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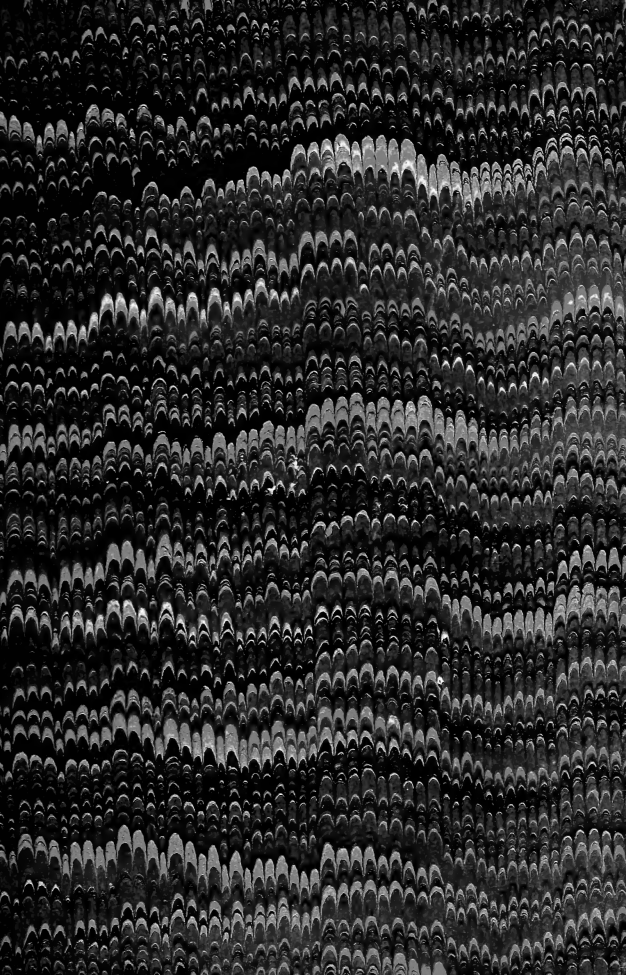
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ERRATA.

On the 7th page, 4th line, after "that" insert the word "the;" also in the last line of first paragraph, for "Mill Extractor," read "Mell Extractor;" 8th page, fourth line, for "thribble" read "treble;" 10th page, ninth line from bottom for "antenna" read "antennæ;" 12th page, third line, for "acknowledge." read "acknowledged;" same page, in explanation of cut, for "formally hatched" read "formerly hatched;" 14th page, tenth line from bottom, for "antenna" read "antennæ;" 16th page, third line, for "covex" read "convex."

There are many other slight errors in the work, but generally the reader will be able to arrive at the true meaning without further explanation

THE FARMERS' GUIDE

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BEE KEEPING.



BEING A PRACTICAL TREATISE IN EVERY DEPARTMENT OF
BEE CULTURE AND BEE MANAGEMENT.

By H. M. JOHNSON.

PRACTICAL APICULTURIST, MARSHALL, MICH.

ANN ARBOR.
COURIER STEAM PRINTING HOUSE.
1875.



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THE FARMERS' GUIDE

TO

BEE KEEPING

BEING A PRACTICAL TREATISE IN

BEE CULTURE

AND BEE MANAGEMENT,

12 ✓

By H. M. JOHNSON,

Practical Apiculturist, Marshall, Michigan.

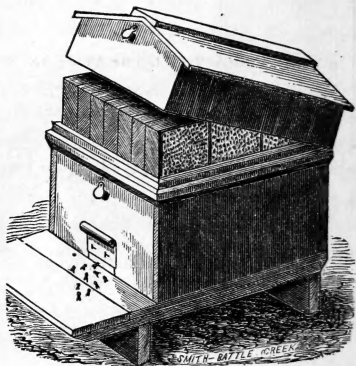


ANN ARBOR:
COURIER STEAM PRINTING HOUSE.

1872.

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Simple Movable Comb Hive.

Entered according to act of Congress in the year 1872,
By H. M. JOHNSON,
In the Office of the Librarian of Congress, at Washington.

PREFACE.

In offering this little work to the American public, the author's object is to supply the great deficiency in reliable apiarian literature: having himself felt the necessity of such information, on many occasions; and fully believing that thousands of others often experience the same want; he has been induced to compile and arrange all the facts known, in regard to apiculture, up to the present time; together with his own experience which has not been small.

It is his design to present all the necessary practical information for the keeping and culture of the honey bee, together with the secret of making them produce the greatest possible amount of honey, in such a simple and concise form, that any one may readily understand it, and be enabled to profit by it.

We are not writing a book for the critical scientist, or theoretical apiculturist, but for the ordinary bee keepers of the land. So that every individual, who may have but a single colony, may be able to know how to make it the most useful and productive, as well as he who devotes his whole time and energy to the business.

The proper care and culture of bees is becoming every year not only more of a science, but more of a business, and hence the greater the necessity of a brief

practical work, which will be within the reach of all, and easily understood by the common people.

Much of the information in regard to bee keeping, as given in the ordinary periodicals of the day, is not reliable, as many persons, with but little knowledge, and less experience, often imagine that they have made some new and wonderful discovery, straightway herald it forth and thereby deceive the inexperienced and unsuspecting, while others having some particular hive, or other article to sell, use their book as an advertising medium, and quite too often mislead and deceive.

The instruction and experience of one who has made it a study, and who has been a practical apiculturist for years, alone should be considered reliable. The author claims that he has presented more real practical information on this important and interesting subject, than can be found in any other work of the size, or that can be purchased in any other way for the same amount of money. We have laid before the public the great advantage of the newly invented machine called the "Honey Extractor," used for removing honey from the comb. A knowledge of this one thing is worth to every bee-keeper many times the price of the book.

Hoping that this little treatise may awaken in the minds of its readers, a new interest, as to the science, pleasure, and profit of collecting and storing the sweets distilled in the alembic of the bright-hued flowers, and assist those already engaged in the business, whether to a greater or less extent, and desiring that the "Little Busy Bee" may be better understood, more highly appreciated, better treated and cared for, it is sent forth upon its mission.

H. M. JOHNSON.

MARSHALL, MICH., NOV. 1871.

MEMOIR OF HUBER.

Francis Huber, who was born at Geneva, July, 2d, 1750, is held by all writers on the science of bee culture, to be the prince of apiarians. His father possessed a decided taste for the study of natural science, which taste was transmitted to the son. In boyhood his attention was called to what, in later years, became his sole and engrossing pursuit, an investigation of the habits and economy of the honey-bee, and no writer, either ancient or modern has displayed so much sagacity, perseverance, and accuracy of experiment as Francis Huber.

By his admiration for the writings of Reaumur, and through the assistance and encouragement of his friend Bonnet, he pursued his favorite study with such intense ardor as to superinduce a weakness of the visual organs, which eventually terminated in total blindness. His misfortune, however, did not present an inseparable obstacle to the successful study of his favorite science. He procured the services of Francis Burnens, who is said to have been an uneducated peasant. Huber took great pains in cultivating the naturally acute mind of the young man, in directing his researches, and accustoming him to rigorous accuracy. A single instance will illustrate the precision with which Huber required him to conduct his experiments. On a certain occasion it became necessary to examine separately all the bees in two hives. Burnens spent eleven days in performing

this work, and during the entire time he allowed himself no relaxation but what was necessary for the relief of his eyes.

Huber was assisted in his researches not only by Burnens but by his own wife ; to whom he was betrothed before the loss of his sight, and who nobly persisted in marrying him, notwithstanding his sad misfortune and the strenuous dissuasions of her friends. She declared to her parents that although she would have readily submitted to their will, if the man of her choice could have done without her ; yet, as he now required the attendance of a person who loved him, nothing should prevent her from becoming his wife ; accordingly as soon as she had attained the age, which she imagined gave her the right to decide for herself, she united her fate with that of Huber. They lived long in the enjoyment of great domestic happiness. She was spared to him over forty years ; to him "she was eyes to the blind," his reader, his secretary, his observer. He said in his old age, that during her life, he was not sensible of his misfortune.

The last days of Huber's life were soothed by the affectionate attentions of his daughter, with whom he was then living, and in whose arms he died Dec. 22d, 1831, in the eighty-first year of his age.

The world owes more to Huber for the advancement of the science of bee keeping than to any other man ; and having myself repeatedly verified his most important observations, I take great delight in holding him up to my countrymen and friends as the Prince of Apiarians.

CHAPTER I.

FUNDAMENTAL POINTS IN BEE-KEEPING.

I believe all practical Apiarians of the present day have decided that there are three fundamental points to be observed, in order to render bee-keeping a success. But I think the most of them will agree with me, that fourth has been introduced, which not only insures success, but adds greatly to the profit of apiculture; and upon these four points rests its perfect success, viz: the *man*; the *movable comb hive*; the *season* and the *honey machine* or "Mill Extractor."

The man should be thoroughly acquainted with and understand the nature and working of the bee to enable him to manage them profitably. When I say man, I mean the *operator* whether it be man or woman, old or young. If you will follow me through this little manual, I pledge you that you will, with a little practice, be able to perform your part.

He should then have a hive that will answer all his needs in every department of bee culture, and in the making or procuring of hives he should aim at simplicity. That is the best motto I have to recommend.

The season we have no control over. If the season is unpropitious, the knowledge of the man, and the perfection of the hive combined, will insure a greater amount of honey than might be expected in a good season with a defective hive and bad management.

The honey machine is acknowledged by all practical bee-keepers to be the greatest improvement to the science, since the invention of the moveable comb hive, by the use of which we claim to double and even thribble the quantity of honey obtained over the old method.

WHAT CONSTITUTES A SWARM OF BEES.

Every prosperous swarm or family of bees must contain one queen, several thousand workers, and a portion of the year, a few hundred, or even thousand drones. If there were present but a pint of bees it would constitute a swarm, or if there were twenty thousand it would be no more than a swarm ; if it contained a queen, workers and drones. They can only flourish when associated in large numbers as in a colony. In a solitary state, a single bee is almost as helpless as a new born child, being paralyzed by the chilling of a cool summer night.

We will now proceed to describe the different bees which constitute a swarm ; how they are raised, their size, shape, color, duties, and the labors of each.

DESCRIPTION OF THE BEES.

CHAPTER II.

DESCRIPTION OF THE QUEEN.



Queen.

The accompanying cut will illustrate the appearance of this most important personage of the industrious colony. She was styled by the ancients the King Bee ; and even at the present day she is called the King by those who know almost nothing of the tiny harvesters who are so industriously storing their homes with the liquid nectar, which they alone can glean, and who never see the busy workers within the deep recesses of their waxen walls, but who still persist in keeping their bees in the old box hive, never having sight of the Queen except by accident when swarming the new colony.

Careful and scientific observation conducted by men who have made the study of the bee their life-long business, like Huber, have proved that the Queen is the only perfect female bee in the colony, and hence the name was given to her as Queen or Mother Bee. In form, she is longer than either of the other species, although she is larger around than the worker, yet her appearance is slender, compared with the drone and worker.

She is usually of a dark color except the under side of the abdomen, which bears somewhat on the golden shade, while some have a yellow band almost encircling

the abdomen at the joint. All her colors are bright and glossy, and she has but little of the down or hair that is seen on the drones and workers.

Different queens vary much in color, some being darker than others. A still greater variation is observed in the Italian Queens, most of which are of a rich gold color, while a few are even darker than the usual shade of the natives. Her wings are short, reaching a little more than half way back ; her posterior is more pointed, and has the appearance of curving under more than that of the workers. She is rather shy ; generally seeks to hide away among the bees and comb, whenever exposed to view ; her motions are usually slow and matronly, although she can, when she pleases, move with astonishing rapidity. She has a sting, but never *uses* it except in combat with a rival queen.

