as ventilators; thus by instinct and devoted labor, they save their combs and treasures from impending danger.

Not unfrequently, however, their efforts are unavailing; the combs become so nearly melted, that they part, of their own weight, and sink down a perfect ruin, involving the lives of the queen and many bees.

More frequently, however, only a partial melt takes place, which occurs in the comb used for breeding, as it contains cocoons left by the young bees, which are retentive of heat, and the wax composing the central foundation or bottom of opposite cells is thereby partially melted. This extends slightly outwards to the waxen walls of the cells. The comb, however, retains its shape, being held together by the lining membranes as well as the remaining sound walls near either surface of the comb.

The lives of the young brood are placed in jeopardy; some are destroyed, while others, being of a different age, survive, although the wax is disintegrated in a slight degree. I apprehend, however, that the insensible respiration of the young bee penetrates the cocoon, and in combination with the heat, causes it to separate from the wax, and a partial decomposition to take place. This, however, is arrested as soon as the young bees emerge, by the moisture evaporating.

Notwithstanding the permanent damage thus sustained, the bees continue to use the same comb repeatedly, perhaps for years, particularly if freed from a repetition of injury; decomposition having once been started, although again arrested, will set in on the return of the exciting cause, although that cause is slight.

Let the hive that has sustained damage, as above, be placed in winter quarters, which may be either a room containing large numbers of hives, or a cellar with either few or many. Also, if placed in a position that is shaded, if dampness is found to collect upon or within the hive, the combs of which have been subject to partial melt, decomposition again takes place, and the combs are soon rotten; this is known by mold collecting. On examining them, they are found to pulverize easily, even when warm; the bees avoid it as long as there is other room in which to build comb and store honey.

It matters not at what age the combs are, when thus damaged; if bad, they are practically worthless.

Bees should not be located where excessive dust is blown to the entrance, as the bees in passing in carry it, and incorporate it with the comb.

HOW TO DETECT HALF-MELT AND COMB ROT.

This can be done by the smell. On opening the hive that is affected, a disagreeable odor will be perceived, resembling slightly that of carrion. The extent of the damage may be judged by the intensity of the smell; this can only be discovered at a time when there is empty comb in the hive, as the smell disappears after the bees refill their hive, but to reappear the next spring. It can also be detected if bad, by breaking the comb; the waxen walls are partly melted, but the lining cocoons retain it in shape. Comb, when good, has a slightly sharp and pungent smell, which is agreeable.

A hive so affected will frequently live three or four years without swarming, but appearing strong in numbers. If the season be a good one, they may make a small amount of spare honey, but soon they dwindle away, till all disappear.

DAMAGED COMBS TO BE REMOVED.

When the damage is but slight, the affected portions of the comb should be pruned out so as to allow the bees to build new ones. But if bad, then transfer the bees into a new hive, and supply them with sound combs taken from other hives. For directions, see Chapter on Transferring.

CHAPTER XIX.

TRANSFERRING.

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stores collected before the flowers fail; hence, starvation and a total loss are sure to follow.

A hive suited to the purpose of transferring bees has been the desideratum heretofore wanting. This want is fully supplied in the California hive.

By means of the adjustable comb frame, the center bar of which is movable up or down, combs or parts of combs of any desired size, together with their contents, consisting of brood and stores, can be fitted in and firmly held in the frames by means of the metallic clamps. These clamps are easily prepared and applied, and are not offensive to the bees. As they are smooth and only grasp the comb by the edge, they cause but a slight loss of the young brood, as compared with the plan of "tying the comb in the frame with twine or tape." As the material used in tying must necessarily pass over the surface of the brood, the bees will cut out and remove all the young under it, causing a considerable loss. Nothing is more annoying to them than such appendages, which in many instances are the cause of their deserting the hive. When they remain, they cut out and remove the wrapping with great labor and difficulty; this the *humane bee keeper* will avoid, at least as a matter of economy.

It is a positive rule that bees should be transferred only when there is good pasturage, that will last at least one month afterwards. All the suitable comb and stores are to be given to them as hereafter directed.

SEASON FOR TRANSFERRING.

The most suitable season for transferring is in the spring, when pasturage first becomes plenty, say about the time that peach trees come into blow. Hives rich in stores and strong in numbers may be changed one or two weeks earlier with safety, by giving them a large supply of honey.

In the Sacramento, and other valleys having the same resources, the best time is from the 20th of February to the 20th of July, though it *may* be performed with safety one month later; but I do not recommend it unless skill and care are exercised. In localities where the pasture fails in June, transferring ought not to be attempted later than the 1st of May.

PREPARATIONS.

A hive, to receive the transfer, should have the frames provided with the metallic clamps: a box six inches deep, and of a size to fit on the mouth of the hive that the bees are to be driven from, is also necessary. (If the box is simply a square, with a movable cover, it is more convenient for dislodging the bees.)

Tools suited to remove the sides of the old hive, and a table or work bench should be at hand; also, a wide dish to receive the honey, and a long-bladed knife to cut out the combs; a roll of cotton cloth for smoking the bees, a wing or quill for brushing, and water for sprinkling them and washing hands, are the preparations required.

TIME OF DAY.

The time of day best suited to this purpose is late in the afternoon, or by candle-light. By commencing about one hour before sundown, the operation can be completed before dark. By transferring late in the day or evening, robbers are not so apt to be attracted by the broken honey, which is of great importance, for when they once get a start it is difficult to stop their depredations. It also gives the bees time to reörganize, and clean up the honey that is smeared over the combs before the following day.

TEMPERATURE.

When the brood is to be handled in the open air, the temperature should be mild.

PLACE.

If the operation is performed by day, the bees are driven out in a box and left on the stand where the hive stood. The combs, as they are taken out and freed from bees, should be taken into a room where the temperature is sufficiently warm to prevent a chill of the brood. Placing the combs and honey in a room also precludes the attraction of robbers. When the combs have been arranged as hereafter described, the hive containing them and the bees is set in the same place that the original hive occupied, and the bees hived as a natural swarm.

PLATE XLII.

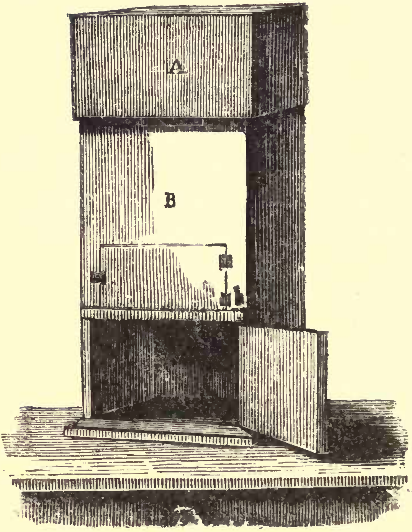

FIGURE 69.

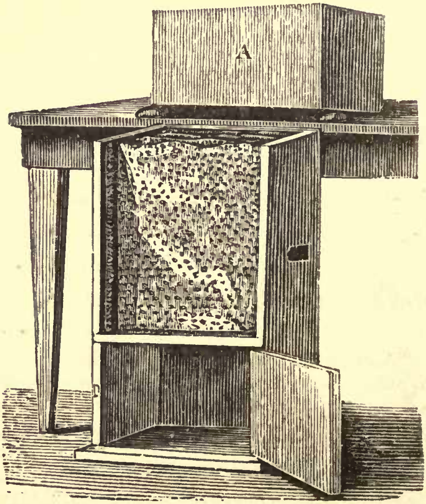

FIGURE 70.

When the operation is performed at night, the bees may be driven and managed in the same manner as by daylight, or all may be taken into a shop or cellar, out of the wind, where all the appliances are at hand.

HOW DONE.

If the bees are flying, commence by blowing smoke into the entrance, or elevate the hive and sprinkle the bees with pure cold water, and jar the hive for ten or fifteen minutes; this will prevent the bees that are in the hive from leaving it, and give them time to fill themselves, and those that are out, time to return. The hive is then to be inverted, as represented in plate XLII, fig. 69. B is the hive, and A is the empty box set on the mouth of the hive for the reception of the bees that are now compelled to ascend. A cloth may be fastened around the joint to prevent the escape of the bees.* Now with a couple of light sticks commence striking the sides of the hive smartly and regularly, which is to be continued for about fifteen minutes. If there are any openings in what was the top of the hive, but as it now stands, the bottom, blow in smoke to accelerate their movements.

At the end of the above time, lift the box which now contains a part of the bees, and without turning

*A gum-elastic band three inches wide, and of a suitable length to reach around the mouth of the box, will answer the two-fold purpose of holding the box firmly on the inverted hive, and preventing the escape of bees.

or jarring it, place it on a table as represented in fig. 70. A is the box and C is the table; one side of the box is raised to admit the bees freely. Then with a hammer and chisel remove one side of the hive, to give easy access to the comb. The hive is to be placed with one side against and even with the table, so that the remaining bees can crawl into the box as they are driven from the hive, which is done by smoking or brushing them with a wing or quill. Then with a thin-bladed knife cut out the comb, and gently brush all adhering bees from each piece on the table, and see that they enter the box with the others. The first comb taken out usually contains stores, and should be laid on the table as represented in plate XLIII, fig. 71. D, the comb; frame K, laid on as a measure to cut it by, so as to fit the frame as represented in fig. 72, which is prepared with metallic clamps to secure the comb in the frame, and is held upright by being stepped in a sill or block prepared for the purpose. When the comb is fitted and fastened, the frame containing it is placed in a hive ready to receive it; beginning at one side, each comb is removed in the same manner. Each piece should be examined and the part containing the brood should have the preference. Having cut and fitted in the frames with as little loss as possible, the frames, when filled, should be placed in the new hive in such a manner that the brood is in a compact form. When the brood is all disposed of, fill the remaining frames with comb containing stores.

PLATE XLIII.

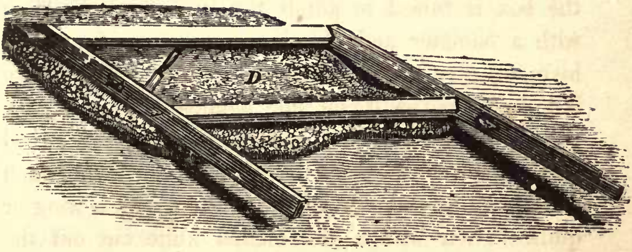

FIGURE 71.

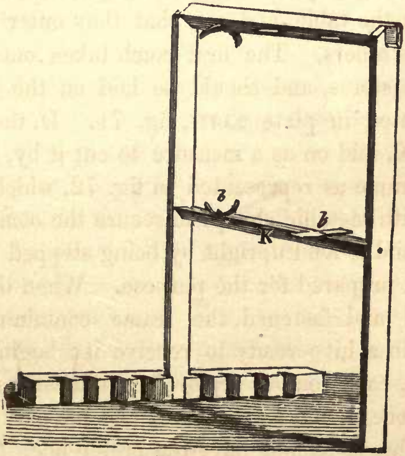

FIGURE 72.

If there is more comb than fills the upper section of the frames, a second cross bar may be put in, so that there will be two portions of comb in the same frame. When all is complete, the glass frame and the honey-board are put in their places and the door closed; the front slide is taken out, and if any honey has run from the combs, clean it out before commencing to hive the bees. A broad board is placed on a level with the entrance, and the bees are to be shaken out of the box on it and compelled to enter. When all are in, arrange the entrance so that the bees can pass out and in freely.

After all the frames are in their places, close the door and leave the lid open; then hold the box containing the bees closely over the hive, and by a sudden jar they will fall directly on top of the frames, whence they are easily compelled to go below, by brushing them with a quill or wing, or by sprinkling or smoking them. When this is effected, open the door and adjust the honey-board so as to prevent the bees reäscending. When the hive is properly arranged and set on the original stand, the apertures are to be opened for the working of the bees. As soon as they have repaired and fastened the combs, which will be done in two or three days, commence to give them the remainder of the honey. This may be done by placing a portion of the comb under the cluster of bees, or in the chamber. When the honey is taken from this comb, let it be removed and more given, until the hive is well provisioned.

CHAPTER XX.

FEEDING.

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CHAPTER XX.

FEEDING.

FEEDING bees becomes necessary when they are in danger of dying, or swarming out for want of food. Feeding may also be made to pay a fair profit for the outlay, provided it is done in season; the object to be gained in this case is to have the bees strong at the commencement of a harvest season, either from flowers or other sources. But if feeding is resorted to for the purpose of having dissolved sugar or inferior honey stored as an article for market, it will prove a loss, directly or indirectly, to the person feeding and a *swindle* on the *purchaser*, as the material fed to them undergoes no material change except to receive a portion of musk imparted by the bees, and to become condensed by evaporation.

WHEN TO FEED.

Feeding may be commenced as early as February, if the weather is warm and the bees are flying frequently. But if cool, defer it, as feeding at such times frequently causes dysentery; consequently, it is better to supply hives that are short of provisions by taking combs having stores from other hives and placing the empty combs in their stead. This plan of equalizing will benefit both hives, if properly done.

There are times in March, April and May, when bees gather but little honey and need to be fed. They can gather pollen in abundance at such times. And when supplied with sweets, they work with renewed energy.

As soon as the flowers fail on the plains, which, in most places, is late in May or early in June, pasturage will be scarce for the balance of the year, except along streams, on wet lands, and in the mountains. Then feeding should commence in quantities just sufficient to cause them to keep their combs full of brood, without allowing their stores to diminish. Their wants being regularly supplied, they rear very large numbers of young, so that at the time the Cephalanthus blooms, there is ample force to gather and store large quantities of the best honey of the season. Where this bush abounds, cease to feed about one week previous to the time it comes into bloom, which is about the first of July.

In sections of country where the pasturage declines in June, feeding will have to be resorted to at intervals during the remainder of the summer, or they will have to be transported to where pasture abounds.

CONDITIONS REQUIRING IT.

The first requisite is a fertile queen, together with a sufficiently numerous swarm of bees to defend themselves.

The second (and it is of but little less importance than the first) is to have perfect combs so arranged as to suit the wants of the bees. If in the first of the season, they will wish to extend the structures. If at the close, they will desire to remain quiescent. Feeding without these conditions is useless.

MATERIAL.

The materials suitable for feeding are *honey*, *pollen*, *sugar*, and *flour*.

HONEY.

Honey for feeding bees is to be preferred to sugar, provided it is of good quality, but great care should be taken that no honey from hives containing *foul brood* is fed, for it will surely reproduce the disease. The dark fall honey, particularly that gathered from honey-dew, is inferior to sugar for bee food; hence it ought only be given after the weather becomes warm in the spring.

If strained honey which has become candied, or of thick consistency, be used, it should first be reduced to that of new honey, which is done by adding a little water and placing it over a slow fire until it attains 120° Fahr.; it is then to be taken off and cooled, and is fit for use.

POLLEN.

Pollen is an indispensable article of food during the season of breeding, yet the adult bees subsist in a healthy condition on honey alone, but cannot on pollen. Pollen, being stored in combs with honey, needs no preparation for the use of the bees; hence the directions given for feeding honey in the comb apply also to pollen.

SUGAR.

Sugar* of the best quality is the cheapest for this purpose. Refined yellow is to be preferred to any other, as it costs less, and is equally as good for the bees as the white crushed. Sugar containing a large amount of gum is unfit to feed to bees.

For feeding in the hive, dissolve one pound of sugar in one pound of water, but for promiscuous feeding, use one and one-eighth pounds of water to one of sugar. Where a large quantity is to be used, it may be dissolved to the consistency of syrup and then reduced with water as above.