THEIR AFFECTION FOR THEIR QUEEN.

The Queen is always treated with the greatest respect and affection by the bees. A circle of her loving offspring constantly surrounds her, testifying in various ways their dutiful regard ; some embracing her with their antenna, others offering her honey from time to time, and all politely moving out of her way that she may have a clear path as she moves over the combs, No Crown Prince or Princess of the world is treated with greater respect or deference than the mother bee in her hive. Every member of that numerous family is ever ready to show her that high respect which she commands from her queenly position.

If she is removed from them, the whole colony is

thrown into a state of the most intense agitation. As soon as they ascertain their loss, all the labors of the hive are abandoned, the bees run wildly over the combs, and frequently rush from the hive in anxious search for their beloved mother. If they cannot find her, they return to their desolate home, and by their sorrowful tones manifest their deep sense of so deplorable a calamity. No colony can long exist without the presence of this mother bee, but must surely perish, unless they possess the means of supplying her place.

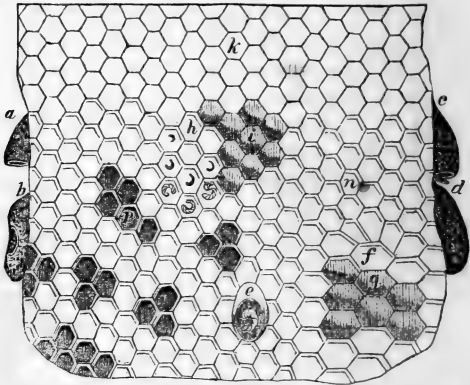
THE AGE OF THE QUEEN.

The average age of the queen is about three years, but they frequently live to reach the fourth or even the fifth year. I must here say that none of mine are allowed to become over three years of age. Every bee keeper who uses the moveable comb hive, should destroy the queens at that age, and furnish the swarm another in its place, as after that age they often become barren, or, if they do not, frequently deposit only drone eggs, in other words, eggs which produce nothing but drones, and the colony soon wastes away without being replenished with worker brood.

Unlike a large portion of the insect world the bee is forced to live in groups or families, for mutual protection, as well as for the continuation of the species. Individually or independently of each other, the different bees of a colony would soon perish.

Like the drone, the queen never goes to the field to gather honey; her only duty, being to deposit the egg, both male and female, to populate the hive; yet she is

as dependent upon the workers, as they are upon her, and both are dependent upon the drones, notwithstanding they are the acknowledge idlers of the colony.



Section of Comb, showing Honey, Bee Bread, Brood and Queen Cells, in their different stages.

(K) represents comb filled with honey, (h) represents the brood in all stages, (p) represents cells containing bee bread, (g) represents drone brood sealed, (i) represents sealed brood, (a) represents an old Queen cell where a Queen had formally hatched, (b) represents a cell where the Queen was killed by violence before hatching, (c) represents where a Queen has hatched recently, (d) represents a perfect Queen cell (e) represents a Queen cell just started with a grub about 5 days old.

DEPOSITING THE EGG,

In all well populated hives, with few exceptions, young brood may be found in different stages of development, every month in the year. In small colonies, there is usually about two months (November and December) that there is no brood to be found in the combs. When the queen commences to deposit the eggs in

small swarms, she places the first in the centre of the cluster of bees, (it may not be in the centre of the hive,) and usually in close proximity to their store of honey. It may not be amiss to say, that the reason why she commences to lay her eggs in the centre of the cluster, is, that it is the warmest place in the hive.



Ovaries of a Queen Bee.

Here then the queen will commence ; in a space perhaps not more than one or two inches in diameter ; this space will be filled, on both sides of the comb alike, in one compact body. If there is sufficient warmth in the hive, produced either by warm weather, or generated by the bees, she will then fill a spot on the adjoining comb, exactly opposite the first, but not quite so large. The circle of eggs in the first comb is then enlarged, and more added to the next and so on continuing to spread, and keeping the distance from the centre to the outside of the space occupied by eggs about equal on all sides until they cover the whole surface of the combs.

Long before the outer edge is occupied the first eggs deposited, are matured, and the queen returns to the centre and uses these cells again. You will seldom find any cells unoccupied by brood, unless they contain honey or bee bread, which are essential in rearing brood, as the bee bread is undoubtedly the principal food of the young bee before it emerges from the cell.

I have removed the bees from the hive and examined them in all stages of development, and have always found their proceedings as I have described.

The motions of the queen when she is depositing her eggs may be best seen, in a good observatory hive, as the season is advanced and she is using the outside comb for breeding. I have often seen the Italian queen continue depositing eggs, when removed from the hive on the moveable frame, but you will seldom see one of our native species continue her labors when exposed to view unless it be in an observatory hive. (I would here state that every Apiarian should procure a good observatory hive, that he may watch the movements of the queen, the different stages of development of the brood, the storing of honey and bee bread, and the making of comb, and it is often of great advantage in ascertaining when to look for swarms, &c.) The queen may be seen passing briskly over the combs with the workers, who, anticipating her object among them, move to the right and left, frequently extending to her their antenna by way of salutation. Some assert that she is attended by a retinue of servants as a body-guard, but I think there are no workers especially chosen as such, but they always appear to me to understand their duty, to feed her as she may require, and pay her the usual respect due a mother.

She carefully examines each cell by thrusting her head in before depositing the egg—probably to see if it contains bee-bread or honey, as a cell partly filled she never attempts to use. On withdrawing her head, if she finds

the cell clear, she immediately curves her abdomen and inserts it. She remains but a second or two, and then leaves the cell, when an egg about the sixteenth of an inch in length may be seen attached by one end to the base of the cell, usually a little to one side. It is of a grayish white color, slightly oblong, curved a little, rounded at the ends, and bursts upon the slightest pressure.

HATCHING.

The eggs remain unchanged in figure or situation for three or four days. They are then hatched, the bottom of each cell presenting to view a small white worm. On its growing so as to touch the opposite angle of the cell, it coils itself up, like a dog when 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 is called a larvæ, or worm. So nicely do the bees calculate the quantity of food which will be required, that none remains in the cell when it is transformed to a nymph. It is the opinion of many eminent naturalists, that farina does not constitute the sole food of the larvæ, but that it consists of a mixture of farina, honey, and water, partly digested in the stomachs of the nursing-bees.

“The larvæ having derived its 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 over the cell with a light brown cover, externally more or less convex, (the cap of a drone-cell being more convex than that of a worker,) and thus differing from a honey-cell, which is paler and somewhat concave." The cap of the brood cell is made not of pure wax, but a mixture of bee-bread and wax; and appears under the microscope to be full of fine holes, to give air to the inclosed insect. From its texture and shape it is easily thrust off by the bee when mature, whereas if it consisted wholly of wax, the insect would either perish for lack of air, or be unable to force its way into the world. Both the material and shape of the lids which close the honey-cells are different; they are of pure wax, and thus airtight, to prevent the honey from souring or candying in the cells; and are slightly concave, the better to resist the pressure of their contents.

To return to the subject, as soon as the larvæ is perfectly enclosed, it begins to line the cell, by spinning around itself a whitish silky film or cocoon in which it is encased, (after the manner of the silkworm.) When the cocoon is finished it undergoes a great change, from the larvæ or grub, to the nymph or pupa, and does not wear a vestige of its previous form.

It has now attained its full growth, and the large amount of nutriment which it has taken, serves as a store for developing the perfect insect. The drones and workers spin complete cocoons, or enclose themselves on every side, while the royal larvæ or queen, construct only imperfect cocoons, enveloping only the head,

thorax, and first rings of the abdomen. Huber says without any hesitation that the real cause of this is, that they may be exposed to the mortal sting of the first hatched queen, whose instinct leads her instantly to seek the destruction of those who would soon be her rivals. He says that such is the instinctive enmity of young queens towards each other, that I have seen one of them immediately on its emergence from the cell, rush to those of its sisters, and tear to pieces even the imperfect larvæ.

Queens are reared from eggs that would, if deposited in worker cells, produce worker bees. By giving the larvæ of such eggs proper capacity of cell and royal jelly, (a substance that is said to be prepared from honey and bee-bread and is found only in royal cells,) queens are developed.

The cell in which a queen is reared differs materially from all others in the hive. At the swarming season, there are usually from five to twenty of them constructed, in which to raise queens. They are, ordinarily built upon the edge of the comb, although when the bees are forced to raise a queen they sometimes construct them upon the side of the comb. Their position is almost vertical, and in appearance they resemble a common sized peanut, with the smallest end hanging downward.

Their dimensions are about one inch in length, and about one third of an inch in diameter. They are not composed entirely of wax, but of a mixture of wax and pollen. Their long cylindrical form is smoothly polished within; and covered externally with a kind of net

work, having a rough appearance. In fact, the imposing appearance of this cell, and the profusion of material expended in its construction is such, that one of them will outweigh one hundred common cells; and points it out as destined for receiving and nourishing the most important personage of the whole colony. After the queen has emerged from the cell, the workers usually gnaw them away, so that nothing is left of them to mark their locality, only a waxen cup, somewhat resembling the shell of an acorn; and may be seen in almost any hive that is one year old.

The time required to raise a queen is three days in the egg, and five days as a worm. The workers then close her cell, and she immediately begins to spin her cocoon which occupies twenty-four hours. On the tenth and eleventh days, she remains in complete repose. She then passes four or five days as a nymph; therefore, it is on the sixteenth day that she has attained to the perfect state of a queen bee. The working bee comes forth, perfected, in twenty-one days from the time that the egg is deposited.

The time required to bring forth the fully developed drone is twenty-four or five days from the time the eggs are deposited. The drones and workers on emerging from their cells, are at first gray, soft, and comparatively helpless, so that some time elapses before they take wing.

The cocoon of the drone and worker 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 may become so much diminished in size, as not to admit of the perfect development of full-sized bees.

The periods for hatching must be accepted with some degree of allowance, as atmospheric changes vary much the temperature of the hive.

IMPREGNATION OF THE QUEEN.

This subject is one in which we place Huber at the head. By a long course of careful experiments he ascertained that, like many other insects, the queen was fecundated in the open air and on the wing; and that the influence of this connection continues for several years, or during her natural life. He describes his first observation with his assistant in this wise:

“ We placed ourselves opposite to a hive containing an unimpregnated queen five days old. The sun had shone from its rising; the air was very warm, and the males had begun to leave the hives in large numbers. We then enlarged the entrance of the one selected for observation, and paid particular attention to the bees entering and departing. The males appeared and immediately took flight. Soon afterwards the young queen came to the entrance; at first she did not fly, but during a little time traversed the board, brushing her belly with her hind legs; neither males nor workers seemed to take any notice of her, and at last she took flight. When several feet from the hive she returned and approached it, as if to examine the place of her departure, perhaps judging this precaution necessary to recognize it; she

flew away. We immediately contracted the entrance, that she might not return unobserved, and placed ourselves in the centre of the circles which she made on the start of her flight, the more easily to follow her and witness all her motions. But she did not remain long in a situation favorable for our observations, and rapidly rose out of sight. We resumed our place before the hive, and in seven minutes the young queen returned to the hive which she had left for the first time in her life. Having found no external evidence of fecundation we allowed her to enter. In a quarter of an hour she reappeared and brushing herself as before, took flight, then returning to examine the hive, she arose so high that we soon lost sight of her. This second absence was much longer than the first, occupying twenty-seven minutes. We now found her in a state quite different from that in which she was, after her former excursion; the organs distended by a substance thick and hard, very much resembling that of the male, the *spermatoza*. But more evidence than mere resemblance being requisite to establish that the female had returned with the prolific matter of the males, we allowed this queen to enter the hive and confined her there. In two days we found her belly swollen, and she had already laid over a hundred eggs in worker cells. To confirm our discoveries we made several other experiments, and with the same success. On another experiment in July of the same year, the weather being very fine, a large number of males left the hives, and we set at liberty a young virgin queen, eleven days old, (whose hive had always

been deprived of drones, or which had never brooded any;) having quickly left the hive she returned to examine it and then rose out of sight; she came back in a few minutes with evident marks of fecundations, the same as the first one."