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* "Experiments have proved the excellence of sugar as a substitute for honey, and in some instances its superiority for the formation of wax. It might otherwise have been supposed that bees might form comb from some particles of wax accidentally present in the honey, and that these afforded the pabulum for this secretion. To prove, therefore, that the saccharine principle alone enabled the bees to produce wax, being still confined, they were supplied with a syrup made with Canary sugar and water, and at the same time comparative experiments were made in another hive where the bees were fed on honey and water. The syrup-fed bees produced wax sooner and more abundantly than the honey-fed bees. Another fact was also incontrovertibly elicited, namely: that in the old hives the honey is warehoused, and that in the new ones it is consumed, then transmuted into wax."—*Bevan.*

Should it be found necessary to feed late in the season, less water should be added, as evaporation is then less rapid, and longer time would elapse before the bees could seal it over.

FLOUR.

Flour of different kinds (that made from rye is best) forms a valuable substitute for pollen, particularly in the spring, before the latter can be obtained from the usual source. As soon as the bees commence to fly out in the spring, they will partake of it, if placed within their reach, and continue to carry it into their hives until a supply can be had from the natural sources.

Take one pound of dry flour for each ten hives of bees to be fed, (the quantity can be increased or diminished according as it is consumed) place it in troughs or large shallow dishes set in a place sheltered from the wind, and at the same time admit the sun to shine on it. It should be kept dry, and replenished from day to day as long as the bees continue to partake of it. Flour may also be put into combs or vessels and placed within the hive, in the same manner as other food.

QUANTITY OF FOOD PER DAY.

From one to two pints of liquid sweets per day to the hive, according to the average strength of the stock, is found to make them flourish; commence by giving a little till they find the road, and then give them one quart per day to the hive, for the first two days, if they can take it; after which, one pint per day regularly, for eight or ten days, will cause them to increase greatly.

It is best to feed liberally and regularly for some days in succession, and then stop for a few days, as this feeding causes them to rear a large quantity of brood, which being considerably advanced in ten or twelve days, they do not require so large an amount of food as at first, or as they will when the young bees emerge, (which is within twenty-two days from the laying of the egg) at which time they should again be fed, unless there is pasturage sufficient to supply their wants.

WHERE PLACED AND HOW GIVEN.

Each hive of bees, or any particular one, can be fed by placing the food within the hive or at the entrance to it; or the whole stock can be fed promiscuously in troughs or shallow vessels placed a few rods from them.

Feeding within the hive is the best plan (whether few or many colonies) when neighboring bees are numerous, unless we wish to give our neighbors' bees a special benefit. If the food to be given is contained in combs, it should be placed within the main apartment of the hive. In frame hives this is done by putting the combs into frames and placing them in the room of empty combs, and adjoining the cluster of bees. But if no frames are used, and there is a space not filled with comb, then, by means of cross sticks, fasten in a quantity of combs containing stores. If no space exists, then take a ring, say six inches deep and of the same diameter as the hive to be supplied; place sticks across the bottom of the ring in a position to sustain and keep the combs elevated, to allow the bees a free passage between them and the stand. Then set the combs in on their edge, giving the usual spaces, and secure in that position by means of pieces of combs and cross sticks. Set the hive to be supplied on top of the ring or eke* and let it remain on the same stand.

An aperture for egress and ingress should be made to occupy the same relative position as the one previously used by the bees. This ring should remain during the winter, and be removed as soon as the bees commence work in the spring. If the chamber hive be used, combs containing stores may be placed in the chamber, and allowed to remain until the bees remove their contents.

At the time of supplying food, either within or at the entrance of the hive, the bees should be attracted

* The above plan has long been practiced, and with good success; hence, persons who keep bees on the old plan, should not fail to avail themselves of its benefits. By supplying such combs as contain mostly bee-bread, whether the bees are in immediate want of it or not, you will add greatly to their prosperity.

to it by sprinkling liquid sweets on the cluster of bees and along the passage leading to the food. When promiscuous feeding is resorted to, sprinkle a portion of the liquid on the bees and at the entrance of each hive that is most in need. Pieces of comb, or even wood, may be dipped in the liquid and placed at the entrance of each hive until the bees cluster on it; they are then to be gently carried and laid on the food wherever placed. When once shown the road, they are always on the lookout for their daily allowance, unless stopped for a few days, in which case they should be toled to it a second time.

A tin cup, or dish of almost any kind, may be set in the chamber, for the purpose of supplying food; floats are to be first placed in them, to allow the bees to sip the liquid without getting soiled or drowned in it. When such vessels are used, it allows the bees to spread through the chamber, and some of them are liable to be crushed in closing the door of the hive; this, however, can be prevented by using smoke to drive them out of danger.

The following described box answers a good purpose for feeding within the hive, as it allows the bees to ascend without being in the way of opening or closing the hive.

Plate XLIV, fig. 73: *A* represents a tin box five inches wide by seven inches long, and two inches deep; *b*, float placed in the tin box to keep the bees from drowning; *C*, wooden box or slip-cover, made to fit loosely over the tin box, being five and one-eighth

PLATE XLIV.

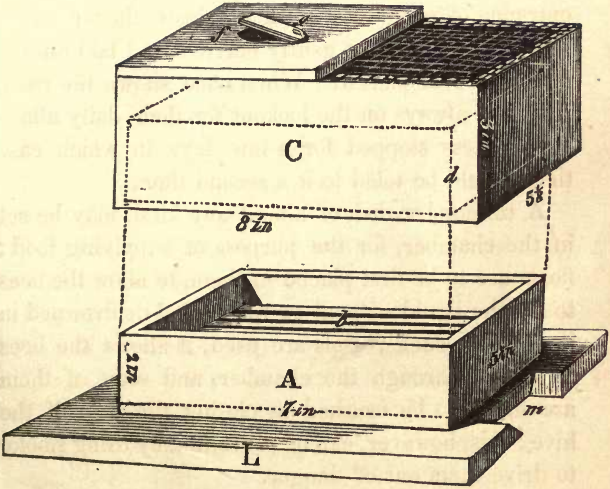

FIGURE 73.

inches wide by eight inches long, and three inches deep—all in the clear; *d*, partition, two inches high, and made at one end to form a passage, as represented at *n*; *e*, wire screen to admit air and enable the apiarist to examine the contents of the tin box; *f*, aperture, through which the liquid food is to be poured; *g*, cover to aperture.

The tin box *A* is represented as placed on a chamber floor in the position it should occupy in the hive, and the cover *C* elevated above it; by lowering the cover to its place, the passage *n* corresponds with the passage *m* in the chamber floor, allowing the bees to ascend to the food, without having their liberty in the chamber. Feed can be supplied either by night or day, without removing the box.

The above tin box may be set at the entrance of a hive, and covered so that only a small opening at one edge is allowed for the bees to pass in and out. The feed should be given in the evening, and the box removed the following morning. This precaution is necessary to prevent robbery.

PROMISCUOUS FEEDING.

For promiscuous feeding, shallow troughs are made as follows: Take a sound plank, one and one-fourth inches thick, sixteen inches wide, and six feet long, for the bottom, and for the rim two pieces sixteen inches long, and two pieces six feet, two inches long and three and one-half inches wide; these are to be well jointed, and white lead used when putting them together; they are to be thoroughly nailed, and the inside painted; when dry, it is fit for use. This size gives eight feet surface, and affords room for the usual number of bees from thirty-two hives to feed at once. Before feed is put in, take slats or pieces of comb and place them in the trough so as to form a floating bridge on which the bees may stand without soiling themselves while feeding.

Shallow pans, bridged in like manner, with a surface in proportion to the stock to be fed, answer the same purpose. The place for feeding should be a few rods from the hives. During the spring, or when the weather is cool, the sun should shine on and around the place; but when warm, it should be excluded.

The advantages gained by feeding promiscuously are, that it can be better done and with less than one-half the labor it requires to feed each hive separately. The strong and vigorous hives gather more than the weak ones. This is as it should be, for they are to be drawn upon, from time to time, for brood and stores to build up the weak ones. When this plan is once commenced, it must be attended to regularly.

FEEDING APT TO EXCITE ROBBERY.

While feeding bees separately, those of other hives are frequently attracted by the smell of the food, and try to rob them. This is best guarded against by keeping the entrance to the hive contracted, leaving barely room for the bees to pass out and in. They should be fed in the evening, and if necessary, the hives kept closed (except for ventilation) during a part of the following day. If at any time they are liable to be overpowered, remove the feed, and close the hive till near sundown; at which time, it is to be opened, to allow the robbers to depart.

Promiscuous feeding is also liable to incite robbery, particularly if a limited amount is given, without satisfying their wants. This difficulty is obviated by giving them all they can carry away, for two or three days in succession; after which, a liberal feed, once a day, at a regular hour, will be sufficient. It should be given either in the morning or late in the afternoon.

After the supply is exhausted, many robbers may be seen hovering around the different hives for a time; but they soon cease their efforts. If, however, they persist, give them all the feed they can carry till dark; and as soon as they have enough stored to answer the purpose, cease feeding entirely.

Homeopathic doses do not work well in the matter of promiscuous feeding.

CAUTION RESPECTING FEEDING.

I would caution new beginners to be exceedingly careful in practicing the different plans of feeding; for if badly managed, it may prove the ruin of the apiary; while if carefully and judiciously managed, it is fully as profitable as that of feeding any other kind of stock.

CHAPTER XXI.

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CHAPTER XXI.

ROBBERY.

PRIMARY CAUSE.

THE primary cause of robbery may be fairly traced to natural acquisitiveness; which is, in the *honey bee*, highly developed. Without any modifying traits of character, it is not strange, therefore, that they sometimes seek to acquire that which does not belong to them. Without that propensity, they would be of no more use to man than any other of the myriads of winged insects that are so common. Being possessed of the bee, which has traits of character no less unchangeable than wonderful, it remains for us to control and direct them in such a manner as to secure the largest amount of honey for the money and labor invested.

SECONDARY CAUSE.

The secondary cause, or that which leads to *marauding*, is a failure of pasturage; for, while they can procure supplies from flowers sufficient to meet their wants, they are never found meddling with their neighbors, unless excited by a careless exposure of honey, or defenceless hives having honey.

EXCITING CAUSE.

The exposure of honey, the presence of worms creating a scent, a neglect of the bee-keeper to notice and remove queenless or deserted hives, or feeble swarms, are among the causes tending to excite robbers. If by these means they once get a taste, the propensity is aroused so as to endanger the lives even of good colonies. The question would here naturally arise—Will not feeding produce this result? The answer is, that it will, unless judiciously managed.

HOW TO DETECT.

Robbers may easily be known, when making their first attacks, by their hovering around the hive, either seeking to alight at the entrance, or trying to force their way through any crevice that may be found in the hive. Their motions are quick and irregular; first remaining poised on the wing, seemingly ready to alight, and then suddenly darting away, to again return in the same manner. If the swarm that is being attacked is on the alert, they try to catch and slay the intruders; when they do this, there need be but little fear for their safety.

When a colony is once conquered and their stores are being carried away, it is difficult to distinguish the robbers from the actual population of the hive, as they fly out with considerable regularity. This bears so strong a resemblance to the playing or "fly-out" of the young bees, that it is difficult to determine their true character.

The robbers may be known by their crawling to the edge of the alighting board, or up the side of the hive, before flying; their sacks being full of honey, gives them a larger appearance than that of playing bees. When some progress has been made at carrying away honey, there may be seen, at the entrance and under the hive, cuttings of the comb.

Robbers may also be known by a peculiar sharp sound they make, when engaged in their depredations.

PREVENTIVES.

No hive having stores, and without a well organized colony to defend them, should be allowed to stand where it is accessible to robbers. Neither should honey or refuse combs be placed where bees can fly to them promiscuously, unless supplied with all they can remove for two or three days in succession; for when they get a taste, they become excited and attack weak and strong hives alike, and of course, numbers are slain on both sides.

As soon as pasturage becomes scarce, and symptoms of robbing are shown, let the entrance of each hive be so contracted that the guards can defend it. Care is required, however, to admit sufficient air, and to provide sufficient shade to prevent a half-melt, which is liable to occur when the weather is warm.

All unnecessary opening of hives should be avoided at such times, (and when required, let it be done late in the afternoon) as it confuses them and allows the entrance of spies, who will appropriate at least one load, and probably return for more.

HOW A CONQUERED FAMILY MAY BE SAVED.

When a family is once conquered,* that contains a quantity of bees worth saving, the hive should be closed up till towards evening, and then opened, to allow the intruders to depart. By sprinkling flour on them as they are leaving, and observing the hives which they enter, they can be diverted for a time from their belligerent purpose by moving their hive one or two feet from its position, and uncapping some honey, to give them employment at home.

The subdued hive may be kept closed for one or two days, and then a small aperture opened for their egress and ingress; they are then to be carefully watched, to see if the attack is renewed. The hive should never be removed to a different place, unless to the distance of not less than half a mile; this is found to be the most effective plan, as, by removing

* That a conquered hive of bees incorporate themselves with the victors, is mere guess-work. I find no experiment on record to prove the assertion, and I have seen no instance that would for a moment lead to such a belief.

to a place remote from other bees, and a sufficient distance from the original stand to prevent their return, they are left at peace, to pursue their labors. But if they cannot be placed at least half a mile from the stronger stocks, it will not pay the trouble of removal; it is then best to break them up, and add the remnants to the next weakest hive. This is the quickest and most effectual method to avoid trouble, and will in most cases save additional loss; as, when robbers get a taste, they are not content to stop their depredations—hence, it is good policy to keep them honest, by giving no opportunity to be *dishonest*.

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CHAPTER XXII.

OVERSTOCKING.

CHAPTER XXII.

OVERSTOCKING.

THE question of overstocking a country with bees is a very important one to all who are interested in bee-keeping. What is wanted to be known, is the number of hives that may be kept with the greatest profit to their owner, in any particular district. As the amount of pasturage afforded differs in each, there can be no fixed number named.

Mr. Langstroth says: "There is probably *not a square mile* in this whole country which is overstocked with bees, unless it is so unsuitable for bee-keeping as to make it unprofitable to keep them at all." His assertion will hold good wherever natural swarming is depended on as the means of increase. Nature has provided effectual guards to insure the continuance of each particular race of created things. Hence, the bee is endowed with the propensity of acquisitiveness to such a degree, that if not sufficiently gratified by *Flora's bounty*, it is turned to the destruction of its weaker neighbors whose stores, though small, are borne away in triumph. Thus the tendency to over-population is constantly held in check. We also find, that as soon as bees become diffused over a country, their propensity to swarm is greatly lessened; regulated, however, to a certain extent, by the productiveness or non-productiveness of the seasons. If, on the other hand, *excessive artificial increase is made, or unusual numbers concentrated at any given point without a corresponding amount of pasturage, then, overstocking will be the inevitable result.*

The distance to which bees extend their flight in search of food will occasionally be three or more miles, yet if compelled to fly over half that distance they work to greater disadvantage, and cannot accumulate so large a store, as when the pasturage is within the latter range.

The following extract of a letter from Mr. Wagner, of York, Pa., to Mr. Langstroth, published in "Hive and Honey Bee," page 300, shows the experience of the largest cultivators in Europe:

"In reply to your inquiry respecting the overstocking of a district, I would say that the present opinion of the correspondents of the *Bienenzeitung* appears to be that it *cannot readily be done.* Dzierzon says, in practice at least, '*it never is done.*' And Dr. Radlkofer of Munich, the President of the second Apiarian Convention, declares that his apprehensions on that score were dissipated by observations which he had opportunity and occasion to make when on his way home from the convention. I have numerous accounts of apiaries in pretty close proximity, containing from two hundred to three hundred each. Ehrenfels had a thousand hives, at three separate establishments, indeed, but so close to each other that he could visit them all in half an hour's ride, and he says that in 1801 the average net yield of his apiaries was two dollars a hive. In Russia and Hungary, apiaries numbering from two thousand to five thousand colonies are said not to be unfrequent; and we know that as many as four thousand hives are oftentimes congregated, in autumn, at one point on the heaths of Germany. Hence, I think we need not fear that any district of this country, so distinguished for abundant natural vegetation and diversified culture, will be very speedily overstocked, particularly, after the importance of having stocks populous early in the *spring* comes to be appreciated. A week or ten days of favorable weather at that season, when pasturage abounds, will enable a strong colony to lay up an ample supply for the year, if its labor be properly directed.