It is acknowledged by all apiarians of the present day, that the act of copulation takes place high up in the open air, (unless by artificial fertilization, which will be hereafter described,) and at the expense of life to the drone; and that it usually is between the fourth and tenth days after the queen leaves the cell. If fertilization does not occur before she is twenty days old, it never takes place and the result is that the eggs deposited will only produce drones, and not workers or those of her own class. The cause of failure to fertilize, may be owing to bad weather, defective wings, or to a scarcity of drones; but whatever the cause, the result is the same—a drone producing queen. These facts prove that an unimpregnated queen has not only power to lay eggs, but that her eggs have sufficient vitality to produce drones, and only drones, they being less highly organized than either queen or worker.

The anatomy of the queen, the physiological laws governing the sex, and her own knowledge of the sex of her progeny, are themes which we have not room to fully discuss, but will simply state, that a drone laying queen produces only drones let her deposit her eggs wherever she may, the cells having nothing to do with determining the sex in her case; but with the fertilized queen the sex is governed by the cell. Mr. Wagner

has advanced a highly ingenious theory, which accounts for all the facts, without admitting that the queen has any special knowledge or will on the subject. He supposes that when she deposits her eggs in the worker-cells, her body is 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. Every egg deposited by her in the small or worker comb, produces a worker bee or a queen if necessary; while every egg deposited in the large or drone comb produces a drone, which is positive proof that in the case of a fertilized queen, the size of the cell determines the sex, and this law is constant.

Mr. Quimby appears to have some doubts in regard to the queen knowing the sex the egg will produce. He gives the result of his observations as follows:

“That the queen knows any thing about the kind of eggs she is depositing, is, to me, very doubtful. One circumstance witnessed by myself, has a strong bearing on this subject. A colony in a glass hive had remained quite small up to the middle of June. One outside sheet of comb was three-fourths worker cells. For several days I had observed the bees cutting off the cells in which they had stored honey the previous season, for the purpose of rearing brood. I soon discovered eggs in both worker and drone cells. Shortly after, on opening the door, I found the queen engaged in laying

eggs in the drone cells. Nearly every one already contained an egg. Most of these she examined, but did not use them. Six or eight, only, appeared to be unoccupied, and in each of them she immediately deposited an egg. After depositing the last one in the drone cells, she continued to search for more empty cells, and in doing so, she passed, apparently by accident, upon the worker cells, where she found a dozen or more empty, in each of which, without hesitation, she laid an egg. The whole time occupied was not more than thirty minutes. Each produced according to the cell used, drones in drone cells, and workers in worker cells. It is hardly worth while to tell me that she knew her series of drone eggs was exhausted just when she laid the last one in the drone cell, because I should at once inquire why she examined so many of those cells, if she did not intend to use them, had they been empty. It will require very positive evidence to convince me that those worker cells did not receive the identical eggs that would have been placed in drone cells had they not been preoccupied.

But can we account for the impregnation of some, and the non-impregnation of other eggs laid by the same queen in the space of a half hour, aside from the theory of Mr. Wagner? Among the objections raised to this by Mr. Harbison, the strongest appears to be that the eggs laid in cells one-eighth of an inch deep, are just as sure to produce workers as those laid in deeper ones. It is considered by some as entirely fatal to the whole theory. For myself, I feel very reluctant to ad-

mit that it affects it in the least, yet I must acknowledge that it is somewhat obscured by the circumstances.

The queen commences depositing her eggs very soon after fertilization. During the early portion of the breeding season she will often, and under favorable circumstances deposit from two to three thousand eggs a day.

ARTIFICIAL FERTILIZATION OF THE QUEEN.

In regard to the theory of artificial impregnation, I would call the reader's attention to, as elaborated by Mrs. Ellen S. Tupper, of Brighton, Iowa. In consequence of the difficulties and perplexities which thron the path of the bee-raiser, any ideas which have for their object the possibility of being practicable, and at the same time reliable, are hailed with pleasure, and are eagerly sifted, that the good may rise to the surface, and the unsatisfactory sink from sight.

In an article published in the *Illustrated Bee Journal*, of October 15th, 1870, Mr. L. C. Waite writes that he received a letter from Mrs. Tupper, dated May 23rd, 1868, in which she gives her plan as discovered and practiced by herself some time previous, which he has adopted and experimented upon, with entire success and satisfaction to himself, in the following words:

“Procure a wire cloth dish cover, nine or ten inches in diameter, fasten a piece of thin board in the bottom; make a door in the board large enough to pass your hand through. If you cannot obtain a dish cover, make a cage of wire-cloth, twelve or fourteen inches long, and six or eight inches in diameter, Fasten a

piece of empty comb, three or four inches square, on the inside, which, when required for use fill with honey and water. In the spring and summer young queens leave the hive to meet the drones usually on the fifth day; in the fall months they seldom leave until seven or eight days old. On the morning of the day a queen is to leave her hive, put her with four or five selected drones into the fertilizer. The drones should be caught as they are about to leave the hive; those returning from a trip being generally too much fatigued.

Place the fertilizer, when prepared, over the frames of the hive (so that the warm air can enter) to which the young queen belongs, it can be used on any hive, however; put on the cap, which should have an opening in the top or side, covered with glass, to *admit light*. Leave her there thirty-six or forty eight hours; a shorter time usually answers. At the end of that time, if a dead drone is found, release the queen, and she goes down into the hive, and in a few days commences to deposit her eggs.

The cages or fertilizers can be made in any form, and two or three can be put on one hive at a time. The principle is that queens can be fertilized in confinement, if shut up about the time they would have flown. I have had over one hundred queens mated in this way, this season, and a great many last season. It is a great help, as it prevents all loss of queens when flying, and also enables us to select our finest drones, and cross with any importation we may desire.

Probably this subject would not have received so

much attention at this time, but for the difficulties and perplexities which beset the raisers of Italian bees, in keeping their stock pure. In order to have the Italian queens impregnated by Italian drones when flying, it is necessary that all the bees within a circuit of three miles, are Italianized.

I find that Mr. Waite, from whom I have given an extract, is about the only person who has had any success in artificial fertilization. The subject was discussed fairly at the Michigan Bee-Keepers' Convention, held at Kalamazoo, September, 1871, and it was the testimony of every individual who had tried the experiment, that in every case it had proved a failure. Some reported the loss of fifty queens in their various experiments. I think that it departs too widely from the natural instincts of the bees, to be generally or successfully practiced.

DRONE PROGENY OF THE QUEENS.

Latterly, there has been quite a vigorous discussion carried on in the various bee journals, in regard to the purity of the drone progeny of Italian queens, fertilized by black drones; some contending that if the Italian bee is a pure and distinct race, and they are crossed by the black drone, sooner or later the peculiar characteristics of each will exhibit themselves in the drone progeny.

But such are not my own views; as the fertilization lasts for life, and the drone eggs are *not* necessarily fertilized, it can have no influence on her drone progeny, but the workers and queens, will of course be hybrids.

I am unable to find sufficient data upon which to

base a position and decided opinion, and the experiments have not been perfect and sufficiently extended to place much confidence in, still a test might be applied, which would decide the matter beyond a peradventure. For the experiment take a virgin queen, Italian, for instance, mate her with the drone of an unfertilized queen, by artificial impregnation, that there may be no opportunity for being deceived in regard to her mating with some other drone, and *her* progeny, *if any*, will decide the question of hybridization.

THE WAILINGS OF THE QUEEN.

The queen has two notes: one of defiance called piping, made during the developmental stage of the young queens, which will be more fully described under the head of swarming. The other is a note of fear, a plaintive, pitiful wail, mournful in the extreme, and lingering long in the memory, when once heard, like the sobbing wailings of a dying child. This mournful note is set up, it may be when removed from their hive, when seized by the other bees to destroy her life, or when her colony are starving. Dr. Peterman says, that he entered his bee depository once during the past winter, and distinctly heard at least two queens uttering their plaintive wailings, but not being sufficiently conversant with bee language to understand the call, thought that a light, which had been carried in had disturbed them, he soon after discovered two dead swarms, one of which he had purchased late in the fall, and they had died from starvation. The other died by the bees

finding a small crevice in the bottom of the hive through which they had nearly all escaped and were unable to find their way back.

The Doctor thinks that the cry came from the perishing queens ; that they were lamenting their unhappy fate ; or hearing him enter their winter house, were calling and pleading with him to stretch forth his hand and save them from destruction. Whenever this note is heard, turn not a deaf ear, but immediately respond to the call, for there is something wrong, institute a rigid examination of the hive, and hasten at once to remove the cause of complaint.

An unimpregnated queen is called a

VIRGIN QUEEN.

A virgin, as before stated, is capable of laying eggs, but those eggs are not so highly organized as workers and queens, consequently can produce only drones, and will be referred to in the description of drones.

A FERTILE OR PROLIFIC QUEEN

Is one who has mated with a drone, and is capable of laying eggs which may become either workers, drones or queens.

A BARREN QUEEN

Is one who has passed the stage of laying eggs that will become either workers or queens ; but continues to lay eggs which will produce only drones. The period of fertility only lasts from two to three years, and cannot be depended upon longer with safety. All such queens should be destroyed and a fertile one be introduced that the colony may not become extinct.

WORKER BEE.



Worker.

The annexed cut represents the worker bee, a very important member of the colony; they constitute the mass of the swarm, and are properly named, as on them devolve all the labors of the hive.

They go forth into the fields in search of stores, and return laden with sweets; while from the baskets on their thighs gleams the golden pollen food for the young; they elaborate the wax from which their wondrous and beautiful combs are constructed; they nurse and feed the young brood; they defend their house against the invasion of enemies; they gather propolis for cementing the cracks in the hive, to repel the air, rain and the miller moth; each industriously plying her skill in finishing and furnishing her home, and providing for the coming time of want.

Ordinarily, within two or three days after fertilization, the queen commences laying, and the eggs are deposited in worker cells. After being deposited they remain attached to the upper angle of the cell, and are covered with a viscid matter for three days; on the fourth the thin membrane by which they are enveloped opens, and a worm is seen in the bottom of the cell. The nursing bees at once commence feeding them with their proper food, which is composed mostly of honey and farina, and probably some saliva enters into its composition. As the larvæ increases in size the attention of the nursing bees are increased, and is indeed unceasing, for it matters not at what time we inspect a

brood comb we shall discover hundreds of the nurses, with the bodies inserted in the cells supplying the wants of the infant progeny. During the first three days they remain almost inactive, their motions being so slow as to be almost unperceptible, but soon becoming more active, are able to turn about in the cell. "The slightest movement of the bees approaching to administer to their wants is sufficient to attract them to their food, which they devour voraciously, as it is unsparingly administered to them. At first this food is nearly incipid, but gradually acquires a perceptible flavor of honey, and becomes more saccharine and transparent, in proportion as the larvæ increases in growth."

"It is indescribable," says Februrier, "the care which the workers bestow upon their little nurselings, toward whom they seem to cherish the tenderest attachment. A comb filled with brood, and placed in an empty hive, seldom fails to retain them there, to the utter disregard of the loss of their stores. The tenderest mother could not watch over her children with more affection, nor supply them with nourishment more impartially, or in greater abundance. At the same time it is done without waste, for the quantity is in such exact proportion to the demand, that none of it remains in the cell, when the larvæ undergoes its transformation to the nymph state."

During the larvæ stage as we have shown, the solicitude of the workers about the welfare and nourishment of their infant charge, is extreme ; but from the moment they have sealed up their cells, and while the larvæ is

undergoing its transformation, they seem to cease from anything like individual attention ; and though, when a brood comb is meddled with, their utmost ire kindled against the invaders, as far as concerns the reception of the newly hatched insect and its introduction to the duties and vocations of the bee-community, they appear altogether selfish and indifferent. There is another case where this indifference appears very striking ; a sudden change of atmosphere about the end of Autumn, from a mild temperature to frost, has such an immediate effect on the brood, that it is not uncommon for a young bee, which has so far succeeded in breaking its prison as to extricate its head and nearly its shoulders, yet perishing from cold in this situation without the slightest effort on the part of the workers to save the life of a companion, whose rearing has already caused them so much labor. Immediately after the young bee has issued from the cell, the workers hasten to clean it out, clear away the ragged remains of the cover and fortify it anew with the usual strong bordering of wax, thus preparing it for the reception of another egg, honey, or farina.

As before stated, they are developed from the egg in about twenty-one days, and are imperfect females ; live about one year at longest, the age however depending on circumstances. If hatched in the midst of the honey season, they are quite short lived, in consequence of the excessive amount of labor to which they are subjected, many of them living not more than one or two months, and but few over six months. Bees reared in the spring and early summer, are shorter lived, than

those reared later in the summer and fall ; these latter, living through the winter ; and from the small amount of labor required of them, retain their bodily vigor, and live longer than those who perform such excessive labor while young.

Like all animals and insects, bees have a period of youth and also of age. Young bees are smaller in size, grayish in appearance, and smooth ; wings perfect, as when first emerging from the cell ; while those that are older are more symmetrical in form, bright and glossy in appearance, and lively in movements ; the more aged ones appear to have passed that point where rotundity and plumpness are indications of full physical development, their wings are worn and present broken segments at the extremities, and a torn and tattered appearance generally.

It has been stated that the workers are all females, whose ovaries are too imperfectly developed to admit of their laying eggs ; but Reim, a German Apiarian discovered that workers *do* sometime lay eggs. Huber afterwards in his observations, ascertained that such workers were bred in hives who had lost their queen, and who occupied cells in the vicinity of those where young queens were being raised ; and probably that a portion of the food designed for the young queens was accidentally dropped into the cells of the workers, and the larvæ feeding upon that, became more highly developed, and consequently, although they did not develop into full-grown queens, became what is called fertile workers. The workers were, for a long time regarded as neither

male nor female, but were called neuters ; but rigid examinations made with the microscope, revealed rudimentary ovaries which decided their sex.

The worker is much smaller than either the queen or drones. She is furnished with a very curious and complicated tongue or proboscis with which she extracts the honey from the flowers, and through this, the honey is conveyed to the stomach which is not larger than a small pea, and being surrounded with muscles, enables the bee to compress it, and force the contents back through the proboscis into the cell. Each worker is armed with a formidable sting, and when disturbed or irritated, hesitates not to make use of her natural weapon of defense. Microscopic examinations reveal a most intricate mechanism.

“ It is moved by muscles which, though invisible to the eye, are yet strong enough to force the sting, to the depth of one-twelfth of an inch, through the thick skin of a man's hand. At its roots are situated two glands by which the poison is secreted ; these glands uniting in one duct, eject the venomous liquid along the groove formed by the junction of the two piercers. There are four barbs on the outside of each piercer ; when the insect is prepared to sting, one of these piercers, having its point a little longer than the other, first darts into the flesh, and being fixed by its foremost beard, the other strikes in also, and they alternately penetrate deeper and deeper till they acquire a firm hold of the flesh with their barbed hooks, and then follows the sheath, conveying the poison into the wound.”

The extremity of the sting being barbed, the bee can rarely withdraw it, if the texture into which it is thrust, is at all tenacious; and in loosing her sting, she necessarily looses her life; but she dies in defending her home and its sacred treasures.

It has been thought by some, that certain classes of the bees, were appointed to the discharge of certain duties; each having her specific vocation, and that her life was spent in the fulfilment of that; that some were set apart to nurse the young; some as wax-workers; others as honey-gatherers; and another set as defenders of the colony against the devastations of the miller worm. But when we reflect that the honey-gatherers have the most laborious duties to perform, often flying two or three miles in quest of their stores, returning laden and panting, to the shelter of the home roof, is it not reasonable to presume that a relay is ready to take the wing, and make the tour of the fields, that the weary may have rest for a season?

DRONES.



We herewith present a representation of the drone of the colony; the "gentlemen of leisure," who leads an easy, comfortable sort of life, taking no thought for the morrow, satisfied if the larder is always full.

"They toil not, neither do they spin," but seem willing that others shall bear the heat and burden of the day; submitting to be jostled and crowded aside, and are

finally ignominiously thrust from the hive when no longer wanted, or the supply of honey fails.

In form and structure they are different from the queen or worker, and of a darker color; they are less active, moving with dull, sluggish strides; have no proboscis for gathering honey; no basket for pollen; no sack for elaborating wax; no sting to defend themselves against invaders; in short, they are a necessary evil; standing around and consuming the fruits of the labor performed by others. Yet who shall say that they are without their use? For would not the family very soon become extinct, but for them? and again, may they not greatly aid in keeping up the warmth of the hive, that the young brood may be perfected, and enabled to come forth? but even that is of doubtful utility, as the space they occupy could be better given to honey-gatherers.

Through microscopic examinations, they have been pronounced the males of the bee family; and in the performance of the function appointed to them, they invariably yield up their life. If the weather is favorable, and the colony strong, they come out as early as April or May, and in June and July they appear around the entrance of the hive, in great numbers, their loud, heavy buzzing being heard some distance, and lacking the busy, bustling hum of the workers, is easily distinguished from it.

In the economy of the colony, the duties devolving upon them, is to accompany the young queens upon their bridal tour; in the performance of the same, their

life becomes the sacrifice. It would seem almost needless that so great a retinue should follow in the wake of the bridal pair, as one is all that is required in the young queen's life; yet in order that one may be forthcoming, the number is increased, that failure in that regard may not ensue.

In July or August, if honey is not secreted in the blossoms, and there are appearances of a short supply of food in the combs, the laborers, wishing to rid themselves of this superabundant population, at once set up a system of vigorous persecution; driving them from or into a corner of the hive, and confining them there until, through hunger and captivity, they become weakened, and from want of a sting are unable to resist the attacks of their merciless assailants, fall, helpless victims to their frightful onslaught; they rush after them, and sting them with such fury, that they die immediately from the effects of the poison; they seize them by the wings, and gnaw them in such a manner as to prevent their escape by flight; and crawling off, death overtakes them by being crushed beneath the feet, or perishing from cold; or by being devoured by toads and birds. If by chance, some escape death, and are sheltered by a queenless colony, they only live a few months at the longest, and are rarely seen after January or February; and from their liability to extermination, the age to which they might attain, cannot be positively determined, but probably they do not live beyond the sixth or seventh month.

CHAPTER III.

THE ITALIAN, OR LIGURIAN BEES

Are now conceded by all practical Apiarians to be far superior in every regard to the black bee above described ; although they do not differ essentially in conformation, yet for the matter of profit and amiability, are considered a great improvement. In color, they are of a beautiful golden hue ; the workers, when pure, have three distinct bands about the body, the color and bands being the test of purity ; the queens are more fertile and prolific, depositing their eggs earlier in the season ; swarm oftener and earlier when not interfered with ; protect their family from the incursions of the robber bees and miller-moth more effectually ; carry in more honey, gathering from the small variety of red clover, and some other plants with cells so deep that the common bee cannot reach the nectar distilled in the bottom of the flower cups ; will not use their weapon of defence upon so slight an occasion, but can be handled with greater ease ; if from any cause, they loose their queen, retain their numbers for a longer time ; do not forsake their home when food becomes scarce, and exhibit a greater affection for their brood ; they are stronger and more hardy, consequently live longer, although performing a greater amount of labor ; are more industrious, laboring assiduously during the entire honey-

season, often going into the fields in very unfavorable weather, many, at those times being beaten down by the rain and lost. They possess undaunted courage, and by their extraordinary vigor and agility do not permit themselves to be overcome while their colony remains strong. Mr. P. J. Severson, in *American Bee Journal* for February, 1870, gives his preference for the Italians, in point of profit, by comparing the amount of surplus honey, and the greater number of swarms given off; having both in the same apiary, in the same style of hive, each receiving the same attention, and both under the same general circumstances; the Italians yielding swarms, and surplus honey, the common bees doing nothing, and proving almost an entire failure as regards profit, and having tested them five seasons has decided in favor of the Italians.

TO PRESERVE PURITY OF STOCK.

Many object to Italian bees, from apprehensions of their becoming hybridized; maintaining that it will be impossible to retain them in their purity, so long as black bees are kept in the vicinity. But the fact of their throwing off swarms more frequently, and earlier in the season, that trouble could be easily obviated. We quote from Mr. Samuel Wagner:

“The main thing to be attended to in any locality where common bees are found or kept, is to secure the production of drones in numbers overwhelmingly large; though Dzierzon is under the impression, that where both kinds of drones exist in about equal num-

bers, the Italian queens will usually encounter Italian drones, both queens and drones being more active and agile than the common kind. Besides, the wings of both queens and drones are finer and more delicate than those of the common kind, and the sounds produced in flying are clearer and higher-toned. Hence, probably, they are readily able to distinguish each other when on the wing.

If, at the time when young queens are emerging, the bees and drones be tempted to sally out earlier than usual in the day, hours before the common drones come forth, by feeding them with diluted honey, the perpetuation of the genuine breed will the more probably be secured. But this end will the most certainly be attained, if measures are taken to have Italian queens and drones bred early in the season, before the common drones make their appearance; and again late, after the latter have been 'killed off.' This may readily be done by the improved hive, and the application of certain known principles in bee-culture."

REARING ITALIAN QUEENS.

All practical Apiculturists have their own peculiar manner of rearing queens, each claiming his own, the only practical way.

In raising queens artificially, I would recommend the use of a small hive or nucleus, as they are termed. They are commonly made about six or eight inches long, five inches wide, and six inches deep inside measure, with three miniature comb-frames each. If your

whole apiary is Italianized, and all the bees are the same for an extent of three miles around, there will not be much difficulty in obtaining purely fertilized queens; but if such is not the case, some of the following methods may be adopted to secure the desired result; either the rearing of drones early in the spring, before the black drones make their appearance, or late in the season, after they have been destroyed; otherwise the manner of double working them will have to be resorted to.