"Mr. Kaden, one of the oldest contributors to the *Bienenzeitung*, in the number for December, 1852, noticing the communication from Dr. Radlkofer, says: 'I also concur in the opinion that a district of country cannot be overstocked with bees, and that, however numerous the colonies, all can procure sufficient sustenance, if the surrounding country contain honey-yielding plants and vegetables in the usual degree. Where utter barrenness prevails, the case is different of course, as well as rare.'"

The following extract from "The Life of North

American Insects," by B. Jaeger, published in 1859, explains why so many more bees are kept in some countries than there are in others.

"In some countries, bee culture has the preference before all other agronomical occupations."

In the same work I find the following: "There is a 'Patriotic Apiarian Society of Bavaria' which is a most laudable institution, and its laws ought to be translated into the language of every country where bees are known.

"It is not permitted for a peasant to have his own apiary, but a particular favorable spot is pointed out by the society, in which the different proprietors deposit their hives. This place is under the management of a skillful apiarian, appointed by the society; and it is ordained that no more than one hundred and fifty hives shall be kept in one place, and each establishment must be four miles distant. A trifling tax is levied upon each hive not belonging to the society; and thus the peasant looks forward, at the end of the year, to a certain profit, with a very slight outlay, and without any demand upon his time or labor. Should a poor peasant wish to become the proprietor of one or more hives, he applies to the society, who immediately accede to his wishes, and an annual reduction is made from his profits until the society is repaid the value of the hive it has bestowed."

Mr. Quinby, one of the most extensive and practical bee-keepers in the United States, gives his opinion as follows:

"What number of stocks" (hives of bees) "can there be kept in one place? is a question often asked. That is like Mr. A. asking farmer B. how many cattle could be pastured on a lot of ten acres. Farmer B. would wish to know how much pasture said lot would produce, before he could begin to answer: since one lot of that size might produce ten times as much as another. So with bees; one apiary of two hundred stocks might find honey in abundance for all, and another of forty might almost starve, like the cattle it depends on pasture."

He (Quinby) further says: "I have had for several years three apiaries, about two miles apart, averaging in spring a little more than fifty in each. When a good season for clover occurs, twice the number would probably do equally well, but in some other seasons I have had too many, so that my average is nearly right. I will further say, that within a circle of three or four miles there are kept about three hundred stocks."

The following quotation from Bevan will more fully explain the matter:

"In the British Isles, in France, Switzerland and many other countries, there are not only great vicissitudes, attended on the one hand by parching droughts, and on the other by a long continuance of wet weather, but there are also very marked differences in honey sources, not only throughout extensive districts, but even in the same vicinity; and each of these causes, wherever it operates, must evidently produce a considerable effect upon the harvest of honey. To say, therefore, that a particular system of management will in any situation uniformly cause a great product of wax and honey, betokens a want of due attention to the sources whence honey is procured, and attributes to a *system* what is chiefly due to the *locality* in which it has been adopted. There are not wanting cases in which it has been necessary to feed bees in one district, at the very time that in its neighborhood were others actively engaged in storing their warehouses with honey. 'M. Huber lived at Cour, near Lausanne; he had the lake on one side of his domicil and vineyards on the other. He soon perceived the disadvantage of his position (as regarded his bees). When the orchards of Cour had shed their blossoms, and the few meadows in the neighborhood had been mown, he saw the stores of his stock hives diminish daily, and the labors of the bees cease so entirely that even in summer they would have died of hunger had he not succored them. In the meantime, though matters were going on so badly at Cour, the bees at Renan, Chabliere, at the woods of Vaux, of Cery, and places at the distance of only half a German league, were living in the greatest abundance, threw numerous swarms, and filled their hives with wax and honey.'" Again, Huber himself says: "They succeeded no better at Vevay, although it is not more than half a league from the place to Hontville, where they thrive remarkably well." Similar disparities in the productiveness of neighboring localities are by no means uncommon in this country, and who can be so deficient in discernment, as not to perceive that the adoption of any system, however judicious, would be attended with different results in these different localities.

We are informed by White, that whilst in the bleak country of Cambridge, seventy or eighty hives may be seen in a single farm-yard, supported, no doubt, by the neighboring heaths, Suffolk, with its beautiful inclosures and fine gardens, yields so scanty a supply of honey, that he thought Halton could not maintain a dozen colonies.

In the spring of 1859, my brother (W. C. Harbison) and myself commenced, at our place situated three miles below Sacramento City, on the east bank of the Sacramento river, with sixty-eight colonies, most of them weak—in fact, not equal to half the number of full ones. There were but five other hives within three miles, and but few at that distance. Up to the middle of May, the bees had more pasture than they needed; by that time, however, the stock had been so largely increased, as to cause a perceptible decrease in the amount of their gatherings; we then separated the stock, taking portions to three other places, leaving about one mile space between the lots.

The quantity of honey gathered by the remaining stock was immediately increased, while the smaller portion of the stock, removed to the greatest distance, gathered twice as much as those of equal strength left standing in the main apiary. While the small stocks of twenty-five, forty and fifty-nine hives each continued to gain slowly through June, the large stock of upwards of two hundred hives would have rapidly grown lighter but for liberal feeding.

However, during July and August the pasture was so abundant as to afford the bees all the honey they could gather. But during September and October there was evidently not enough pasturage in reach to feed so many bees during these months; while stocks consisting of from ten to twenty hives, sold and carried from five to twenty miles away from any other bees, and in no better pasturage, but each bee having a large range, gathered and stored honey rapidly during the same time.

In the spring of 1860 there were upwards of two hundred and twenty hives of bees located at different places, but confined to the same range of pasturage that the bees of the seventy-three hives were the previous year. The result was, that the pasture was so thoroughly overstocked that constant feeding was required. Even with that assistance, there were not over one hundred and fifty colonies increase, part of which were natural swarms and the balance divisions. Although a number of full hives were left standing, for the purpose of making surplus honey, not one of them succeeded in filling a single box during the whole season. This great deficiency of pasturage was, to some extent, owing to the clearing up of a considerable quantity of land that had afforded pasturage the previous year.

Another case of overstocking occurred during the months of July and August, at a place seven miles from my residence, where we had located an apiary of one hundred hives, most of which had the main apartments of their hives full, and had commenced to fill their surplus honey boxes, at the time another stock of one hundred and twenty-five hives was brought from a distance and placed a little over one mile from ours, but in the immediate vicinity of the same pasturage where they fed. There were then not less than four hundred hives of bees within a range of three miles long by one broad. The result was, that our bees immediately ceased to store surplus honey in the boxes, and were barely able to procure enough to fill out the empty combs in the main breeding apartments.

Thus, a large amount of honey that would have been obtained from the stock previously existing in that neighborhood, was cut off by the large additional stock placed in the same vicinity; while the latter were benefited, to some extent, by their new location, (they having been removed from a place where all the bees were in a starving condition, except where fed) yet their gain would have been vastly greater had they been taken to an unoccupied pasture.

Perhaps the most remarkable case of overstocking on record, occurred in the city of Sacramento, in the year 1860. At the commencement of the season, there were between eight and ten hundred hives of bees within a space of two miles square. The result was disastrous to most persons engaged in the business. After being at a heavy expense for hives and feed, many of their bees died from starvation and disease, or were so reduced as to be practically worthless.

The same results attended bee-raising in the city of San Francisco, and also in several other places in the State of California during the same year.

It is true, the season was less favorable for the production of honey than some previous ones; yet wherever a limited number of healthy stock was kept in the vicinity of good pasture, they increased and made honey nearly equal to the average of previous years.

The testimony of such apiarists as Huber, Bevan, and Quinby, which I have here introduced, (that of others is not wanting) is sufficient of itself to prove that each locality has a capacity to sustain a certain number of bees profitably. Increase that number, without a proportionate increase of pasture, and the production of surplus honey will decrease in proportion to the increase of the number of the colonies. Bee pasturage can be increased at pleasure, and pay as large a profit to the producer as any ordinary crop raised by the farmer; and I would here call the especial attention of the latter to this fact. While all cannot enter largely into the business of bee-raising, yet every owner or occupant of a few acres of land should have his own table supplied with *home-made honey*, as regularly as with home-made butter.

There are unsightly wastes on almost every farm where food-producing trees and plants would grow, and pay a profit for this one purpose alone; besides, it would add to the health and beauty of the premises.

CHAPTER XXIII.

TRANSPORTATION.

CHAPTER XXIII.

TRANSPORTATION.

"THIS is a practice which many apiarians have recourse to, for the purpose of removing their bees to fresh pasture, to districts where buckwheat is cultivated, or to the neighborhood of heaths, or to any other place where such late-blossoming flowers as afford honey abound.

"Mr. Isaac assures us that he once had a poor swarm of a month's standing, which only weighed five pounds, four ounces, and that on the thirtieth of July, he had it removed to Dartmoor Heath, from whence it was brought home, two months afterwards, increased in weight twenty-four pounds and a half. He moreover states that the increase of others that were sent there was nearly proportional, and he is of opinion that the whole addition was made during the month of August.

"In Lower Egypt, where the flower harvest is not so early by several weeks as in the upper districts of that country, this practice of *transportation* is carried on to a considerable extent. About the end of October, the hives, after being collected together from the different villages and conveyed up the Nile, marked and numbered by the individuals to whom they belong, are heaped pyramidally upon the boats prepared to receive them, which, floating gradually down the river, and stopping at certain stages of their passage, remain there a longer or shorter time, according to the produce which is afforded by the surrounding country. After traveling three months in this manner, the bees having culled the perfumes of the orange flowers of the Saio, and essence of roses of the Faicum, the treasures of the Arabian jessamines, and a variety of flowers, are brought back about the beginning of February to the places from which they had been carried.

"The productiveness of the flowers at each respective stage, is ascertained by the gradual descent of the boats in the water, and is probably noted by a scale of measurement.

"This industry procures for the Egyptians delicious honey and abundance of beeswax. The proprietors, in return, pay the boatmen a recompense proportionate to the number of hives which have thus been carried about from one extremity of Egypt to the other. Latreille states that between Cairo and Damietta, a convoy of four thousand hives was seen upon the Nile, by Niebuhr, on their transit from the upper to the lower districts of that country.

"Floating bee-hives were formerly common also in France. One barge was capable of containing from sixty to a hundred hives; which, floating gently down their rivers, enabled the bees to gather the honey which is afforded by the flowers on their banks.

"Reaumur likewise states that it has been the practice, in some districts, to transport them with similar views by land, in vehicles contrived for the purpose. Feburier tells us that it is still continued, and that the environs of the forest of Orleans are, at certain seasons, covered with bee-hives. Mr. Oliver, a member of the Institute, also states that in Provence there are honey merchants, who purchase bees for the purpose of transportation. These dealers take all the honey that the bees can spare prior to setting out, and when the plains can no longer afford a supply, convey them to the foot of the mountains and sacrifice them, after they have collected their second harvest. In Savoy, Piedmont, and other parts of Italy, this practice is also common. It is, indeed, of very ancient origin. Columella speaks of it as a very general custom among the Greeks, who used annually to send their bee-hives from Achia into Attica.

"The practice prevails to a considerable extent in Scotland. About six miles from Edinburgh, at the foot of one of the Pentland Hills, stands Logan House, supposed to have been the residence of Sir William Worthy, celebrated by Allen Ramsay in his 'Gentle Shepherd.' This house is at present occupied by a shepherd, who, about the beginning of August, receives above a hundred bee-hives from his neighbors resident beyond the hills, that the bees may gather honey from the luxuriant blossoms of the mountain heather. The present proprietor of Logan House, W. Robertson, Esq., informs me that he has counted nearly two hundred hives in a season, and that other shepherds, in the neighborhood, undertake similar charges; among the rest, his own game-keeper, who has accommodation for fifty or sixty families. They remain as long as the heather continues in bloom—usually rather more than two months. 'A lover's plaid and a bed of heath,' says the poetical Allen Cunningham, 'are favorite topics with the northern muse. When the heather is in bloom, it is worthy of becoming the couch of beauty. A sea of brown blossoms, undulating as far as the eye can reach, and swarming with wild bees, is a fine sight.' Sir Walter Scott, in his 'Pirate,' makes an Orkney husbandman speak of having imported nine skeps of bees, for the improvement of the country and for turning the heather bloom into wax and honey.

"These, however, are advantages which very few situations can afford; probably but few of my readers may reside in the neighborhood of heaths, and still fewer may be disposed to incur the trouble and expense of removal. If, therefore, incorporation be desirable in any particular case, I can only recommend that attention be paid to supplying the bees with proper food, in a feeding trough, by the assistance of which indeed, I should not be afraid of carrying even a weak stock very safely through the winter and early spring. 'Give your bees,' says Mr. Isaac, 'two harvests in one summer, (alluding to the practice of transportation) and you may make almost any swarm rich enough to live through the following winter.' This second harvest may be very efficiently supplied by an attention to *feeding*.

"I ought here to state, upon the authority of Mr. Dunbar, that if the weather prove wet and unfavorable, as it did in the autumns of 1829 and 1836, the transported hives are sometimes found to diminish in weight during their sojourn on the moors.

"In Scotland, prior to the bees being sent to collect their second harvest, recourse is had to the practice of *drumming*, or *driving*, and the bees being thereby expelled from their stores, and secured in a new habitation, are sent on the morrow to their station on the moors, sometimes to a distance of fifteen or twenty miles. There they remain for a month or six weeks; a shilling a hive being the usual compensation to the shepherd who superintends them.

"For the above information, I am indebted to Sir J. G. Dalyell, of Edinburgh, the translator of Huber."—*Bevan.*

The foregoing account possesses much interest to bee-keepers in this country, showing as it does the practices of those of other countries.

The great diversity of soil and climate found within short distances on the Pacific slope, furnishes inducements; and abundance and ease of communication by both land and water, afford facilities for the safe and speedy transportation of bees to sources of fresh and luxuriant pasturage, whenever a location becomes exhausted. Hence, there can be no doubt that this system will soon be practiced very extensively; giving employment and the means of support to large numbers of citizens.

By commencing with a stock of bees located on the plains or foot hills of California, in the spring; and when the pasturage fails, depriving them of a considerable portion of their honey, and then removing the stock higher up in the mountains, where late pasturage abounds, an uninterrupted harvest of honey can be secured, insuring large returns from the investment.

CHAPTER XXIV.

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CHAPTER XXIV.

WINTERING BEES.

A HIVE made tight, without upward ventilation, condenses moisture on the sides and top, which being absorbed by the wood, makes it a conductor of heat and cold, and renders it excessively damp within, causing great loss of bees, and permanent injury to the combs.

These difficulties are now overcome by attending to the condition of the combs, and by the use of the California hive in combination with the following plans of of management during the winter.

CONDITIONS SUITED TO WINTERING.