If the apiary is large, perhaps the last named method would be the most practicable; as it would be almost impossible to obtain the desired results by either of the others, unless in the hands of an experienced operator. The manner of double working them is very simple. It is merely raising all the queens you may desire for the whole apiary, from a queen of undoubted purity, and let the young queens mate as they will with black or Italian drones. (According to the theory adopted by myself, and the majority of bee-keepers, the drones of the young queen will be pure, while the workers of a queen fertilized by the black drone will be hybrides.) From this theory, it is evident that the drones of your apiary the following spring will be Italian, and you have only to proceed and raise another set of queens from the same old one, (or what would be better, from a new queen from another apiary,) which would produce a cross, and prevent in and in breeding. If any of the queens of the second year's raising do not produce workers of undoubted purity, namely,

those with three distinct bands on the abdomen, she should be replaced by another, until the desired purity is attained. It is not necessary to make much preparation for queen-raising until the drones begin to make their appearance, as they should be, at least two weeks old, at the time the queen sets forth upon her bridal tour. When the proper time arrives to prosecute your labors, the nuclei should be stocked with combs ²/₅ in the frames, and a little honey, about one or more frame full, in order that the bees may concentrate their labors on the queen cells, instead of being obliged to store their hive with honey. To insure success, it is also necessary to have some brood in the nuclei to retain the bees, and keep them on the increase, and not allow them to diminish in numbers; for the nuclei should be kept well stocked with bees. The brood should be over seven days old, from the time the egg was deposited; so that the bees will not construct queen cells from brood that you do not wish to use. To procure the bees and comb, it is best to obtain the hive from a distance of two or three miles; drive out the bees into a box, as in transferring, search out the queen, divide the combs, and put them in the nucleus; then put into each nucleus at least one quart of bees, without a queen. A good swarm in May will furnish bees enough for about five nuclei; while in June, sufficient may be obtained for ten. The bees in the nucleus should be confined, with a little ventilation, for from twelve to twenty-four hours, and if the night is cool, should be covered or carried into a room, so that their brood may not become chilled.

The nuclei should be placed promiscuously about the yard, so that when the queen makes her flight, she may return safely to her home and not enter another, and in the mistake lose her life. The bees for the nucleus may be obtained from your own yard, in which case it will be necessary to confine them for at least three days, that they may not return to their old habitation, when set at liberty. If it is desired to put the brood that you wish to have queens reared from, into the nucleus, at the time of putting the bees in, it can be done if done quickly, that it may not become chilled in the process ; or it can be put in at the time they are allowed to fly out. I prefer the plan advocated by Mr. Alley, that is, to introduce your best queens, or those you wish to rear from, directly into the nucleus, and change combs from them, when there are eggs deposited there, to others from which to rear queens. In all cases to raise large, strong, fertile queens, I think it best to introduce the brood into the nucleus before the eggs hatch ; as, in that case, the larva is fed upon the royal jelly from the time the egg hatches, until it is sealed over, and therefore would receive more than a grub that is well advanced. When the brood is given to the nucleus, the bees will often start several queen cells from it, and in from ten to fourteen days some of the cells will hatch. Just before they do, all the cells but one may be removed, and placed in other nuclei, or in hives that have been queenless for at least twelve hours. This is much safer than to allow them to hatch, and then attempt to introduce a virgin queen to a hive or nucleus,

as they will rarely receive a queen until after impregnation takes place.

During the months of June, July and August, if the weather is pleasant, the queen will invariably come out to meet the drone on the fifth day after leaving the cell, and in two or three days she will commence laying eggs. She should be removed from the nucleus after impregnation takes place and before she commences to lay, if it is desired to rear another queen in the same nucleus. If she is allowed to commence laying before being removed, the bees will, after her removal, begin to construct queen cells from the eggs laid by her, in which case, it would be necessary to keep the nucleus queenless for five days, or introduce a cell just ready to hatch within twelve hours after removing the queen.

There are other methods advanced, by which queens are reared artificially in cages, such as Mr. Jewell Davis's, as described in the *American Bee Journal* for January, 1870, in which he confines a cell with a few bees, in a cage,—perhaps a dozen cages on a common comb frame. But in whatsoever way they are reared, it is important that the cells should be attended with a suitable number of workers to nurse it. It is known by any one who has ever examined the hive while the bees were constructing queen cells, that they are in constant attendance upon it, even after it is sealed over. They are continually running to and fro over it, seeming to pay as much attention to it, as to the queen while performing her maternal duties about the hive.

Mr. J. H. Townley, of Tompkins, Mich., says: To raise early queens, put your best queen with sufficient bees, into a hive containing only drone comb, and daily feed them to stimulate them to rapid breeding. In a few days, or as soon as you find plenty of eggs, remove the combs to a clean hive, and supply its place with worker comb, and continue the feeding as before. As soon as the queen has again filled the combs, remove her to another hive, and allow the bees to raise queen cells; when these queen cells are sealed over, about the eleventh or twelfth day, cut off the cells, and remove them to nuclei hives; or if you wish to Italianize your swarms of black bees in movable comb hives, take out a centre comb, cut out a square piece, put one of the sealed cells in a queen cage, with wire-cloth on both sides, insert the cage in the place of removed comb, and return it to the hive, so that the queen cage will be in the midst of the cluster of bees.

When the young queen is five or six days' old, search out and remove the old queen, liberate the young one, who is already at home, and who will soon become fertilized, and become the founder of another colony. If you have a box hive and you succeed in driving the bees up with smoke, so that you can place the queen cage in the cluster, leave her till the fifth or sixth day, and then drive the bees, (as directed in the chapter on transferring,) shake them into a cloth, search out the old queen, liberate the young one, and let the bees return to the hive.

When you have placed the drone comb into a clean

hive, (containing some honey of course), supply it with a sufficient number of bees, without a queen, to protect it, and raise the drones, feeding them daily and liberally, lest they destroy the drone brood; after a few days give them a card of comb containing worker brood, and allow them to raise queens, all but one of which should be removed, the feeding continued daily until there is sufficient honey secreted in the flowers.

To introduce a fertile queen to a colony, Mr. Townley first removes the old queen, and introduces the young one in a cage, where she remains until the bees treat her with respect, and she becomes scented with the odors of the hive, when she is liberated.

INTRODUCING THE QUEEN.

The proper time for removing the black queen, is the middle of the day—great care being taken not to alarm the bees when the frames are removed. Smoke, or even sudden jarring, will cause the queen to seek the bottom of the hive, or some other place of refuge. Carefully raise off the top, without jarring the hive and alarming the bees, near you place an empty hive in which to put the frames as you take them out, examine carefully the combs in the centre or those first filled with brood; and if the bees are not disturbed, they will be spread evenly over the surface, when the queen will be easily recognized, and can be picked up with the fingers. If the bees become alarmed, the queen being the most shy and retiring, will seek to conceal herself by hiding in a mass of bees, in the corners of

the hive, or anywhere, that she may be out of sight, when a close scrutiny will be needed to discover her. If you do not succeed in finding her, return the entire mass to the hive, and make the effort at some future day; or divide the swarm, putting one-half the contents in the empty hive, and, if possible, the greatest number of bees. Separate the combs in each, putting in only half the number, or even less would be preferable. In a few minutes the bees will become quiet, and the queen will leave her hiding-place, her locality being readily detected by the quietness of the bees near her, and their restlessness on the other combs. The combs must now be returned to the hive in the position they occupied before being removed. When the bees are returned to the hive destitute of a queen, they will at once commence operations to remedy the defect, by converting some of the worker larvæ into queens, which can only be done before the seventh day, as at about that time all the eggs left, have passed that stage when it will be possible to change them thus.

The combs must be again removed, and all royal cells that contain larvæ cut off, as the safety of the new queen depends greatly on their entire removal. Mr. L. A. Aspinwall gives a very simple and easy process; that of "immersing the queen in a little honey, slightly warmed, if necessary, and dropping her among the bees, they immediately commence licking her off, and forget that she is a usurper.

This method is regarded the safest and surest by all practical apiarians for an inexperienced person; but I

believe, the method above described, as practiced by Mr. Townley, equally as safe, provided the operator has sufficient experience to know when the bees are ready to receive a new queen. There are various other ways as practiced by different individuals, such as intoxicating the colony with tobacco smoke; scenting them with various perfumes, or drumming the hive, that the bees may fill themselves with honey, &c. All of which may do very well for those who raise their own queens, or have the means of readily replacing them if they are rejected or destroyed; but for those who send a long distance and expend large sums in the effort to obtain the best, the experiment would prove extremely hazardous.

TO ITALIANIZE AN APIARY.

If it is desired to Italianize the entire apiary early in the spring, before the black drones are flying, the method as described by Mr. Townley, (see rearing queens,) appears preferable. The queen cells should be introduced in their cages, to every swarm before the black queen deposits drone eggs. Great care should be exercised, that all become fertilized, unless there is a large number of drones, which is not usually the case at that season of the year. There is another of changing an apiary, when there are a large number of colonies, which may incur less trouble than the foregoing, unless Mrs. Tupper's plan of artificial fertilization is adopted. The apiarian can raise, in one season, queens sufficient to supply all his colonies, no matter how many may be

required; he can raise them all in his own hives, and allow them to meet the native drones. This fertilization will produce mixed workers, for, as above stated, the impregnation of the queen does not affect her drone progeny. Give a queen to each colony and the next season, or if introduced early perhaps before, all the drones will be pure Italians. Now from these that are pure raise another set of queens, your drones being all pure, and there being none others for them to meet, you will scarcely fail of obtaining pure workers for the second generation. It sometimes occurs that a queen will produce workers that are hybrid, but she should be removed as soon as discovered, and another introduced in her place.

ITALIANIZING A BOX HIVE.

There may be those who still have swarms in box hives which they wish to Italianize, this they can do, but it will consume some time in the manipulation, and will subject them to no little trouble. First, drive out the bees, then find and secure the queen, and permit the bees to return immediately into the hive. At the expiration of ten or twelve days they will raise themselves a queen, and the one that hatches first, will destroy all the others. As soon as it is ascertained that she has destroyed all the young queens, which will be in two or three days, she, herself, must be destroyed before she commences laying, which is usually the case in about eight days. Again drive out the bees, find and destroy the queen, and return the bees to the hive.

There being no possibility of their rearing another queen, the Italian may be introduced, after two or three days, without a great deal of risk, if the usual precaution is exercised.

ANOTHER METHOD.

There is still another method by which a small apiary of box hives may be Italianized in one season, and with but one movable comb hive. First, then introduce into your colony occupying a movable comb hive, an Italian queen. Drive all the bees of a good stock into an empty hive, and set this on the stand. Take the hive from which the bees were driven, with its contents, to the stand of the one with movable combs. Lift out the combs and shake or brush the bees down by the box hive, which they will immediately enter. Now take the movable comb hive with contents to the other stand and put that colony in it, and your colonies have simply exchanged hives, and each will carry on its usual operations the same as if they had not been disturbed. The one with movable combs can now be controlled. After a few hours, when the bees have become quiet, take out the combs, find and destroy the common queen. In one week cut out all queen cells, give them an Italian queen, and when she has filled the combs with eggs, four or five days after, this colony may also be transferred. Continue the process until all are changed. The cells cut out being Italians, may be put in the rearing boxes to hatch.

When you have an Italian queen in a box hive for

one week, you can Italianize another colony by simply driving the bees from each hive and change places with the hives; then put the bees back into the hives, simply changing the Italian bees to the black brood and *vice versa*. It will be necessary to catch and destroy the black queen, and the bees will raise a queen from the Italian brood in the hive.

CHAPTER IV.

THE HIVE.