Combs that have been used to rear a number of generations of young, are the most suitable to receive the winter supplies of food, and for the bees to cluster on during the winter; when first built, the comb is nearly white; at the emerging of the first generation it becomes yellow, and grows darker and darker with each succeeding generation; each young bee leaving a fine lining or cocoon in the cell it emerges from. This serves to insulate each cell from adjoining cells, and when full of honey, they are non-conductors; and hence the animal heat is retained.

Comb continues to improve and does not reach the best condition to insure the perfect health of the bees until it is two years old. They will continue to do well with the same combs ten years, though a partial exchange at suitable intervals of old for new increases their prosperity. New comb containing honey is to some extent a conductor of heat, and is liable to crack and sweat under the influence of frost or moisture. Feeding in this condition invariably produces dysentery, if not soon relieved by fine weather. Large swarms are always desirable for wintering as stock hives, yet if small ones are to be kept over they will live and thrive with old comb, while swarms of equal strength and the same amount of stores, with new comb, will perish.

WHERE KEPT DURING WINTER.

Bees have their points of compass, and can work from and to a hive as the farmer does from and to his house; and hence, if in a suitable place, they should remain upon the same stand winter and summer.

Winter repositories, such as cellars or dark rooms, have been used and recommended by some of the most eminent apiarians in the United States and Germany.

The advantages claimed for this system are that bees winter without serious loss of numbers, and with a less consumption of stores than if left on the summer stand. I have tried the plan, and have found on taking them out in the spring, that there was but little loss in numbers, and slight diminution of stores. But this supposed gain, though gratifying for the time, never proved permanent. The large numbers kept in the same room for several weeks, produces a sameness of scent in all, so that the members of one hive cannot be distinguished by those of another. This renders the strong hive liable to attract bees from the weak ones, leaving a portion of the brood to perish. It also causes the comb to become more or less moldy or rotten, and proves a permanent damage to the hive. Bees wintered out of doors, being vigorous and ever on the alert for a defenceless colony, quickly scent out those removed from the repository, and attack and rob them.

This practice probably originated *foul brood*, and will serve to perpetuate it; for in the distric's where this system has been most practiced, this disease most abounds. In fact, I am not aware that the disease has appeared in any other localities except when carrying bees or honey from the infected districts. As far as I can learn, the disease only exists in New York, New Jersey, and some of the New England States, whence it has been brought to California, to the great damage of many apiarists and novices in the latter State.

WINTER MANAGEMENT.

About the first of December, or as soon as the weather becomes cold, they should be protected from rough winds and fogs. This is best done by entirely closing the entrances in front, and opening the ventilators, and admitting air through the ventilating chamber, by which it is greatly modified and freed from moisture before reaching the bees; light being excluded (by the same means) from entering the hive, and the sun from shining on it. The bees are kept quiet, whereby many are saved.

It is very important to retain all the animal heat within the hive, whenever the outside temperature is below blood heat. It is also important to provide for the escape of vitiated air. These objects are best accomplished by opening the upper ventilator and removing the honey-board, putting in its place a cloth and adding old clothes, dry moss, or any substance that is an absorbent of moisture, and at the same time a non-conductor of heat. The chamber is to be partly filled, and the material left loose to allow the air to pass freely through it; and when saturated with moisture it is to be exchanged for dry. A cloth should also be placed between the glass and the main frames to remain during the winter. Whenever the weather is sufficiently warm to enable the bees to return in safety, they should be permitted to fly out as often as once a week through November, December, and a part of January. By the middle of the latter month breeding has commenced to some extent, and they should have their liberty every good day. If strict attention is paid to closing the hives whenever the weather is cold and windy, and opening them on the return of mild weather, large quantities of bees will be saved which would otherwise perish.

For further directions on wintering bees, see Chapter on Monthly Management.

CHAPTER XXV.

MONTHLY MANAGEMENT.

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CHAPTER XXV.

MONTHLY MANAGEMENT.

It is the design of this chapter to direct the bee-keeper to such a course of treatment as is best adapted to the wants of the bee during each particular month of the year.

The reader will bear in mind that the habits and instincts of the bee are the same in all countries and climates; therefore the same *system* of management is applicable to all, being varied only to meet the difference in climate. In warm climates the summers are long, and in cold ones short, the winters being *vice versa.* This renders two courses in the same system of treatment necessary.

I therefore propose to give two series of monthly management, making the two points where I have had experience, the bases. Sacramento, California, will represent such portions of the States as have but little snow; while western Pennsylvania, latitude 41° North, longitude 3° West of Washington, the field of my earlier experience, will represent those having cold winters, with frequent snows.

In order to fully understand the following directions, the reader should first study the preceding chapters. I call attention first to the management adapted to a warm climate, which will apply to most parts of California and the Southern States.

SUITED TO WARM CLIMATES.

JANUARY.

The bees are now (Jan. 1st) in a state of repose, and having had proper care in December, will require but little attention during this month. They should be permitted to fly occasionally, when the weather is sufficiently warm to guaranty their safe return. The hives should be examined, and all accumulations of filth, whether from dead bees or other sources, *removed.* This should be done so as to cause the least possible disturbance of the bees. By the last of this month they will commence to carry in pollen, and to breed.

Should it be desirable to change the location of the apiary, this work should be done early in this month, before the bees have commenced to work; for, if removed afterwards, many will return to the original stand and there be lost. Should there be many hives, and all are to be removed, let the preparations be made beforehand, and all removed at the same time, and the old stand taken down, so that the place will not be familiar to them. This will cause the bees to immediately return to their hive. But should a hive be removed to a short distance, and another of the same appearance remain near the same spot, many of the bees will return and enter it, and remain, to the great detriment of the hive or hives from whence they came.

Hives and honey boxes should be prepared in sufficient numbers for the supposed necessities of the season, before the labors commence.

FEBRUARY.

The bees are now at work carrying home rich loads of pollen.

The entrance of the hive should be opened just enough to permit the egress and ingress of the workers, without room for the convenient entrance of robbers.

By the first of this month, (February) if the stock is strong and full of comb and stores, take out a side comb where fewest bees cluster (for directions see page 262) and place it in any hive not full, or lay it away to be returned where needed; now examine that adjoining, and if a portion of empty worker comb is found, place it next to that containing brood; if no empty comb is found, and the bees are numerous, then place an empty frame next to the brood, but keep the latter compact; the bees then construct comb for breeding, and in doing so, consume increased quantities of honey to enable them to elaborate the necessary wax, and the cells thus exhausted furnish room for more brood.

When a hive has not a large amount of honey, no combs should be removed till pasturage is abundant, as it would endanger the existence of the hive.

At the time of reärranging the combs, be careful to place the drone comb not yet occupied with young on the sides; and where there are young drones found, let them be placed next a store comb on one side, and then move all the worker brood up to it, so that any new comb to be built will be adjoining worker comb, and more likely to be straight and filled with worker brood. A portion of the honey in the projecting or uneven combs should be uncapped.* When a hive is found to be destitute of honey, or in danger of becoming so, supply it at once with combs from another hive. See Chapter XX, on Feeding.

No hive should be condemned as queenless during this month, although no brood is found, unless there are other evidences, or a search proves it to be so. Yet the absence of brood is a just cause of suspicion, and the case should be watched, and a careful exam-

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*During the first warm days in the spring, bees sometimes swarm out, deserting their hives entirely; this is occasioned by disease, or a presentiment of starvation, either real or fanciful; I have known many instances of the latter. The cause seems to be that their stores are all closely sealed up, and they are not really aware that they have abundance, but become alarmed and rush forth as above. When deserted from this cause, hives may be known, either by their having but little honey, or plenty of sealed honey, with but little in uncapped cells; there is always some brood found in the comb in such cases. The preventive is to feed, or uncap a portion of the honey as directed.

ination made from time to time till its condition is determined. When two hives are found very weak it will perhaps be profitable to unite them, in which case they should be removed at least a mile, and remain three or four weeks.

MARCH.

By the first of this month all hives should be actively engaged rearing young and collecting food for their maintenance; in fact, some hives will have added largely to their members by this time, and hives not now found to have brood should be condemned as queenless, and either broken up or a fertile queen given to them; using the precautions however, as given in Chapter XXVIII, for Supplying Queens. The queen in this case may be taken from a hive, and a queen nursery formed for rearing others to supply colonies, which may be formed as early as the middle of this month, provided the drones have made their appearance in considerable numbers.

Then on the tenth day from forming the nursery, take all the queen cells from the hive and return the queen that was taken away. Give one of the cells to the hive whence she was taken. The queen, during her ten days' residence, will have supplied a considerable amount of their comb with eggs, thus affording them profitable employment in rearing the young bees during the time that the young queen is becoming fruitful.

The remaining queen cells can be used to supply any colony that is destitute, or any new colony that may now be formed.

Much of the brood in weak hives is lost by cold, wherefore no time should be lost in strengthening such so that they may rapidly increase without waiting for warm weather. There is sometimes difficulty in supplying small colonies with brood comb so as to have it exactly adjoining that which they already have.

To remedy this, take from the weak hive a comb or combs containing brood; brush off all the bees before removing it; then from a hive known to have a large quantity of brood, take one or two combs of mature brood, (according to the quantity of bees in the weak hive to cover the same) and brushing off all the bees, place in the weak hive whence the others have been removed, being sure to place store combs adjoining. Then cover the whole carefully with a cloth, to retain the animal heat.

Now give to the strong hive the combs taken from the weak one, and the exchange (being no robbery) will essentially aid the weak without danger to the other. This plan of exchanging combs is efficient, and may be practiced with equal success throughout the breeding season.

Each weak colony may be strengthened at any time by adding a single comb of mature brood, which is preferable to adding bees, unless they are young ones, and separated from the old as directed in Chapter XVII.

Feeding should be attended to during this month. In favorable seasons primary divides may be made, and queen nursery formed during the latter part of the month, and in some cases colonies can be formed to good advantage; surplus honey boxes may also be put in such hives as are full, if it is intended to let the bees swarm in the natural way. The ventilation should be gradually increased as the hives become crowded and the heat increased.

APRIL.

The first swarms issue in the early part of this month, and towards the last of it many may be expected, calling for the close attention of the bee-keeper.

This is also one of the principal months in which to form artificial colonies; primary divides are to be made at intervals, so as to supply embryo queens in numbers and at times to suit the condition of the stocks to be divided. The directions given in the Chapter on the Formation of Colonies will apply to this month, as well as to the three following ones.

MAY.

This is one of the principal swarming months, and where this plan of increase is relied on, the bees require constant watching in order to secure the swarms as they issue from the parent hive. The formation of colonies, and the care required to build them up to that of good hives, should receive the careful and prompt attention of every bee-owner; nothing should be delayed to a later date that can as well be done during this month. Where hives have been allowed to store surplus honey, their boxes will have been filled by or before the close of this month.

JUNE.

The same directions given for May will apply to this month, except that as soon as the flowers fail, swarming ceases, and consequently the formation of colonies should be discontinued, unless liberal feeding is resorted to, or artificial pasturage be provided to fill the vacancy between the failure of wild flowers on the plains and the blooming of the cephalanthus, in July. See Chapter XX.

The ventilating apertures should all be kept open at times when excessive heat prevails, and again contracted on the return of cold.

Watch carefully for and summarily destroy every moth and worm that can be found; in fact, this should also be attended to at all times, from early spring till late in the fall. See Chapter V, Bee-moth.

JULY.

Swarming is mostly over by the first of this month, except in places where pasturage abounds and bees are not numerous..

But where cephalanthus abounds, the great honey harvest commences about the first of July. All colonies should be formed previous to this time and equalized, so as to insure the filling of their hives. During this and the following months, much care is necessary to so arrange the combs as to have them straight and uniform.

Full hives, designed for the accumulatiou of surplus honey, should be supplied with boxes at once, and as fast as these are filled and sealed up, they should be removed and new ones substituted.

The rays of the sun should be excluded from the hives with care, and a free circulation of air provided around all the hives; in fact, the winds should have full sweep in every direction during the months of June, July, and August, or while the hot weather continues.

Where pasturage is scarce, feeding will be required at intervals, through this and the following months, or until there is pasturage.

AUGUST.

Swarming is mostly over previous to this month; there are places, however, where occasional swarms come out during this month, but they are mostly grand or great grand swarms.

In districts where pasturage abounds, there is as much honey gathered and stored in August as in any other month in the year.

The removal of full boxes and supplying of empty ones should be promptly attended to, and continual care taken to so arrange the combs that new ones will be built in proper shape.

All hives that are not strong should be made so without delay; in fact, all equalizing should be completed by the last of this month. Colonies can be formed in this month to do well, where there are but few bees; yet it will in most cases prove a loss in the end. It is much better economy to permit them to make honey for market; they are then in superior condition to endure the winter, and in the spring, one such hive is worth as much as three weak ones; the attention required is also much less for the former than for the latter.

If possible, the apiary should be so managed that before the first of August all the hives should have their main apartments filled with comb; for most of the comb built during the earlier portion of the season is constructed for brood, and hence will be straight and regular. And also, as is elsewhere shown, combs that have been used for rearing brood promote the health of the bees during winter.

Another advantage gained by this plan of managing is, that most of the early constructed comb will be filled with honey during this and the preceding months. This summer-made honey is usually of a much better quality than that made during the fall season; consequently, is a more wholesome food for the bees.

All hives managed as above, usually have the spaces among the combs, as well as the intervening spaces next to the bottom board, literally full and crowded with bees. Such hives, if free from any taint of disease, are the standard of excellence: while colonies formed late in the season, or which as yet have not filled their hives, build their combs (if at all) in a crooked, irregular manner, and fill them with dark fall honey, which is unwholesome, it being one of the causes of *dysentery* among bees during the winter and spring. And again: such irregular combs cannot be used for breeding purposes to any advantage; consequently, such hives, even if they do contain a numerous swarm, are inferior for all purposes, and hence are an uncertain investment.

The directions given for September, in the following course of monthly management, will, in many localities, apply to this month; while in others, it will apply to September, and even to October, in this course.

SEPTEMBER.

If the directions given for August management have been attended to, there is but little to be done during the present month, except to see that the hives are protected from the direct rays of the sun, to destroy moths, worms, and other enemies of the bees; remove surplus honey, and insert empty boxes. If honey is still being gathered and stored, avoid, as much as possible, the opening and removing of the main frames; in fact, they should not be removed at any time, unless positively necessary, until the following spring. (See directions for February.)

Now is the time to procure materials for the manufacture of hives and honey boxes for the ensuing season. These should be made during the following months, when but little time is required among the the bees. With a proper attention to the economy of time, the apiarist finds more uniformity of employment and less seasons of haste—more healthful exercise and less personal exposure to inclement weather —than in almost any other pursuit.

OCTOBER.

As soon as the weather becomes cool, contract the entrances, so that no more room is left than affords a free passage for the bees; additional air should be admitted through the ventilating chamber; this serves to guard against the intrusion of robbers and other enemies.

Such hives as are light, should now be fed enough to last them until the return of spring. Hives which have enough provisions to last them through the winter, should not be fed till they need it in the spring.

The sun may be permitted to shine on the sides of the hive, to give additional warmth to the bees. Towards the last of this month, the roof should be taken down, and a covering placed directly on the top of the hive, and so fastened that the high winter winds cannot blow it off. These covers are to remain thus till the return of warm weather the following year, when they are again to be elevated.

These covers will not need to be removed in ordinary seasons before the middle of April or the first of May, when they are again to be elevated, as shown in plate XXVIII.

NOVEMBER.

Bees have now closed their labors, both in the fields and in their hives, where they remain tranquil; very few are rearing brood, and on applying the ear to the hive, scarcely any sound is perceptible. The temperature is suffered to fall to a much lower degree than at any other season, and they remain in a semi-dormant state. When the weather is warm, they arouse, and have a play once in every few days, especially just before or after a storm.