Next in importance to the bees, in the apiary, is the hive, and as the whole land literally teems with bee hive sharks, who are continually introducing their worthless wares on the ignorant or innocent bee-keepers, seeking whom they may devour, I trust you will bear with me, kind reader, while I point out some of the defects in many of the so-called improved hives before I describe what, in my opinion, constitutes a good hive. Every book, with one exception, heretofore written and published on apiculture in the United States, that has come to my observation, has been in the interest of some patent hive. Every bee journal and agricultural paper is filled with patent bee hive advertisements, until the whole land groans under the load of patents. I am sorry to be compelled to say that not less than ninety-nine per cent. are entirely valueless as bee homes.

Some of them make very good ornaments, while others are indices of ingenuity, showing the amount of trouble some men have taken to more than double the labors of the industrious workers and render bee-keeping uncertain and profitless.

Since the day that the Rev. Mr. Langstroth introduced the use of the movable combs, but one real im-

provement has been made in the bee hive, which I will point out at a proper time. All the other so-called improvements and changes are undeserving of notice, while I unhesitatingly pronounce the whole legion *worthless*.

DEFECTS OF HIVES.

I will now proceed to present a few of the defects of some of them. First, all diamond hives, or those set cornerwise, with the entrance in the bottom and centre of the hive, are unsafe for wintering bees. During the winter, the dead bees drop down, and slide both from front and rear, to the bottom of the hive, close the entrance, exclude the air, and the bees smother, unless you remove them from time to time, which is not always convenient, either with them in the winter dormitory or on the summer stands.

Second, all hives with a back and bottom board, and the comb racks hung so as to swing open, like the leaves of a book, the hive opening with a door, and the contents drawn out in a body. In the latter part of summer, the bees carry in a large quantity of propolis with which they fill all cracks and flaws, as well as cover the inside of the hive; and when you attempt to open the hive you must first cut it loose from the door; then from the sides, and on the top between the brood-chamber, and surplus honey arrangement, and then you are able to draw out the bees and combs. In a few minutes after they are drawn out, thousands of them are over the back, seeking shelter in the body of the hive; you remove some of the racks with combs, and when you

attempt to return them, there are so many of the bees in the way that you cannot do it readily ; when at last you succeed in replacing them, and wish to close the door, half the swarm are in the body of the hive ; these you brush out with a feather, and start to return the combs but to your chagrin, hundreds have again crossed over the back board, and you must work slowly, wait for them to cross back or crush thousands of them. At last you get the combs back to their place and attempt to close the door, but the bees are, many of them in the way, which you must smoke back, or again crush great numbers.

In many of the hives, the space between the brood-chamber and the surplus honey arrangement, is so open that the queen will go up and deposit the surplus honey combs full of drone eggs.

Again, all back boards, bottom boards, and every unnecessary thing inside a hive, make good haunts for miller moth, so that many of the patent hives are complete moth nurseries ; and no man will be able to keep his stocks so strong, but that the miller will destroy them. One man has a wire-cloth bottom, that the moth may drop through, into a box underneath the hive, where they find plenty of the small scales of wax, which is their natural food, (and just what should be caught on a tight bottom board, that the bees could carry out of the hive) and there, undisturbed, they grow and thrive, wind themselves in their cocoons, come out as millers, lay their eggs in the dirt, comb chits, and wax scales, and

in a few weeks have bred to thousands, and possibly, hundreds have crawled above to riot on the combs.

Another man has a moth trap—a modification of the latter but more expensive—his wire-cloth extends only under a portion of the hive ; but he has a drawer, and on each side of the entrance two holes with tin tubes, that the millers may slip under the bottom board, while any worms crawling on the central part of the hive may drop through, also, into this drawer. This, too, is a splendid moth nursery, where the worms riot and grow fat at their ease, and in the place of destroying the millers, breed them by the thousand ; so that, whenever you hear a man talking about a miller trap, bear in mind that the name is a misnomer, it being emphatically a green-horn trap with which to capture the innocent, unsuspecting novice.

There are other hives that are made double, one box within another, splendid to breed millers ; and again others full of drawers—many of them entirely too expensive, (even if they were convenient and practicable), to be used by the majority of bee-keepers ; therefore, take my advice,—use no hive that is very expensive, ill-shaped, inconvenient for exploring the interior, or, indeed, any work inside the hive other than the simple comb frames.

A good hive should possess the following points, viz. : 1st, cheapness ; 2d, simplicity ; 3d, durability ; 4th, as good for winter as for summer ; 5th, that the combs may be removed without injuring or irritating the bees ; 6th, that the bees may have free access to the surplus honey

arrangement ; 7th, that the surplus honey may be removed, without injuring or irritating the bees, and be in the best marketable condition ; 8th, that the bees may be able to store every ounce of honey that they can collect ; 9th, completely ventilated, that the bees may not suffocate and thousands of them hang on the outside of the hive for air, in a hot day, idling away their time, nor yet smother in the winter ; 10th, that all of the heat from the hive may enter the surplus honey boxes, or chamber, to enable the bees to elaborate wax and make comb ; 11th, that in case the bees are carrying in honey very rapidly, one set of boxes may be raised, and another set placed under them, to be filled while the upper ones are being sealed over ; or, if you wish strained honey—that is, honey removed with the mell-extractor that a second hive may be placed above the first, with less comb racks in it, in order that the bees may build store comb, which, after they are once made and filled, may be removed, emptied of honey, and returned to the hive without disturbing the queen and nursery ; 12th, that there be no place in the hive where the miller moth can conceal itself and wind its cocoon ; 13th, that there be no space between the top of the combs and bottom of the honey boxes, except a single quarter of an inch, to enable the bees to freely enter the honey boxes, or in case of the second hive but one-half inch, between the top of the lower comb frames and the bottom of the upper comb frames ; 14th, that the bees may enter the surplus honey boxes from any part of the hive, without creeping through a hole in the honey board ;

15th, that all necessary openings of the hive be guarded with a slide or button, which can be closed in a moment, if occasion requires, or so far closed as to prevent the escape of the queen, if desired, or the return of the drones, if it becomes necessary to remove them ; 16th, that the back end of the hive may be elevated so as to give the comb frames an angle of at least twenty-five degrees, to induce the bees to build straight combs, and also enable them to remove the debris from the bottom board with ease ; 17th, that the hive be so constructed that it can be shipped to any distance, with safety, or consuming too much time in preparing it for removal ; 18th, that the boxes be covered with a tight cap to exclude the chilly air at night, and the excessive heat of the noonday sun, as well as the rains and storms, with a ventilation at each end to be opened on hot days and allow a current of air to pass over the honey boxes, thus aiding in evaporating the honey, and at the same time permit the excessive heat of the hive to escape in summer, and in winter to carry off the moisture generated by the bees.

MOVABLE COMB HIVES.

I believe it is now very generally conceded by the best practical apiarians that the Rev. L. L. Langstroth has accomplished more to advance the science of apiculture, in the introduction of the movable comb frame, than the combined ingenuity that has been expended or devised from their first introduction, to the present time. In fact, nearly all the patent hives that have been placed

in market since his was patented, make use of the movable comb frames in some form which accomplish the same object. It has never been *my* good fortune (if I may so call it,) to obtain a movable comb frame so cheap and simple, and at the same time so easily removed from the hive, as the Langstroth frame, the book style and side-opening hive, to the contrary notwithstanding.

SOME OF THE ADVANTAGES NOT FOUND IN BOX HIVES.

What bee-keeper, using the old box hive, has not seen some of his stocks most promising in the spring, containing the brightest combs, (perhaps a swarm of the past season,) with sufficient amount of stores and a strong colony of bees, begin to dwindle away without any apparent cause? And how often has he wished for some means by which he could inspect the interior and ascertain if the queen were lost or barren; or whether the brood had become diseased? Those of us who are using the movable frame hive are happy to say, that when such is the case, we have but to remove the top of the hive, blow a little tobacco smoke among the bees, raise out the frames containing the comb and make the necessary examination. If the colony proves to be queenless and you have an extra one, she may be introduced, or one or more frames can be exchanged for one or more from another hive that is in a prosperous condition—care being taken that the exchanged frame contain eggs or larvæ in different stages of development, or at a proper age from which the bees may rear a queen. If the queen is barren she can easily be removed, and a

fertile one substituted ; and if it contain diseased brood it should be treated according to directions given in chapter on diseased brood, which see, and in the end the life of the stocks saved from the ravages of the moth miller.

How often has he observed in autumn some of his colonies with an insufficient supply of honey to carry them through the winter, while others have a superabundance ; and without being able to equalize this supply, the life of the light stock must necessarily become jeopardized. With the movable frames we have but to take one or more frames from the full hive, and transfer them to the light one, and save the light colony from annihilation, otherwise they must be sacrificed over the brimstone pit, and their scanty stores are all that remains of them ; while the old boxes, or perhaps the old salt barrels, are lying in ignominious heaps, monuments of an unconquerable prejudice, awaiting the advent of another season.

He may desire an increase of colonies by swarming ; but his bees remain clustered on the outside of the hive, utterly refusing to swarm, the entire summer. Methinks he would gladly welcome any invention, by means of which he could swarm them artificially or at will, and still have it safe and profitable. This also can be accomplished by dividing the combs, and following the directions given in the chapter on Artificial Swarming. Still another case of the superiority of the movable frame, over the box hive ; he may desire a hive by means of which he could prevent his bees from swarming. To

illustrate, I will relate a little conversation had with a bee keeper, a few weeks since. One day I called upon a farmer but a few miles from this place, to look at his bees, and have a friendly talk with him. He had five stocks that had wintered through, and appeared to be in good condition. I asked him how many colonies he had the spring before? He replied "five," just the number he had this spring; but says he, "I had eighteen at one time last summer," but he said, as I have heard others say before, "they swarmed themselves to death." I told him that I could tell him what became of his bees. His five old stocks were so reduced by swarming three times each, that the moth miller found no difficulty in entering and exterminating what remained; and that he took up, or consigned to the brimstone pit, the light stocks which he thought had not sufficient stores upon which to winter through, and I supposed that he had two objects in view, one was to kill the bees, and the other to get their honey, as that was all the surplus he obtained that year. The balance of his stocks, eight in number, went into winter quarters in apparently good condition. After passing the long winter months in fear, lest his bees should not winter through, when the first warm rays of the sun in March brought forth the bees from their long confinement, he counted them, and to his utter dismay, found that he had but five left; and these were invariably the first swarms that issued from the old stocks.

We have in the movable comb hive only to take out the combs seven days after the first swarm issues,

and cut off all of the queen cells except one, if none are hatched, and swarming is arrested for the season ; or if you are working your bees for honey, you can, by a little skill, prevent them from over-swarming, by putting on the surplus honey boxes, and inducing the young bees to enter them. To this class of bee keepers I write, and think that the pages of this book could not contain all the reasons why the movable comb hive should supercede the old box hive ; or were I to occupy the entire space with a consideration of this subject, I should fail to do it justice ; but a few points more, and I leave this matter to you.

You have often found some of your swarms constructing entirely too much drone comb, rendering the stock unprofitable ever after, from the multitude of drones reared, frequently hundreds of times more than required, and their only avocation being to idle around and consume all the surplus honey the colony can gather. How desirable, then, to substitute worker for drone comb, and thus convert the unprofitable colony into one of profit. With movable comb hives, it is only necessary to cut out the drone comb, and insert in its place worker comb, the same as in transferring ; and to this end all pieces of good worker comb should be saved.

When the miller worm has affected a lodgement in the combs, could the bee keeper have access to the interior, he could attack them in their strongholds, but in the movable comb hive, they can be traced to their

hiding places, be brought forth, and exterminated with ease.