Early in this month the hives should be prepared for winter, as follows: remove all the surplus honey boxes, whether full or not, and store them in a dry place, until wanted in the following spring; the apertures in the honey-board are to be left open. Old clothes of any kind, dry moss, or other substance that will not be offensive to the bees, but will absorb a large amount of moisture, is to be placed loosely in the chamber, in such a manner that the steam passing up through the apertures, can pass through and be absorbed by the material. Whenever this becomes saturated, replace it with that which is dry. If there is still much moisture appearing in the main apartment, remove the honey-board entirely, and in its place cover with a cloth, and add dry material as before. The upward ventilating passages are to be kept open during the winter, and be partly closed when the chamber is cleaned out in the spring.

The amount of air admitted below is governed by turning the slides on the sides of the hive, to admit air into chamber B. If one-half of each aperture is left open, it will afford ample air, unless the bees are excited by removal. The movable slide F is to be taken out, and the propolis that the bees have plastered over the wire screens covering the apertures G G, melted or scraped off, and the slide replaced. The curtain is used to exclude the light and the excess of moisture from reaching the bees.

The entrances in front are to be entirely closed during the prevalence of cold, stormy, and windy weather; but on the return of warm days, they are to be opened, to permit the bees to fly out. But if this cannot be attended to, or if there is danger of neglecting to open the hives when it becomes necessary, it is better not to close them; for it is better to lose a few from exposure, than to endanger the lives of the whole swarm.

When the hives are properly prepared for winter, as above, great care should be taken not to jar or disturb them in any way, but to afford them the full benefit of their season of repose.

DECEMBER.

The hives having been arranged for the winter as directed in the previous month, all that is required during the present month is to see that they are kept dry, and that the bees have their liberty occasionally. If it is desirable to change the location of any hive, it may now be done—keeping them closed, however, for about one week; after which the bees will have less propensity to return to the original stand. The sun should be permitted to shine on the hives, as well as on the ground in front of them, during the fall, winter, and spring. Straw should be spread on the ground in front of the hives, to enable many exhausted bees, that would otherwise be lost, to regain their hive.

Too much caution cannot be observed to secure the bees from any excitement or interruption of their repose during this and the preceding month. Much of the care that should be given to bees requires but little time, if done at the right time; and as the labor is light and sure to be well repaid, (if judiciously expended) it will readily be seen that pocket interest is one of the incentives to industry.

SUITED TO COLD CLIMATES.

JANUARY.

The bees having received all due care and attention in the fall, to prepare them to endure the rigors of winter, we should find them during this month remaining within their hive happy and contented; *not dormant, nor in a half-benumbed state, as some suppose.*

Any one can prove this, by opening a hive when the temperature is very low, even many degrees below zero. The bees will be found active and capable of flying instantly if introduced to a warm atmosphere. In fact, some will rush out and fly a few feet (when they drop dead) even in a cold, frosty atmosphere. Any that separate from the cluster at such times are lost; hence the caution not to disturb them.

It is the nature of the bee to fill its sac with honey whenever the hive is disturbed. Excitement or disturbance also induces them to consume more food, which, in turn, induces impatience to fly out when too cool for safety. Hence, it is apparent that the health and safety of bees are greatly promoted by being allowed to remain undisturbed during each period of cold weather. When the weather becomes sufficiently warm to allow them to fly and return with safety, they should be allowed to do so at any time of year. At such times, the front slide should be raised, and all accumulations of dead bees and filth removed.

In keeping his hives dry, and in the manufacture of hives and honey boxes for the coming season, the apiarian will find full employment.

FEBRUARY.

What has been said of January, applies equally to this month. No water* should be placed within the hive at any time, unless the bees are confined and forced to breed during warm weather. It is soon enough in the season for them to have water, when they can go forth and obtain it themselves.

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* I am aware that Mr. Langstroth and others have attempted to show that water is indispensable to the health of bees during the winter, as well as in the spring and summer. In this I differ with them, and will give my reasons. First: honey and pollen constitute perfect food for the bee; they will even live for months on honey alone, though both seem required when rearing brood. Although commencing to breed in January, only a limited amount of brood is found till they commence flying out in the spring. This is as it should be, for if breeding is greatly extended at an unseasonable time, much damage is liable to result from a sudden cold spell occurring. That bees will take water when placed contiguous to them, or even lick up the condensed moisture on the sides of the hive, is true; but that is no proof that they need it, for it is well known that this is their practice for removing liquid substances offensive to them. It is also well known that in a hive having proper ventilation, which will prevent the condensation of moisture on the sides, the bees remain dry and enjoy superior health, and are found to multiply more rapidly than if not well ventilated. And further: bees carry but a limited amount of water when they first gain their liberty in the spring, and the demand for it gradually increases till the period of swarming, after which time the quantity rapidly diminishes, so that after the first of September but few bees are found to visit watering places. The different management of bees by different parties who shipped them from New York to California, is proof in point; those who did not water or feed any during the voyage succeeded much better than those who did so regularly: this was the result as tried side by side on board the same ship.

In the absence of a natural brook or marsh, troughs, such as are recommended for promiscuous feeding, may be filled with water, at all times of spring and summer.

MARCH.

On the first fine day (that succeeds each period of cold) when bees can fly out and return to their hives without being lost, the front slide H (see plate XIII) should be taken out, and all dead bees removed.* The slide is immediately returned to its place, but elevated three-eighths of an inch to afford a free passage of the bees out and in. The aperture J is to be opened and kept so for the same purpose. Common hives are to be turned up and cleaned as above, and the apertures opened for the egress and ingress of the bees. The hives are to remain open as now arranged, as long as the weather remains warm; but if cold returns, or severe winds prevail, the entrances should be again closed or contracted, observing that the ventilating passages are open to admit sufficient air.

Thus by timely attention the bees are preserved in a state of health, and the lives of many saved, at a time of year when they are particularly valuable. Less food is also consumed when kept in repose with the light excluded.

The hives are all to be examined at the time that

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* These directions are also applicable at all seasons.

they commence to carry in pollen, to ascertain if any have exhausted their honey, if so; their wants are to be supplied, as directed in Chapter XX.

This is the time to reärrange their combs. (See directions, Chap. XVIII.) Feeding however should be attended to regularly thereafter until abundant forage is found in the fields; but if they are not fed, then defer reärranging their combs till about the first of April, or until peach trees begin to bloom, as no one date will suit all places, or even two seasons in the same locality. The above will serve as an unerring guide to mark the advance of the seasons in all places where the peach tree is grown.

There is considerable propensity to rob each other during this month, requiring care to guard against it.

APRIL.

The care for this month consists in strengthening weak swarms by interchanging of combs, as directed in Chap. XVIII. This is a suitable month for transfering bees, together with their combs, from common chamber and other hives into such as are found to be the best suited to the wants of the bee, and profitable to the bee-keeper. A constant watch should be kept to find and kill all moths and worms throughout the season.

Whenever a scarcity of pasturage occurs, feed regularly until it again becomes plenty; prepare hives and stands, so that no delay will occur when the season of swarming arrives.

MAY.

Continue to feed liberally during this month, or until the white clover and other sources of pasturage are in bloom, at which time it is to be discontinued. By this means, each hive in the whole stock is full of bees, and the combs are full of brood, besides stores in reserve.

Should the season be favorable, primary divides may be made as early as the twentieth of this month, and in some places still earlier. Occasional swarms may be expected under favorable circumstances, towards the last of this month.

JUNE.

This is the great swarming month, and is the busiest, besides the most profitable one to the bee-keeper in the whole year, whether he lets the bees swarm the natural way or divides them.

Where they are left to swarm of their own accord, surplus boxes should be placed in the chambers as early as the first of June. (In some places they should be put in one month earlier.) These boxes seldom retard the bees from swarming, and as they are usually filled, or nearly so, by that time, are so much clear gain.

Bees should (if not divided) be constantly watched during the whole of this month, from eight o'clock

A. M. till four o'clock P. M., of each day, in order to secure all the swarms that issue.

Where the artificial increase is relied on, the utmost diligence is required to form as many colonies as wanted for the season. This should be done early in the month, so that each may have a fertile queen as early as the twentieth, and none to be later than the first of July.

The equalizing and interchange of combs forms a very important and profitable part of the labors of the bee-keeper during this month. (See Chap. XVIII.) Considerable quantities of surplus honey are usually made during this month, which should be removed as soon as the combs are full and sealed over, and empty boxes put in their place.

The sun's rays should be excluded from the hives at all times when the temperature is above 70° in the shade; the covering should be elevated (as shown in plate XXVIII) in order to allow a free circulation of air between the cover and the hives.

JULY.

In some places swarming continues as late as the middle of this month; but as soon as pasturage becomes scarce, which it does in most places about this time, no more need be expected.

All colonies should be properly organized and have their hives full of combs and stores at this time, and all full honey boxes removed. The bees work but little during the remainder of the month, and should not be opened or disturbed during the hours of labor. Many bees are seen to cluster on the outside of the hive, but no swarms need be expected unless pasturage is abundant, which is but seldom the case (except in highly favorable districts) unless specially prepared for them.

AUGUST.

Where bees have but little pasturage, as is the case in many places, they remain inactive, except they are excited to rob each other; hence it is wrong to open hives so that the combs are exposed.

Do not feed any in this month, as it creates undue activity that is injurious. Where buckwheat or other honey-producing plants are cultivated in sufficient quantities, bees gather and store honey with great rapidity during this month; in which case, empty boxes are to be supplied and full ones removed without delay. On wild lands, where the golden-rod and other fall flowers prevail, this and the following month afford a large yield of honey with which the winter quarters are amply stored, besides a large surplus for their owner.

Each hive should be examined about the last of this month, to see that they have a queen; this can be ascertained either by removing the rear slide F, or front slide H, then by driving the bees from a portion of the comb it is readily seen if there is worker brood, this is a sufficient test; if brood cannot thus be found, then lift out the combs to determine with certainty. This test will not usually apply much later in the season than the last of this month.

SEPTEMBER.

The accumulation of honey terminates for the season in most places sometime during this month. This event should be watched for, and as soon as it occurs such hives as are not wanted, or are not suitable for stock hives, should be deprived of their honey and the bees united with those of other hives having abundant stores. (For directions, see Chap. XXVIII.)

All refuse combs, particularly those from which the honey has been drained, may be put into a suitable box and placed in the honey chamber of stock hives for the bees to clean up the remaining honey. As this is likely to incite to robbery, care must be taken to guard against it. This is best done by closing the entrance of the hive and admitting air through the ventilating chamber. If the hive is kept shaded, the bees may be kept confined for one or two days in safety.

By prompt attention to the above, there will not only be a large amount of honey saved, but also the lives of many bees which would otherwise be lost in their attempts to rob other hives; for it is a notorious fact that where there are weak hives the annoyance by robbers is much greater than where the whole stock are uniformly strong.

The entrance of the hives should be contracted as the weather becomes cool; this will protect the bees from cold, and enable them to better guard against their enemies. Care should be taken to *destroy moths* and thus prevent, in a measure, a numerous progeny of worms in the following spring.

OCTOBER.

The season of gathering from flowers is now mostly over. Hives that have not enough stores should be supplied with full combs, or fed an amount that will last them till the return of spring. The less bees are disturbed, the less trouble there is with robbers, and the better it is for the bees. As the weather grows colder, the entrance should be reduced, as also the ventilating apertures.

NOVEMBER.

The harvest is now fully past; but few days during the next four months will be so mild or inviting as to induce the bees to go out of their hives. Having improved the shining hours, they are prepared to safely endure this long confinement with comfort, being surrounded with plenty.

The bee-keeper has now important duties to perform in preparing his bees for winter. I recommend letting the hives remain on the summer stands during the winter. Each hive is to be arranged as follows: Remove the honey boxes *e e* and honey-board *L*; (these are to be placed away in a dry and safe place until wanted in the following spring) then cover the tops of the main frames *K* with a linen or other cloth, and on the top of this place a quantity of dry material, such as old clothes, leaves of trees, (white oak is best) paper, or moss.

The glass frame *k* is to be taken out, and a cloth so placed that when it is reïnserted, the cloth intervenes between the glass and the main frames. The upper apertures in the sides of the hive are to be opened, to admit a circulation of air, and are to remain so till the following spring; at which time they should be partly closed. The slide *F* is to be taken out, and the propolis removed from the wire screens covering the apertures *G G*; this is easily done if cold, by scraping, or if warm, by fire or boiling water.

The curtain *C* should be in its place; the apertures *L*, in the sides of the hive, are to be opened about one-half; this is done by turning the attached covers. Thus, by the arrangement of the graduating chamber *B*, in combination with the curtain *C*, and air passages *E* and *G G*, air is admitted to the bees, while piercing winds and light are excluded, which preserves their vitality, and keeps them in a state of repose and health superior to any other known method.

A quantity of lump charcoal, oak leaves, or moss, placed in the graduating chamber so as not to interrupt the free passage of air, will further protect the bees from moisture and cold.

As soon as the above arrangements are completed, the front entrances are to be entirely closed, so that no light can enter; when it is desired to let the bees have their liberty, these can be opened; after which they are again closed. Each hive should be entirely enveloped with canvas, or straw bound around, being careful not to obstruct the air passages. The hives should be covered to keep them dry and secure, to prevent their being blown over.

Common chamber or other hives should have apertures made as represented in plates XXIII and XXIV, with ventilating blocks attached.

During winter, all the apertures should be kept closed, and air admitted through these ventilators, allowing the bees to have their liberty at suitabls intervals during mild weather.

The hives should also be protected by means of canvas or straw, as above directed.

The advantages gained by this arrangement are:

FIRST: A more equable temperature within the hive.

SECOND: Protection from piercing winds and moisture, whereby the health of the bees is greatly promoted, and the texture of the combs preserved.

THIRD: It effectually guards against all danger of smothering the bees; there are more bees lost from the latter cause than there are from worms and all other enemies combined.

DECEMBER.

The bees having been arranged as directed for the previous month, the labors of the year are brought to a close by occasionally noticing that the hives remain undisturbed.

CHAPTER XXVI.

ITALIAN HONEY BEE.

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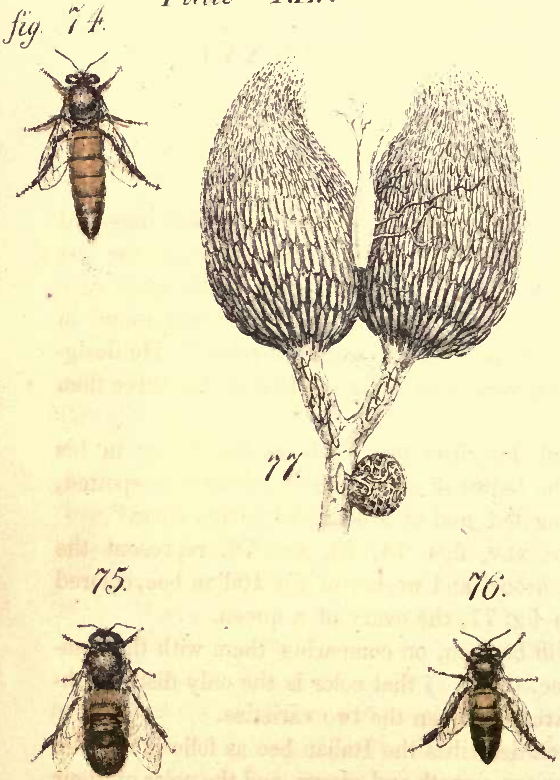
Plate XLV.



Lith^d by Geo. H. Baker Sac.