There are times when it is desirable to know the amount of honey on hand, also of the bee bread or pollen, and could the surface of each comb be examined, the amount could be determined without difficulty; and with the movable comb hive any deficiency could be supplied, or surplus removed.

The amount of brood, that the colony shall raise, can, at any time be controlled; and instead of limiting the area of comb used for that purpose to a very small space, it may be enlarged to any extent practicable, by removing full combs to one side, and introducing empty ones in their stead; notwithstanding the danger of receiving more stings, and the greater expense of construction.

There is a class of bee-keepers, and their number is constantly on the increase, who understand the value and profit of these conveniences, and who will make it pay to use them.

I do not anticipate that what has been said in regard to the movable comb hive, will turn all bee-keepers who are using the old box hive into the path of science, and convince them that one swarm of bees properly managed, in such hive, is worth two in the old box or gum; but I do hope to influence a goodly share of them, together with the assistance of those who are writing for the bee journals, and the agricultural papers, setting forth the progress made on every hand, that in time the old box hive may be altogether abandoned,

while in their stead we may behold these beautiful bee mansions scattered about the farmers' yard, conveying to the mind of the passer-by, the idea that that man is master of his profession and is keeping his bees for profit.

When I commenced in my apiarian pursuits I used only the old box such as is still seen and used in nearly all the apiaries. I at once commenced improving my hive as much as was possible, but finding that its defects were legion, I began experimenting with the different styles of patent hives that were presented to the attention of bee-keepers, trying one after another, until I had used eight different ones, but I soon discovered that the most of the so-called improvements were for the man, and not for the bee, I rejected them, and finally decided upon the cheapest, plainest, and most simple movable comb hive that can be made, and one that is adopted by the majority of bee-keepers, unless it be those who have a patent of their own to offer.

THE SIZE OF THE HIVE.

The size of the hive should depend somewhat upon the locality, the bees, and the object of the apiculturist. If a large number of colonies are desired, and the bees are allowed to swarm naturally, the hive should be small. If the main object is honey, the hive should be larger; and if for Italian bees, at least one-tenth larger than for the natives. The hive must also correspond in size and shape to the surplus honey receptacles. With the hive I am using I have succeeded in a most happy manner

in adapting the hive and the honey boxes to each other ; making use of a medium sized hive, but still capacious enough for Italian bees, and without encouraging them to excessive swarming.

The air space of the hive being 2,567 inches, the space inside the comb racks containing 2,184 inches, a space sufficiently large to contain 75,000 worker cells, or 48,000 drone cells, so that in case of but a moderate amount of drone cells, and the combs one-third full of honey, there would be about 48,000 worker cells for the use of the queen or 2,300 daily ; sufficient to increase and fill the hive very rapidly.

The majority of practical bee-keepers seem to agree in the idea that for this latitude, $42\frac{1}{2}$ degrees north, a proper hive must contain in area, about one bushel, which is the size of the body or breeding part of the one I am now using. The excess of inches being as small as can be used for the space occupied by the frames, the space between the racks and the side walls of the hive, I think no detriment, as it affords better ventilation, and at the same time gives the bees more room, who, instead of clustering on the outside of the hive, can remain on the inside, and thus assist in a great measure in keeping up the warmth of the hive necessary to facilitate breeding.

HIVES ALL ALIKE.

No man, unless for the purpose of experimenting, will ever have but one sized hive in his apiary. Every hive should be the exact size of all the others ; so that the inside or comb frames of one, will fit in all ; he can

then change the frames from one to the other at will, and without much trouble or loss of time, thus giving him full control of all his hives, and enabling him to change the combs as often, and whenever it becomes necessary; as in artificial swarming, queen raising, feeding a light stock, removing the miller moth, &c.

On the contrary, if he has a half dozen different kinds of movable comb hives, he is in constant perplexity, often wishing to exchange a comb, but is unable because the frame will not fit, or if he wishes to use empty comb, the same trouble exists; before it can be used it must be transferred to a frame that will fit the hive he wishes to introduce it into, and this is seldom done without a loss of some of the comb, and often times it is so soon filled with honey, that it will break down before the bees have secured it in the frame.

SHALLOW VS. TALL HIVES.

There has been much written in favor of tall hives as being best to winter bees in, and I believe they are generally considered by the mass of bee-keepers, as being safer than shallow ones; but from my own experience, I must prefer a medium depth hive. Now, while I am free to admit that they have their advantages, I must speak of their disadvantages, which are not few, and frequently of a two-fold character. First, as has often been claimed, they permit the heated air or breath of the bees to ascend, which being moist, is, in extreme cold weather, deposited in large quantities in the shape of frost on the combs directly above the cluster of bees;

and the taller the hive, (when speaking of tall hives, I mean those that are from fifteen inches, to two feet high,) the more frost there will be above the bees, as more space will be afforded for its deposit, and, instead of being best adapted to the wants of the honey bee during the winter, it, under such circumstances, is often the means by which they are destroyed, for it not unfrequently happens, that a few days of severe cold weather, is followed by a sudden thaw, and the frost melting above the bees, in descending completely wets them, and all that is necessary at this particular time to cause their entire destruction, is another severe freeze, which frequently occurs, and the only reason why we do not oftener have colonies lost in this way, is that these severe frosts are sometimes gradually superceded by degrees of temperature sufficiently warm to slowly melt the frost off the combs, thus giving the bees time to dry themselves about as fast as the water falls upon them.

Look into the top of a tall hive after one, two or three weeks of severe cold weather, and what do you see? invariably one solid mass of frost, the combs completely hidden from view, and all, or nearly all of this over the cluster of bees. It often occurs that on a warm day following a severe cold spell, the water may be seen running from the hive, if the bottom board is a little inclined, and again, this water freezing as it approaches the cold air at the entrance, by closing or nearly closing the opening, the sudden destruction of the colony by suffocation is the consequence.

Another objection to the tall hive is, that in the early part of the season or spring, the heat from the bees is permitted to ascend, at a time when it should be as much as possible, confined to the cluster, in order that early breeding may be promoted.

Now, if we dispense with the tall form of hive, and adopt the long, wide, shallow form, we shall have gained but little; as in that case the heated air escapes from the cluster by passing to either end of the hive, which is also objectionable. Thus, it will be seen that we have two extremes to avoid in the construction of our hives; namely, the depth of the tall hive, and the length and width of the shallow hive; and in avoiding these two extremes, caution must be observed that we do not drop into a third extreme, viz.: that of contracting the dimensions of our surplus honey arrangements. Were I to construct a hive expressly for breeding and wintering successfully, I would make the length and width equal, although a hive of that shape would not be as well adapted for surplus honey, and still have it in good marketable form.

HIVE AS USED BY THE AUTHOR.

The hive I am now using is seventeen inches long, inside, thirteen inches wide, and eleven and three-quarters inches deep, and contains nine comb frames. After giving it a thorough trial, I am well satisfied that the shape of the hive, and the arrangement of the frames are all that can be desired. The depth is as great as the combs will sustain when filled with honey, and for a greater depth, it would be necessary to pass a strip

through the center, paralld with the top piece, in order to support the upper part of the comb, this strip being objectionable for the reason that it occupies one inch in depth of the capacity of the frame, and giving so much more room in the hive to be kept warm. This space I prefer to have occupied with worker comb. I know that some will say that it will make a passage through which the bees can get from one side of the comb to the other, but it is far preferable to lift out the combs, and cut out about three one-inch holes, which will make much less unoccupied space in the hive, and answer every purpose of a winter passage, which is only necessary when the bees are wintered in a dormitory, expressly for that purpose, or in a cellar.

With the rear end of the hive elevated so that it will stand at an angle of about twenty-five degrees, the bees will store the honey for winter consumption, in the top of the frames and at the back end, and rear their brood in the front, and using nearly every comb for that purpose. This being the rule in properly managed stocks.

When winter approaches, there are sufficient empty cells in the front of the hive, and honey in the other, to last the bees through the cold weather, without obliging them to change from one comb to another to obtain supplies; they have but to move backward as the honey is consumed, on the same principle that they would move upward in a hive deeper from top to bottom, than from front to rear, thus avoiding the excess of moisture above them, as in the tall hive.

The frames should not be the longest from top to bottom, for three reasons. First, you could not raise a frame seventeen inches in depth, out of a hive, and return it again without touching the sides occasionally and thus arousing the bees. Second, on account of the excessive moisture collecting in the top of the hive, and dripping down on the cluster, as is the case with all tall hives, and third, there would not be sufficient room on the top for surplus boxes. When placed horizontal there is one-third more room for this purpose, on the top, than when perpendicular.

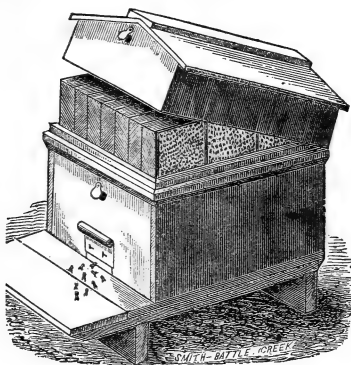
DIRECTIONS FOR CONSTRUCTING THE MOVABLE COMB HIVE,
AS USED BY THE AUTHOR.

Fully believing the hive I use to possess and combine more good qualities than any other hive now used, I give the following directions for its manufacture :

Procure good pine lumber, twelve inches wide and one inch thick. I have it planed on both sides, reducing it to seven-eighths of an inch. One object in planing them on the outside is, that they may be painted, and present a neat and tasty appearance, and thus preserve the lumber. On the inside, because these hives having frames to assist the bees in holding fast, the smooth surface is an advantage, as it saves the bees the trouble of waxing over the rough places.

I saw all the material for the hives by machinery, and more particularly the small stuff, as it saves much more labor than to saw it by hand, and I claim that it is just as essential to saw the large pieces by machinery, because

a box so made is worth twenty per cent. more than when made by hand, as every joint is perfectly square, and when nailed together, has not to be squared and trued up, which often consumes much time, and besides, when done by machinery every piece is an exact duplicate of the other, if properly done, with a good machine and a competent mechanic.



SIMPLE MOVABLE COMB HIVE.

Saw the end pieces just $13\frac{1}{2}$ inches long, and $11\frac{3}{4}$ inches wide, the sides, $18\frac{3}{4}$ inches long, and of the same width as the ends; cut a rabbet on the upper edge of the end pieces on the inside $\frac{3}{8}$ of an inch wide, and $\frac{3}{8}$ of an inch deep, to receive the ends of the comb frames; also cut a rabbet on the ends of the side pieces $\frac{7}{8}$ of an inch wide, and $\frac{1}{4}$ of an inch deep, to receive the end pieces; this makes a double joint, and makes

the hive tight. The rabbeting can all be done on a good buzz saw, and much faster and truer than can be done by hand.

The whole is now thoroughly nailed together, making a box 17 inches long, 13 inches wide, and $11\frac{3}{4}$ inches deep, inside measure without top or bottom. At the bottom, in one end make an entrance, by sawing out a piece 4 inches long by $\frac{3}{8}$ of an inch deep, or what I think is better, saw a piece off of the bottom of one end the whole length, a little beveling, $\frac{1}{2}$ inch on the outside, and $\frac{3}{8}$ of an inch on the inside. Saw out 4 inches from the centre of the piece, and place the two ends back where they came from, then when you need to clean the bottom board or give the bees a larger entrance, they can be removed.