CHAPTER XXVI.

ITALIAN HONEY BEE.

Bees bearing the above name have been imported into the United States from Europe within the last two years. They are supposed to be the same variety described by Aristotle as "small and round in size and shape, and variegated in color." He designates this variety as being the best of the three then known.

Virgil describes two kinds as flourishing in his time, the better of which he describes "as spotted, or variegated, and of a beautiful golden color."

Plate XLV, figs. 74, 75, and 76, represent the queen, drone, and worker of the Italian bee, colored to life; fig. 77, the ovary of a queen.

It will be seen, on comparing them with the common bee, (plate I) that color is the only distinguishing feature between the two varieties.

Busch describes the Italian bee as follows: "The workers are smooth and glossy, and the color of their abdominal rings is a medium between the pale yellow of straw and the deeper yellow of ochre. These rings have a narrow, black edge or border, so that the yellow (which might be called leather-colored) constitutes the ground, and is seemingly barred over by these slight black edges, or borders. This is most distinctly perceptible when a brood comb, on which bees are densely crowded, is taken out of a hive. The drones differ from the workers in having the upper half of their abdominal rings black and the lower half an ochrey yellow; thus causing the abdomen, when viewed from above, to appear annulated. The queen differs from the common kind chiefly in the greater brilliancy of her colors."

The following advantages have been claimed for the Italian bee over the common kind:

"*First:* that the Italian bees are less sensitive to cold than the common kind. *Second:* that their queens are more prolific. *Third:* that the colonies swarm earlier and more frequently; of this, he (Berlepsch) has less experience than Dzierzon. *Fourth:* that they are less apt to sting; not only are they less apt, but scarcely are they inclined to sting, though they will do so if intentionally annoyed or irritated. *Fifth:* that they are more industrious. Of this fact, he had but one summer's experience; but all the results and indications go to confirm Dzierzon's statements, and satisfy him of the superiority of this kind *in every point of view. Sixth:* that they are more disposed to rob than common bees, and more courageous and active in self-defense. They strive on all hands to force their way into colonies of common bees; but when strange bees attack their hives, they fight with great fierceness, and with an incredible adroitness."

EXTRACT FROM THE CALIFORNIA CULTURIST.

"During the last two years, we have heard a great deal upon the subject of the introduction of the Italian bee, its superiority, in many respects, over the common black honey bee, and the attempts made to introduce it, not only in the Atlantic States, but in California. There is so often a disposition to overestimate the advantages or value of introductions from foreign countries, with a view of obtaining large or speculative prices therefor, that we have watched the progress of the introduction and culture of the Italian bee, and commented upon such successes as we could find available, rather than recommended positively anything from personal knowledge. We believe, however, that the superiority of the Italian bee is no longer questionable, even among apiarians who have large stocks of the common bee for sale.

"We take pleasure in introducing proof of this, that those who may have been in doubt, may have their doubts removed, and at once obtain this superior breed; just as the stock-grower would a superior breed of horses, cattle, or sheep.

"Apiarians of the United States are generally aware of the persevering efforts of Mr. S. B. Parsons, of Flushing, L. I., to introduce the Italian bee, and that his efforts have, in the main, been eminently successful. We have thought it might be interesting to bee-keepers, and many who intend to be, to hear relative to the genuineness of his stock. But without relying solely upon his statements in regard to the intrinsic merits of his own hobby, we give the experience of others, in the shape of letters, entirely reliable and conclusive."

LETTER FROM A. J. BIGLOW.

EDITOR CULTURIST :—Knowing that you have taken a deep interest in the propapation of the honey bee in California, I have taken the liberty to address you on the subject of the Italian bee. I am on a visit to the Atlantic States, to satisfy myself whether they are actually superior to the common bee. I am fully satisfied that they are. I find a greater difference between them and the common kind, in their appearance, than I expected. The Italians are truly beautiful, to one who is an admirer of the industrious little insect. There are two or three parties who have imported the Italian bee from Europe; but, as far as I could learn, there are only two queens in this country that are direct from the mountains of Italy, where the black bee is not known; they are in the hands of Mr. S. B. Parsons, of Flushing, N. Y. I have procured a few queens of him, and shall use every effort in my power to try and get them through safely to California. For their capacity to gather honey, I refer you to Mr. Parsons' statements, and others to whom he refers.

A. J. BIGLOW.

NEW YORK, Sept. 28th, 1860.

LETTER FROM S. B. PARSONS.

Having received sundry requests from gentlemen in California to supply them with Italian queens from the stock which I brought from Italy, I have made arrangements with A. J. Biglow, of Sacramento, corner of Nineteenth and J streets, to take out a number, from which I can supply those gentlemen, and some others, who may desire them.

He is now preparing the bees, and will soon be ready to leave. The terms on which he can supply them will depend upon his success in carrying them, and will be made known soon after his arrival.

I obtained these bees in a section where no other race exists. I have not felt like endorsing all that was said of them by German writers, until they had been tested by reliable men here. However beautiful may be bright colors and graceful forms, I felt that these were of comparatively little importance; that the great question was—Will they make more honey than the common bee? My own experience, this summer, has been entirely satisfactory in this respect; but I am unwilling to rely entirely upon my own, when I have that of others.

The following letters prove conclusively that the progeny of those bees which came from Italy, have far surpassed the common bee, the past summer, in the production of honey.

One is from the Rev. Mr. Langstroth, so well known to all bee-keepers as a careful, conscientious man, and the author of the best work on bees that has yet been written. Another is from Dr. J. P. Kirtland, a well known naturalist, of Ohio, whose simple word is sufficient with all who know his truthfulness, his habits of accurate observation, and his caution in giving his opinion on any subject. The third is from Mr. Brackett, published in the September number of the *Agriculturist*, and appreciated as the evidence of an unbiased man, who is as skillful an apiarian as he is a successful sculptor.

To these letters, I would invite the attention of all who desire information of the qualities of this beautiful and industrious race.

S. B. Parsons.

Flushing, L. I., Sept. 27th, 1860.

LETTER FROM REV. L. L. LANGSTROTH.

I have three colonies (artificial swarms) to which Italian queens were given in June. All of the common bees appear to have died; and if we may judge from the working of these colonies, the Italians will fully sustain their European reputation. They have gathered more than twice as much honey as the swarms of the common bee. This, however, has been chiefly gathered within the last few weeks; during which time, the swarms of common bees have increased but very little in weight. The season has been eminently unfavorable for the new swarms, (one of the very worst I ever knew) and the prospect is, that I shall have to feed all of them except the Italians.

L. L. Langstroth.

August 24th, 1860.

LETTER FROM DR. J. P. KIRTLAND.

In your last letter, you expressed a wish to hear from me the result of my experience with the Italians, etc.

First. Their disposition to labor far excels that of the common kind. From the earliest dawn of day to the arrival of evening, they are invariably passing in and out of the hive, and rarely suspend their work for winds, heat, or moderate showers—at times when not a solitary individual of the common kind is to be seen. Two hours, each day, their labors are extended beyond the working time of the last named kind.

Second. Power of endurance, and especially of resisting the impression of cold, they possess in a marked degree. Since the buckwheat, salidagoes, and asters have flowered in this vicinity, the nights have been remarkably cold. This low temperature has in a great measure suspended the efforts of the common bees, and they have been eating their previously accumulated stores. Not so with the Italians; they have been steadily accumulating honey and bee-bread, and rapidly multiplying their numbers. They seem peculiarly adapted to resist the chilly atmosphere and high winds, which predominate in autumn, on the shores of Lake Erie.

THIRD. Prolificness they equally excel in. Both my full and half-blooded stocks have become numerous and strong in numbers, as well as in stores, at this late season of the year, when the common kind have ceased increasing, and have become nearly passive.

FOURTH. Their individual strength is greater; and this is well illustrated in their prompt manner of tossing to a great distance any robber that chances to approach their hive.

FIFTH. Their beauty of color and graceful form, render them an object of interest to every person of taste. My colonies are daily watched and admired by many visitors.

SIXTH. Of their moral character, I cannot speak favorably. If robbery of weaker colonies is going on, these yellow-jackets are sure to be on hand. So far as my experience has gone with them, I find every statement in regard to their superiority sustained.

They will no doubt prove a valuable acquisition to localities of high altitudes; and will be peculiarly adapted to the climate of Washington Territory, Oregon, and the mountainous regions of California.

J. P. KIRTLAND.

CLEVELAND, Ohio, Sept. 13th, 1860.

EXTRACT FROM THE AMERICAN AGRICULTURIST.

"We are yet unable to offer any well founded opinion as to whether the recently imported Italian bees will prove really superior to our common native bees, or not. They are being rapidly propagated and diffused over the country; and to secure this result, the main effort is now directed. Another season will be required to determine their merits. The fact that so many of our oldest apiarians have considerable confidence in them, argues well in their favor. We have watched their multiplication from a single swarm, and if the rate of increase be as great at other points to which the queens are being daily dispatched, it will not take long to fill the country with them—if such a consummation be desirable. Below we give an extract from a letter, dated August 10th, written by Mr. E. A. Brackett, the well known sculptor, who is an enthusiastic amateur in bees also. His suggestion in regard to improving bees, by care in selecting breeding queens, is worthy of attention. All kinds of domestic animals have been brought to a much higher standard, by special care in breeding. Why may not our common bees be in like manner improved? No attention has been given to this subject, so far as we know. Let some one of our bee-keepers try the experiment.

"Who knows but that in a few years, we may get a race of bees that shall rival the humble bee in size, and in ability to extract sweets from a large class of deep-tubed flowers, such as the red clover, and others, which are now useless for the common honey bee. We hope those who undertake the enterprise, will remember to try to breed out their stings. From a honey bee of the size of the humble bee, with the sting developed in proportion, may the fates deliver us. (Speaking of stingless bees, we may mention that our friend A. O. Moore, Esq., who recently returned from a tour of several months in Central America, brought with him two varieties of stingless bees, which he left in our office for several days. They are quite peculiar and interesting, and we hope to give a further description of them, with engravings of their appearance, mode of depositing honey, etc.) Here is an extract from Mr. Brackett's letter previously referred to:

"* * * I think it too soon to form any certain opinion in regard to the Italian bees in this country. We must, therefore, still in a great measure, depend on the statements of German bee-keepers; and that is universally in favor of their great superiority over the black bee. Dzierzon states, that since he has Italianized his apiaries, his yield of honey has been double that obtained from the same number of common bees. My experience, thus far, satisfies me that they have not been overrated. The queens are larger and more prolific. The workers, when bred in comb of their own building, are longer, and their honey sacs larger. They are less sensitive to cold, and more industrious.

"In all my handling of them—and I have done so pretty freely, lifting the combs, and examining them almost daily—I have never known one to offer to sting. A queen that I received in June, and introduced to a strong stock of bees, in eleven days filled thirteen sheets of comb with brood and eggs. There is at present scarcely a black bee in the hive, so rapid has been the change. Although I have taken from it large quantities of worker brood and sealed drones, the hive is still overflowing.

"Allow me to suggest to you an idea that may be of importance. These bees come from the Italian Alps, where they have received no attention. They are in a state of nature, susceptible, in my opinion, of great improvement, at least, as far as form and color goes, by culture and careful breeding. In order to do this, they should be allowed to build their own comb, as soon as may be, and the largest and best colored queens be selected to breed from; avoiding breeding in-and-in as much as possible.

"I have received a letter from a friend, stating that one of his queens is quite dark; and he seems troubled about it. A little knowledge, if not a dangerous thing, is sometimes an uncomfortable one. Any one at all familiar with common black bees, knows very well that their queens vary much in color, and I see no reason why the Italians should not do the same, within certain limits, and still be true to the race. Those who are anxious to have high-colored queens, must resort to careful breeding."

A. J. BIGLOW'S EXPERIENCE, ETC.

SACRAMENTO, December 29th, 1860.

MR. J. S. HARBISON:—*Dear Sir.*—At your request, I have much pleasure in giving you what few items I have gathered since my connection with the Italian bees, and my experience with them.

Having received an invitation from Mr. S. B. Parsons to become his agent in California and Oregon, through recommendation of Rev. L. L. Langstroth, I left Sacramento on the first of September last for the Atlantic States. While there, preparing the bees for shipment, I made many inquiries of different apiarists in reference to different importations of Italian bees, my object being to gather facts in relation to them. The following items I find in the *Country Gentleman* of November 1st, which corresponds with the results of my inquiries. "Richard Colvin, of Baltimore, and Samuel Wagner, of York, Pennsylvania, have made several attempts to import these bees, but had been unsuccessful until the autumn of 1859, when Mr. Colvin succeeded in getting a few stocks through safe; which, however, did not survive the winter.

"Next in order of date, is the importation of Mr. P. J. Mahan, of Philadelphia.

"In the spring of 1860, Mr. S. B. Parsons, of Flushing, L. I., succeeded in getting a few stocks alive direct from Italy.

"The last successful importation was by Messrs. Colvin & Wagner, sometime during the past season. Two of these importations are from Germany, and one from Italy."

The Italians that I have brought out are of Mr. Parsons' importation; the queens were nearly all hatched in the month of September; some, however, as late as October.

I prepared one hundred and thirteen packages, with about one-third of a swarm of common bees in each package, and introduced Italian queens as soon as they became settled; the queens filled the combs with eggs. I engaged passage on the steamer Ariel, which left New York on the first of November, and arrived at Aspinwall on the ninth. I remained on the Isthmus ten days, and allowed the bees to fly five days.

Upon giving them their liberty, they immediately commenced work, gathering pollen and honey.

During these five days, I examined each package and removed all dead bees. I found the brood had all emerged from their cells, and the queens again depositing eggs in abundance.

On the eleventh of November, one of the swarms deserted its hive and entered one of its neighbors, which resulted, as I ascertained the next morning, in the death of the two queens.

I divided the double swarm, and returned a part of the bees to the empty package, and gave them both a comb containing eggs, and shut them up, and did not open them again until the thirteenth of December, when I found as perfect a queen to all appearance in each hive as I ever saw, and a large number of queen cells that had been destroyed.

I have been thus particular in giving an account of this rearing of queens *at sea*, while confined in their hives, as it may be of interest to naturalists. No water was given to my bees during the voyage.

I sailed from Panama, on the steamer Uncle Sam, on the twentieth of November, and arrived at San Francisco on the morning of the sixth of December; shipped that evening on the steamer for Sacramento, where I arrived on the seventh inst., one month and seven days from New York. I overhauled the bees as soon as convenient, and found one hundred and eleven alive, out of the one hundred and thirteen.

Many of the swarms had as many bees when I arrived at Sacramento, as when I left New York. I attribute my success to the rearing of so many young bees on the passage from New York, to San Francisco.

On the twenty-first of December, I introduced some twenty *Italian queens* into native stocks of bees, which I examined before removing the native queen, and did not find a single egg. Two days after I let the Italian queens out of their cages, I found eggs in abundance.

It is my firm conviction, from what I have seen and heard of these bees, that they are peculiarly adapted to the Pacific coast, especially the mountainous region of California and Oregon, as the climate so nearly resembles that of their native home. Yours, with respect,

A. J. BIGLOW.

BREEDING OF ITALIAN BEES.

Mr. Langstroth says: "The chief obstacle to the rapid diffusion of this valuable variety has been the difficulty experienced by the ablest German apiarians in preserving the breed pure; even Berlepsch having failed entirely to do so." "From one Italian queen sent him by Dzierzon, Berlepsch succeeded in obtaining, in the ensuing season, one hundred and thirty-nine fertile young queens, of which number about fifty produced pure Italian progeny."

"It is a remarkable fact, that an Italian queen impregnated by a common drone, and a common queen impregnated by an Italian drone, do not produce workers of an uniform intermediate cast, or hybrids; but some of the workers bred from the eggs of each queen will be purely of the Italian, and others as purely of the common race; only a few of them, indeed, being apparently hybrids. Berlepsch also had several bastardized queens, which at first produced Italian workers exclusively, and afterwards common workers as exclusively. Some such queens produce fully three-fourths Italian workers; others, common workers in the same proportion. Nay; he states that he had one beautiful orange-yellow bastardized Italian queen, which did not produce a single Italian worker, but only common workers, perhaps a shade lighter in color. The *drones*, however, produced by a bastardized *Italian* queen are uniformly of the Italian race; and this fact, besides demonstrating the truth of Dzierzon's theory, renders the preservation and perpetuation of the Italian race in its purity, entirely feasible in any country where they may be introduced." S. Wagner, page 324, in "Hive and Honey Bee."

Mr. Wagner very frankly admits that there are a few bees apparently hybrids. This fact, of itself, is sufficient evidence of the inutility of relying on or practicing the theory which he advances. It also proves conclusively to my mind that the theory is not well founded; or, at least, is of no practical value.

Mr. Langstroth says—p. 43, "Hive and Honey Bee"—that "all the leading facts in the breeding of bees ought to be as familiar to the apiarian, as the same class of facts in the rearing of domestic animals." In this opinion I fully concur. Hence I make the following extract from the same work, for the purpose of correcting what I conceive would be an error in practice, (though not in fact) that ought never to have been recommended to bee-keepers.

"Dzierzon found that a queen which had been *refrigerated* for a long time, after being brought to life by warmth, laid only male eggs, whilst previously she had also laid female eggs. Berlepsch refrigerated three queens by placing them thirty-six hours in an ice house, two of which never revived, and the third laid, as before, thousands of eggs, but *from all of them only males were evolved.* In two instances, Mr. Mahan has, at my suggestion, tried similar experiments, and with like results. It does not seem to have occurred to the German apiarians *that by this refrigerating process, we may secure* as *many Italian drones as we need.*

"All that is necessary is to convert by it one or more of the queens of the nuclei into *drone layers.* The reception of an Italian queen quite late in the season may thus be turned to good account."

Exclusively drone laying queens, as well as fertile workers, are monstrosities; then why seek to breed from either of them? Even admitting that it were practicable to do so, there is no necessity for it, as the number of both queens, drones and workers that may be bred from a small number of *perfect queens* is almost without limit.

So well are "all the leading facts in the breeding of bees" known, that they are now increased with as much certainty as that of any of our domestic animals.

CARE REQUIRED IN BREEDING.

Great care will be required in propagating the Italian bees, to keep the breed pure, or up to the standard of the imported ones. This can only be done by removing them away a distance of not less than five miles from all of the common kind, for the purpose of having the young queens impregnated by Italian drones.

Each person should commence with not less than two Italian queens, in order that the queens bred from one hive may be impregnated by the drones of the other, and *vice versa*, as hereafter directed.

New beginners in apiarian pursuits will do well to procure full hives, whether of Italian or common bees, with which to commence the business.

When queens are procured for the purpose of uniting with common bees, select thrifty hives for that purpose, being careful to remove all drones and drone brood, and supply them with empty drone and worker comb. The queens are then to be united as directed in Chapter XXVIII.

After the queens become fairly established, with both worker and drone brood sealed up, with the season and pasturage favorable, proceed to make primary divides, and form *queen nurseries* from the two Italian hives at the same time, as directed in Chapter XVII.

When the queen cells are sufficiently advanced to be used in supplying to *colonies*, bees and comb are to be selected from common hives in the usual manner, except that no drones or drone brood are to be taken from them, but in their stead, drones and drone brood are to be taken from one Italian hive and put with the embryo queens taken from the other, making the exchange mutual.

All the colonies supplied with embryo queens taken from one hive and drones from the other, are to be immediately transported to one place, which should be at least five miles from all common bees, as before directed, while all the colonies formed reversely are to be taken to a different place. By this method breeding in-and-in is prevented, and at the same time the breed is kept pure.

As fast as the queens become fertile, they are to be taken from the small colonies and supplied to full hives, and the colonies again used to perfect other queens in like manner. Thus a stock, no odds how extensive, may be quickly and surely Italianized.

It will, however, be necessary to Italianize all the bees of a neighborhood, to prevent them crossing with the common bee.

Parties having apiaries remote from all others, who will at once Italianize all their stock in the manner I have indicated, *and constantly select the* FINEST QUEENS AND DRONES from which to breed, and avoid breeding in-and-in, will be able, not only to preserve the breed equal in purity to the imported stock, but to improve it.

From my own experience, I am satisfied that the common bees are capable of being improved in like manner.

In closing this chapter I would remark, that it is by no means certain that the Italian bee will possess all the advantages, and to the extent claimed for them. From the number scattered over the country, and in different hands, a few months will suffice to decide the matter.

Let each person who tries them, institute comparative experiments, side by side with the common bee, and thus decide their merits.

The interest awakened, and the knowledge obtained in the business of bee-keeping, by such a course of experiments, will alone more than repay for the trouble, besides advancing an interest that is yet in its infancy.

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CHAPTER XXVII.

STINGLESS HONEY BEE.

PLATE XLVI.

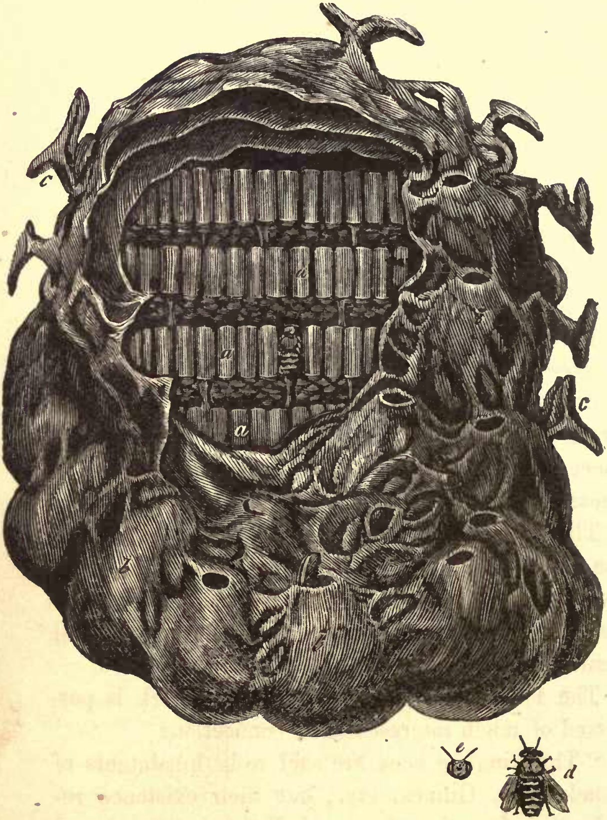

FIGURE 78.

CHAPTER XXVII.

STINGLESS HONEY BEE.

A VARIETY of the honey bee without stings (to which fact their name is owing) has long been known to exist in South America. They also exist in Central America and Mexico.

Dr. Bevan, in his "Honey Bee," says: "It was proposed a few years ago to import the stingless bees into this country" (England). "If such bees there be, I very much doubt its ever being attended with success, as the fruits of their labor must very soon become a prey to wasps and bees of the country."

The subject of introducing this variety of bees to the United States has also been proposed and discussed, by many of the public journals, within the last few years, but thus far without any practical results.

The following extract from Bevan's work is possessed of much interest in this connection:

"The stingless bees are said to be inhabitants of Guadaloupe, Guinea, etc.; but their existence requires confirmation, for an indisposition to wound affords no evidence of inability to do so. Queens were formerly supposed to have no sting. According to Sir J. G. Dalyell, *there are bees in India that construct under the boughs of a tree a single comb of very large dimensions*."

The most interesting account of exotic bees that I have met with, is in Captain Basil Hall's highly instructive and interesting journal, written on the coast of Chili, Peru and Mexico, in 1820–'21 and '22, of which I shall here give a transcript.

"From the Plaza, we went to a house where a bee-hive of the country was opened in our presence. The bees, the honey comb, and the hive differ essentially from those in England. The hive is generally made out of a log of wood, from two to three feet long and eight or ten inches in diameter, hollowed out and closed at the ends by circular doors cemented closely to the wood, but capable of being removed at pleasure.

"Some persons use cylindrical hives, made of earthern-ware, instead of the clumsy apparatus of wood; these are relieved by raised figures and circular rings, so as to form rather handsome ornaments in the verandah of a house, where they are suspended by cords from the roof, in the same manner that wooden ones in the villages are hung to the eaves of the cottages.

"On one side of the hive, half way between the ends, there is a small hole made just large enough for a loaded bee to enter, and shaded by a projection to prevent the rain from trickling in. In this hole, generally representing the mouth of a man, or some monster, the head of which is moulded in the clay of the hive, a bee is constantly stationed, whose office is no sinecure,* for the hole is so small, he has to draw back every time a bee wishes to enter or leave the hive. A gentleman stated to me that the experiment had been made by marking the sentinel, when it was observed that the same bee continued at his post a whole day.

"When it is ascertained, by the weight, that a hive is full, the end pieces are removed and the honey withdrawn. The hive we saw opened was only partly filled, which enabled us to see the economy of the interior to more advantage. The honey is not contained in the elegant hexagonal cells of our hives, but in wax bags not quite so large as an egg. These bags, or bladders, are hung round the sides of the hive, and appear about half full; the quantity being probably just as great as the strength of the wax will bear without tearing. Those near the bottom, being better supported, are more filled than the upper ones." (Mr. Jesse, in his gleanings upon the au-

* If the Mexican bees enter the hives with as much rapidity, and in as great numbers as Reaumur states they do in this part of the world, it would indeed be no sinecure. He observes that the population of a hive amounts to 18,000, and that a hundred enter in a minute; if as many go out in the same time, I think the sentinel must rather stand on one side of the entrance than within it. Captain Beechey states that it withdraws on one side to a recess adapted for the purpose, and that a Mexican family of bees is not believed to amount to more than one thousand.

thority of a naturalist residing in Demerara, states that the honey sacs in the lower tier rest on the floor, and resemble the broad-bottomed, long-necked bottles used in Holland.) "In the center of the lower part of the hive we observed an irregular shaped mass of comb furnished with cells, like those of our bees, all containing young ones in such an advanced state, that when we broke the comb and let them out, they flew merrily away.

"The naturalist just referred to says, that these breeding-combs are suspended from the roof of the hive, in separate pieces, about two inches in diameter, and that the cells are on one side only. Captain Beechey states that these combs vary in their position, some being perpendicular, others horizontal; and the bees being smaller than those of Europe, the brood cells, as might be expected, are smaller also. During the examination of the hive, the comb and the honey were taken out, and the bees disturbed in every way, but they never stung us, though our faces and hands were covered with them. It is said, however, that there is a bee in the country which does sting, but the kind we saw seem to have neither the power nor the inclination, for they certainly did not hurt us, and our friends said they were always *muy manso*, 'very tame,' and never stung any one. The honey gave out a rich aromatic perfume, and tasted differently from ours, but possessed an agreeable flavor. This honey does not readily ferment, but has remained perfectly sweet and grateful after its importation to this country."

Mr. A. J. Biglow, the well-known apiarist of Sacramento City, California, while on his return from the Atlantic States, with Italian bees, in November, 1860, procured nests of two varieties of stingless bees while on the Isthmus. He brought them home with him, but, unfortunately, all the bees of both were found dead on his arrival.*

Plate XLVI, fig. 78, represents a side section view of the nest of the variety alluded to by Bevan.

a a a are horizontal tiers of brood cells, so arranged that the young bees are bred in a perpendicular direction with the head upwards, which is the reverse position of wasps, yellow-jackets, etc.

b b are honey pots, composed apparently of resinous gum or propolis, with a portion of wax intermixed. Whether any of the substance is an animal secretion, is to me unknown. No allusion is made to this particular in any of the accounts which I have had.

The pots vary in size, averaging, however, about one inch in diameter and one and one-half inches in depth; resembling, somewhat, an egg, with the large end downwards.

They are of an irregular shape, but so joined together as to leave no space between them, and are placed so as to surround the brood cells.

A portion of the pots are sealed up, while others are shown open at their tops.

---

* I am indebted to Mr. Biglow for his kindness in presenting the nests to me, for the purpose of having drawings taken and engravings prepared for this work.

The color of the brood cells is light brown, while the honey pots are dark brown. The honey is of a slightly reddish tint and musky flavor ; not as pleasant to the taste as common honey. This, however, is doubtless owing to the flowers from which it is gathered ; as the honey gathered by the Italian bees during Mr. Biglow's sojourn on the Isthmus, was of the same character.

The stingless bee is much smaller than the common bee, and resembles a fly almost as much as it does a bee. *d* represents it life size, and *e* the head separate. They are of a yellowish-gray color, having the rings of the abdomen striped ; the joints or folds being yellow and the centers of the rings gray. Their bodies are thickly set with fine down-like hair.

I have made careful examinations, and find them to be without stings. As a means of defense, they resort to biting with their jaws, and darting at their enemy in a menacing manner.

This variety of bee doubtless might be made profitable in most of the warm latitudes.

This nest was found within a recess in the wall of a stone building in the city of Panama. The room in which the nest was found, was also occupied by a family of the natives, who, together with the bees, entered by the same door.

The space occupied by the nest was of a capacity of about eleven hundred cubic inches ; three-fourths of which was occupied by the honey pots, and the balance by the bees and brood cells.

The other variety of the stingless bee brought by Mr. Biglow, was about half the size of the foregoing. It, however, constructs its nest in a somewhat similar manner; but it is mostly made of mud, instead of propolis and wax. This nest was taken from out of the iron railroad bridge spanning the Gatune River. They are mostly found built on trees.

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CHAPTER XXVIII.

MISCELLANEOUS.

PRECAUTION IN SUPPLYING QUEENS.

It is often necessary to supply queens, either to queenless hives or those made so by division, and exchanging Italian for common ones. And as the bees, in most cases, will attack and kill a stranger queen when first introduced, or when she first attempts to enter the hive, precaution must be taken to prevent it.

This is effectually done by imprisoning the queen to be supplied in a cage (plate XXIX, fig. 52) made of wire cloth, and the ends closed with corks. It is well to put a small amount of honey, or a few well-fed workers, in the cage with her; the honey should be given by saturating a small piece of sponge with it so as to prevent the queen from getting bedaubed. Then open the hive to which she is to be given and remove their queen, if in possession of one; this may be done with advantage a few hours previous to supplying the queen. Then place the cage containing the queen within the cluster of bees, in order that they may become acquainted and acquire a sameness of scent before she is allowed her liberty.

This is best done by removing a frame (if the hive is full) of comb from adjoining the brood and substituting an empty one in its place: the cage is then laid on the center bar of the frame so that the bees will be sure to cluster around her. The door and lid of the hive are then to be closed and kept so for ten or twelve hours. If the bees are fed liberally during this time, it hastens a reconciliation.

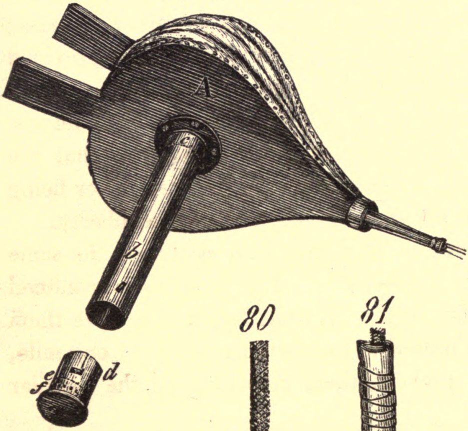
At the end of the above time open the hive again and set the queen at liberty, and at the same time observe if any bees are disposed to molest her as she mingles among them. If she moves off without being immediately attacked it is a sign that she is received, and the hive may be properly arranged without fear of failure. But if attacked, immediately return her to her cage and keep her confined for some time longer, which, however, need never exceed from eighteen to twenty-four hours from the time she is first imprisoned to ensure a safe reception.

UNITING BEES OF DIFFERENT FAMILIES.

Bees of different families may frequently be united with advantage. If done during the season of rapid breeding and gathering of honey, they will generally unite peaceably. But if not gathering honey, they are liable to kill one another; particularly the queen or queens, as the case may be, are liable to be killed by the bees of the opposite swarms. I have had queens of weak swarms killed in this way by uniting bees from other hives with them.

PLATE XLVII.

Fig. 79



80

81

A safe plan for uniting bees, is to feed the different swarms with all the food they will take, for at least one day; then select the queen to be given to them (all others are to be destroyed) and confine her in a cage. The bees to be united are then brushed or shaken on a sheet or table in a promiscuous mass; the hive intended to receive them being provided with comb and suitable stores, they are allowed to enter the same as an ordinary swarm. The imprisoned queen is to be placed in a position so that the bees are sure to cluster around her, and after being confined for about ten hours, to be set at liberty.

If the bees to be united have occupied the same apiary, it is necessary to either keep them confined for four or five days; or, what is better, remove them after being united to the distance of about one mile, which will prevent them returning to the familiar spot.

A very good way to unite bees would be to confine one part in a box, having one side of wire cloth, and place it in the hive with the ones to which they are to be united, on the same principle that queens are supplied.

FUMIGATOR.

Plate XLVII, fig. 79, represents a machine for producing and using smoke to conquer bees with, in an easy and efficient manner, and also to *guard against the danger of fire.*

a is a common hand bellows, to which is attached tube *b*. The tube is made of sheet iron, ten inches long and two inches in diameter; fine wire screen is securely fastened within the tube at the dotted line *c*, being within three-fourths of an inch of the end where attached. This wire is to prevent fire being communicated to or being drawn into the bellows.

d is a cap made to slip over the lower end of tube *b*, with a fastening to hold it in place; wire screen is also fastened inside of the cap, as indicated by the dotted line *e*; holes are made in the cap as represented at *f*.

Fig. 80 is a hollow cylinder made of coarse wire screen, around which cotton stuff is to be rolled, as represented in fig. 81.

This roll is then inserted into tube *b* (fig. 79) and after it is set on fire, the cap is adjusted; then, by working the bellows, air is drawn through the tube, and the smoke is blown out and among the bees as wanted.

ACCIDENTS.

Accidents, (so called) such as having a hive thrown over or the comb broken down while being transported, sometimes occur.

The best way to proceed in such cases is to open the hive, transfer the combs, or so much of them as are fit, to frames, in the same manner as directed in Chapter XIX, which, together with the bees, are to be placed in an empty hive as there directed. The remaining honey should be fed to them as fast as they can store it away, *being always careful to guard against robbery.*

NEW COMBS SHOULD BE SAVED.

New combs, or such as have not been used for rearing brood, may frequently be procured, as in case of uniting small swarms, or from honey boxes partly full. At the close of the season, any combs containing unsealed honey should be given to the bees for the purpose, both of augmenting their stores, and having the combs cleaned out. All such combs are valuable and should be carefully saved till the following season, at which time they are to be used for attaching in surplus honey boxes.

ATTACHING COMBS IN HONEY BOXES.

Combs may be attached in the honey box with great advantage and profit. The boxes are first to be completed, except attaching the bottom; the combs are then cut into pieces of a size ranging from an inch square up to six inches, according to the amount on hand, and the number of boxes required by the stock. Now take the boxes into a room, or expose them to the sun till they become quite warm; the combs to be inserted are to be kept cool, to prevent their being injured in handling.

Having the boxes and combs all in readiness either by the blaze of a candle or bright coals of fire, melt the edge of the comb to be attached, so that on being stuck to the wood where wanted, it will adhere.

Another way is to have melted wax and dip the edge of the comb into it, and then suddenly stick it where wanted. The wax should be barely liquid; otherwise, a sufficient quantity will not adhere to the comb to make it stick. A little practice will be required to determine the right temperature.

All the combs put into a box should be of the same size, and placed parallel with each other, with the centers an inch and a half apart.

In putting combs into section honey boxes, the sections should first be made ready to be coupled together. Combs about one inch square are then to be attached to the center of each frame, so as to be square with it when extended.

The advantages gained by thus using combs are: *First:* an amount of wax, and labor of the bee equal to the quantity of comb so supplied, is saved. *Second:* the bees are induced to commence work in boxes so supplied sooner than they otherwise would. *Third:* the combs are built straight and even, and in the desired direction.

The above advantages, either separately or combined, are of great importance, and should receive the careful attention of every bee-keeper.

FURTHER ON FEEDING.

At the close of the year, there are always honey boxes that are but partially filled; the honey being mostly uncapped is unfit for market, and is not profitable for table use. Such boxes should be put away in a dry place, and excluded from the air as much as possible, until the opening of the following spring; at which time they should be distributed to such hives as are most in need of food. The bees will consume the honey and leave the combs to be refilled when the honey season arrives.

This is a safe and easy way of feeding, and less likely to excite robbery than any other plan that can be practiced. It also economizes in the item of combs.

SUGGESTIONS TO HONEY-CONSUMERS.

Honey, like butter, is frequently very untidily handled. It is mainly owing to this cause that honey in the comb is more sought for than that which is strained.

Owing to the filthy habit of some people in smoking and using it to drive the bees from the honey, the latter is frequently so tainted with the fumes of tobacco as to be perceptible both to the scent and taste, although the honey may be perfectly sealed within the comb.

In straining honey, it is frequently subjected to heat, whereby the pollen and the impurities of the old combs used a part of each season for rearing brood are set at liberty, and become incorporated with the honey, rendering it both impure and of bad flavor.

On the other hand, honey that is separated from the combs while at a low temperature, and without pressure or use of water, and with all the appliances used in the process, *kept clean as well as* SWEET, will retain the fine aroma peculiar to all good honey. Air should be excluded as much as possible from honey, as it, together with cold, causes it to candy.

Honey will keep good for many years. As an illustration of this fact, my brother (A. Harbison) had a small box filled with honey during the month of August, 1845; in November, 1859, it still remained perfectly good.

There are large quantities of honey produced in the West India Islands, and imported into the United States, as well as to Europe, where it is known as *Cuba honey.* It is generally impure, owing mainly to bad handling and adulterations. Being had at a low price, it is, after being clarified, canned up and labelled "*pure honey*," and thrown into market.

There has been considerable honey imported from Mexico to California within the past year or two, and sold at a low price. It appears to be of a better quality than the Cuba honey, but will never compete successfully with that made in California, Oregon, and Washington Territory.

TERMS OF LETTING BEES ON SHARES.

As it frequently happens that persons wish, either to let or take bees on shares, the enquiry is often made as to what the terms should be. I therefore propose to state the terms usually made in such cases.

First. The party letting bees takes the risk of their dying, unless it results from inattention or carelessness, during the period for which they are let.

The party taking the bees to transport them to the place where they are to be kept, furnish the necessary enclosure, shades, hives for swarms, and attend to keeping the stocks in good order; watch for and hive the swarms as they issue; in short, perform all the labor required during the period of two years.

At the end of that time (unless otherwise agreed by the parties) the original stock, together with half their increase and products to revert to their original owner; who, in turn, bears the expense of their removal. The other half of the increase and products to belong to the party having them in charge.

The above terms have been most common, and properly apply where bees are managed on the old system, viz: keeping them in ordinary straw or box hives, letting them swarm as the means of increase, and killing the bees to get their honey.

If the bees are in good condition at the time of letting, the first year will be in favor of the party taking them, the second year the advantages would be about equal, and the third year in favor of the party letting them. Consequently, two years would be fair for both parties. If extended to a third, each party should be at an equal expense for the hives needed during said year.

SECOND. Where bees are kept in chamber or other hives, in which honey boxes are used for obtaining the honey, the terms are as follows:

If let for one year, the party letting the bees to find the honey boxes for the hives let, to remove and to have all the honey made in said boxes, together with the original hives at the end of the year.

The party taking the bees to furnish and to do all the things named in terms No. 1, the parties to share equally in the swarms and their products during or at the end of the year.

If let for two years, then the party taking the bees to furnish and to do all the things named in terms No. 1, together with honey boxes for the original stock during the first year; but during the second year, to find all the hives for the swarms and half the honey boxes for the whole stock, the party letting the bees furnishing the other half.

The parties to share equally all the honey made by the bees, both of the old stock and the swarms during said period. At the end of the two years, the swarms to be divided equally between the parties, and the original stock to revert as before.

And if let for a third year, then the terms to be the same as named for two years, except that during the third year each party shall furnish their respective share of the hives.

THIRD. Where bees are kept and managed by a skillful bee-keeper, competent to manage them on scientific principles, the terms for the first year should be as follows:

The party letting the bees to furnish in addition half of the hives and boxes, and the party taking them the other half, together with sheds, and to give all necessary attention. At the close of the season, a hive of bees for each original one, and equally full, to belong exclusively to the person letting said bees, and the increase to be divided equally between the parties. The above terms would also apply if extended to two years.

There are but few practical bee-keepers, however, who, having the means to purchase, will take bees on shares, as the labor of such devoted to the business can be made to yield a return equal in value to the stock, such as can be attended during a season, is worth at its commencement.

Where bees are let to an inexperienced person, and the necessary oversight furnished to secure their proper care and increase, then the terms should be varied accordingly, or other recompense be made by the party having the bees on shares, equal to the amount of assistance rendered.

PREPARING BEES FOR TRANSPORTATION.

In preparing bees for transportation two things are essential.

First. To confine them within the hive so as to prevent their escape, while being transported, otherwise there is great danger of their attacking the team used in their removal.

Second. To give the bees sufficient air to prevent their smothering during confinement.

The quantity of air required depends on the number of bees and brood in a hive, and also on the temperature of the atmosphere. If the ordinary chamber or box hive is used, it should be inverted and wire cloth tacked over the mouth, the hive to remain in the same position until it arrives at its destination; it is then to be turned right side up and set on the stand, and the bees allowed their liberty.

But if the Langstroth hive is used, it is to be kept in the usual position; after fastening the frames to keep them from rubbing together, wire cloth is to be tacked over the apertures in the honey-board, and also over the entrance passage in front.

To prepare the California hive for transportation, all that is ordinarily wanted is to turn the ventilating blocks so as to admit air, and fasten them to prevent their turning out of their places, and close the entrance passage to confine the bees.

But should the hive be crowded with bees, together with a large quantity of brood, and the weather warm, then the front slide (H) should be removed and wire cloth tacked over the opening, which not only affords ample air, but additional room for the bees. The passages leading to the honey boxes should be left open to allow the bees to ascend. The hive must be kept in an upright position at all times.

In addition to ventilation, hives of every description should be kept well shaded from the sun, and a free circulation of air allowed around them during the confinement of the bees. With the above precautions, together with careful handling, bees may be transported long distances, at all seasons of the year, with perfect safety.

CONCLUSION.

The reader who has had the patience to follow me thus far, and who has either commenced the business of bee-keeping or intends to do so, may here be reminded that all who commence are not successsful; neither are all successful in any other pursuit. "It has been said that three out of five who commence an apiary, must fail."

Why is it so? In most cases, it is owing to a lack of knowledge of the business. It is useless to incur expense in the purchase of stock and the preparation of fixtures, unless sufficient knowledge is obtained to enable one to properly manage the apiary, and sufficient energy and perseverance exercised to continue the management with efficiency.

Notwithstanding the cause of such failures is self-evident, people are frequently heard to say: "*I have no luck with bees.*" "*It is no use for me to try to keep bees, for I have tried them* ONCE, *and they did no good.*"

There should be no such words as either *luck* or *fail* in the bee-keeper's vocabulary; there is none such practically. "Good luck" (so called) either results from the possession and application of knowledge of the business, or the inherent vigor of the bees, favored by a genial season: while "bad luck" is always traceable either to ignorance, sloth, an ungenial season, or a combination of those causes.

Superstitious notions concerning the honey bee exist in the minds of some people, which have served to retard the business of bee-keeping. Namely: that it is wrong to sell bees—that luck will be lost thereby; that if a member of a family dies, the bees will do no good, unless they are informed of the fact, the hives turned upside down, or some other equally absurd performance gone through with.

There are many others, but the above are sufficient to illustrate the idea.

The light of science is rapidly removing the incubus from everything pertaining to the welfare of man; leaving *reason* to rule in its stead, and pointing out clearly the road to success; so that it need no longer happen that three persons out of five, nor one out of ten, who commence an apiary, must fail.

The business of bee-keeping, perhaps more than any other branch of agriculture, requires a knowledge of Nature and her laws, in order to make it successful in a pecuniary point of view. The pursuit of such knowledge always affords one of the most pleasing studies, and serves to ennoble and better the condition of mankind.

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ADVERTISEMENT.

Patent No. 22,500, dated January 4th, 1859, was granted to me for improvements in Bee Hives; but, owing to defective specifications, I now believe it is inoperative, and have made application to the Commissioner of Patents to be allowed to surrender the same, and ask for new letters patent for the same invention, to be issued for the residue of the period for which the original patent was granted.

The following are the claims of the amended specifications:

What I claim as my invention, and desire to secure by letters patent, is—

1st. Adjusting the narrow comb frames to a bee hive, so that they may be removed through the side or door of the hive. Substantially as set forth.

2d. Providing the comb frames with clamps for confining the comb. Substantially as set forth.

3d. A store honey box, made in sections, which are temporarily united, so that one or more sections, or the whole series of sections, may be taken away from the hive at will, and thus the honey sold by the whole box, or narrow sections of a box, at the market, and thus the wants of a purchaser suited, and a frame, or support for him to transport the honey in, is furnished at a slight extra cost. Substantially as set forth.

4th. The combination of an air chamber below the bottom of the hive, ventilating passages, and a curtain for excluding the light from the interior of the hive. Substantially as set forth.

J. S. Harbison.

The above patent (No. 22,500) covers the improvement in the California Hive. (See Chapter VII.)

The price of an individual right, entitling the purchaser to make and use the above Hive, in one and not more than two apiaries, is FIFTEEN DOLLARS. Any additional improvements hereafter made in Bee Hives by me, are hereby guaranteed to the purchaser without additional charge.

J. S. HARBISON, Patentee.

Patent No. 26,431, dated December 13th, 1859, for improvement in Bee Hives.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is—

Placing the bee comb, known as worker cells, in a horizontal, or nearly horizontal position, so that the cells shall be vertical, or nearly vertical, instead of horizontal, by the means or their equivalents. Substantially as set forth and represented.

J. S. HARBISON.

The above patent (No. 26,431) covers the Queen Nursery described in Chapter XVII.

The price of an individual right to make and use the same, is ONE DOLLAR.

J. S. HARBISON, Patentee.

For Individual, County or State Rights, to make and to use the California Hive, or the Vertical Queen Nursery, apply to W. C. HARBISON, Chenango, Lawrence County, Pa., or J. S. HARBISON, Sacramento City, California.

I hereby tender to all ministers of the gospel, and editors of newspapers throughout the United States, the right of the above patents, for their own personal use, free of cost.

J. S. HARBISON, Patentee.