The bottom board should be made of lumber $14\frac{3}{4}$ inches wide, not necessary to be planed only on the upper side, and should be cut 22 inches long. Across the front end nail a piece one inch square to prevent its warping; now nail to the bottom of the hive, or put on with screws so that it can be removed without jarring the bees. In having the bottom board fastened it keeps the hive square, and is much more convenient to move from place to place if necessary, and I find the bees will keep it clean if the back end of the hive is raised about four inches higher than the front. Bees do not hesitate in picking up one of their dead comrades and going down hill with him, while, if they had to carry him up hill, they would find it a very laborious task.

Now bore a hole 1 inch or $1\frac{1}{4}$ in the front and

back end, in the centre, about three inches from the top, and put over the same a button to close at will. The back one should have a small piece of wire-cloth nailed over it on the inside, to serve as a ventilator, to be used in very hot weather; and also when you wish to move the hive from one locality to another, the front one can be used as an entrance in the busy season.

Saw out some pieces one inch square to nail around the top of the hive one-half inch from the top or below it, for the cap to rest upon. If you wish to ornament the hive these pieces can be an ogee moulding, or that cut into dentals would present a very tasteful appearance. The cap to cover the boxes may be ornamented in the same manner, giving the whole a finished appearance with but little trouble or expense.

The cap to cover the hive is made by sawing out two pieces for the ends, $14\frac{7}{8}$ inches long, 7 inches wide at the ends, and 9 inches wide in the centre. This will give sufficient pitch to carry off the water readily, and is much better than a flat roof. The side pieces should be $20\frac{5}{8}$ inches long by 7 inches in width, with two pieces for the roof 23 inches long and 10 inches wide, so as to project about 1 inch at the ends and sides. The sides and roof may be one-inch lumber if preferred. I usually make them by sawing two-inch plank into three pieces, and planing the outside only. There should be a hole bored in each end, near the peak, and covered with wire-cloth, and button the same as in the rear of the hive. Also, get out a strip 2 inches wide, $\frac{7}{8}$ inch thick, and of the length of the roof

boards. Hollow out one side, which can best be done on a buzz saw, to fit on the top of the roof, which will make a perfect roof, and the whole when finished and painted white will make a very beautiful little house.

The hive being completed, it should be covered with something beside the cap, and I would recommend a cover made of two pieces of boards 12 inches wide and 28 inches long, nailed together in the same shape as the roof of the cap; being large enough to project over the sides and ends, to protect them from the direct rays of the scorching sun.

I much prefer a cover of this kind and have my bees stand in the open field, than have them set in one of the old-fashioned bee-houses which you will see scattered about here and there, boarded on three sides, or even prefer them to setting my bees under trees where the sun seldom strikes them.

The comb frames are made of five pieces each. The top pieces is $17\frac{11}{16}$ inches long, $1\frac{1}{8}$ inch wide, and $\frac{5}{16}$ inch thick. The two pieces for the ends are $10\frac{5}{8}$ inches long, $\frac{7}{8}$ of an inch wide, and $\frac{5}{16}$ of an inch thick. One piece for the bottom, $16\frac{1}{4}$ inches long, $\frac{3}{8}$ of an inch wide and $\frac{1}{4}$ of an inch thick. The guides to start the bees to work straight comb, I make a piece 16 inches long, $\frac{1}{4}$ of an inch square; this I nail on the under side of the top piece, cornerwise, making a small level edge with a recess above, on each side, very convenient for the bees to cluster on when first hived, and has proved very worthy of a recommenda-

tion wherever they have been used; in fact, I think it is the best guide in use—taking up but very little room, not half the amount occupied in many of the hives now in use. I use nine frames, in thirteen inches, a trifle less than $1\frac{1}{2}$ inch from centre to centre. I have used frames with this space between them for several years past, and am well pleased with it, as it prevents the construction of so much drone comb, which is very undesirable, particularly in the breeding department; but in the surplus honey boxes we cannot have too much.

BEST SURPLUS BOXES.

The reader will notice that I have given no description of a honey board,—for the simple reason that I never use one. I think them a detriment to the result of the yield of surplus honey. I construct my box to answer every purpose of a honey board, and thus save the expense, which would be no small item for a large number of hives.

I find that I can induce my bees to work much earlier and faster in the boxes, if they are not compelled to crawl up through a hole in the honey board, which are usually one inch in thickness, and there being from one to six holes over which the boxes are set. The honey box I use I make of small frames or sections, and by placing seven of them side by side, the whole securely fastened together by nailing two strips of pine, $\frac{1}{4}$ of an inch square on the bottom, which also serve, as an air chamber for the bees under the boxes. I also

paste white paper over the top and sides, which holds them together and renders the boxes air-tight.

For the frames I take good pine plank and plane it on both sides to $1\frac{7}{8}$ of an inch in thickness, then pass it through a buzz saw, cutting into strips $\frac{1}{4}$ of an inch thick, which will be $\frac{1}{4}$ inch by $1\frac{7}{8}$ inch; cut these strips into pieces $5\frac{3}{4}$ inches long—these will be for the sides; for the tops and bottoms, I make for the top pieces of five of the frames, and the bottom pieces of the the whole seven frames, pieces that are only $1\frac{5}{8}$ inch wide by $\frac{1}{4}$ inch, and 6 inches long. For the top of the two end frames I use pieces that are $\frac{1}{4}$ inch thick by two inches wide and 6 inches long, these to project about $\frac{1}{4}$ inch to receive the glass.

The best method of putting them together is by tenons and mortises;—to do which requires seven buzz saws on one arbor, $\frac{1}{8}$ inch thick to make the mortises, and the saws to be set the right distance apart to leave the tenons between the saws. Saw into the ends of the side pieces, just $\frac{1}{4}$ of an inch deep, or as deep as your lumber is thick, making 7 mortises and 8 tenons; and for the tops and bottoms use six saws, making 6 mortises and 7 tenons, and for the two end top pieces use 7 saws, leaving one tenon on one edge $\frac{1}{4}$ of an inch wide, and 7 tenons $\frac{1}{8}$ of an inch wide, and 7 mortises.

The above method would be too expensive unless a bee-keeper had occasion to use a large number of boxes, in which case it would be much the cheapest, as any one could put them up in good style when once sawed out. If one should require only a few hundred

boxes, it would be cheaper to send to me or some one else who has the conveniences for making them in this way, and have them sent packed in boxes or barrels. Another method of putting them together, is to nail them with patent brads, but is a very tedious task. Should they be nailed, the top and bottom pieces should be of the same length as the sides. Each process of putting together will make the frames $5\frac{3}{4}$ inches high and 6 inches wide. Now put the seven frames together, in shape to make a large box, with the two pieces with tops projecting at the ends; nail on the small strips the whole length of the bottom, which will make the box 6 inches high; then nail a piece $\frac{3}{4}$ of an inch wide, 6 inches long across each end at the bottom, to hold the glass in place, which should be 5 by 6, and can be securely fastened by small brads. This forms a light box, one that no person will object to paying for. When full it will weigh 15 lbs, and three such boxes cover the hive. When turned over on their sides they make a tight cover over the bees, and when set right side up, form a passage the whole length of them, over the comb frames.

In the bottom of each box are six entrances, $\frac{1}{4}$ of an inch by $5\frac{3}{4}$ inches. There are also slots corresponding with them in the top, only those in the top are covered with paper. The advantages of this style of boxes are numerous. They being set upon the comb frames of the hive, the bees will find their way into them much quicker than they would if there was a top, or honey board, with scattering holes for them to pass

through. Besides, when the boxes are on the comb frames, the bees work in them with much more vigor, than when it seems to them that they are storing their honey away from home; and I find this the principal cause of complaint that is everywhere made—"that the bees do not work in the caps."

If you were to make the old-fashioned box hive, I would put slats across the top, instead of a board with holes.

It will be found of great advantage to stick fast to each top piece of the boxes a small piece of empty white comb, which will guide the bees in building the combs in the direction you may wish; besides inducing them to commence work in them several days sooner than if they had to start the combs themselves. Pieces of comb one inch wide and two inches long, will be sufficient, always observing to put them in the same side up that they were built, for the reason that the cells always descend a little towards the centre, and thus prevent the honey running out. To fasten them securely, melt one edge by the fire, or have a shallow dish with melted wax over the fire; dip one edge into the hot wax and apply to the frame before cooling. I firmly believe that such pieces of comb are worth ten dollars per pound to any man, many times more than they would be for wax. For a supply of such combs I save all empty, clean, white pieces, when removing combs from the hive or boxec. I also empty all unsealed combs from the boxes, rather than sell a box partly filled.

These boxes are so constructed that in case the

bees carry in honey very rapidly, and you wish to, you can separate the sections, (after numbering them, or otherwise marking them, that they may be replaced as they were before separating,) place them in the honey extractor, throw the honey from the combs, put the boxes together, and replace them on the hive again to be refilled, which operation can be repeated as often as the combs are filled. In case the boxes are used in this manner, it would be necessary to have an extra set to place on the hive, as soon as those already filled are removed, and after emptying, change with the next hive, and so on. The profit of this procedure will be given in the chapter on the honey extractor, as also the arrangement of the hive for that purpose.

It has been observed by all apiculturists that bees store honey much faster in large boxes than in small ones; and although my boxes are large, each holding 15 lbs., they yet possess all the advantages of the small ones. By the aid of a pen-knife, they can, at any time, be divided into seven sections, each section holding about two pounds, or any number of pounds to suit customers, and without the annoyance of having to cut the comb and thus allow the honey to escape, as is the case when the common large box is used. I contemplate making, during the coming winter, (1871 and 1872), a new box the size of the present one, but have it contain five frames instead of seven. When full it is divided into five parts—then put a light of glass on each side of each box or section; when filled to weigh about $3\frac{1}{2}$ lbs. This style of box I find is

in as much favor with the grocer or retailer, as the one I now use. The box, honey and glass, are always sold together, no tare being deducted; hence, the apiarian will get more than cost of his box, and make a good profit in selling lumber and glass at the price of honey.

TWO SETS OF BOXES AT ONCE.

I have, for several years, practised using two sets of boxes at the same time; and have always been rewarded with good results. The bee-keepers of the old school are generally in the habit of leaving the boxes on the hive until the cells are entirely capped over. I find the method very prejudicial to their interests. When the room diminishes the bees become less active, and begin to idle away their time—especially if the box is allowed to remain on the hive until the honey is entirely capped over. Precious time is lost by the bees, even if the box is full. The work of capping goes on slowly, and it usually occurs in the very best of the honey season. Besides, when full boxes are replaced by empty ones, the bees are discouraged by the loss, and sometimes several days elapse before they resume their work in the empty boxes; hence, a great loss of honey to the bee-keeper. To avoid these two inconveniences, as soon as the box is full or nearly so, ready to be capped, or just as they commence to cap, if there is a prospect of the honey season continuing for a week or two longer, the bee-keeper should raise up the full boxes, open the holes through the top of a new set, and place them under the full ones. The bees being obliged to pass through the

empty boxes to reach the honey in the upper ones, finding a vacant space, will work with renewed activity to fill it up. The capping of the cells will not be delayed, and almost invariably the honey crop will be double what it would have been had the first boxes been allowed to remain on the hive until entirely capped. If the honey season is unusually good, the same process may be repeated by putting on another set of boxes in the same manner, as soon as the full boxes are removed. When treating swarms in this manner it will be necessary to make a frame six inches high to place on the hive, on which to set the cap, to exclude the light from the glass, or the bees will cover it with propolis, which would obscure the transparency.

For the profit of the above procedure, perhaps it would not be out of place here, to give a few figures, that the reader may better understand how the large yields of box honey are obtained. At the end of one week, with a good swarm, and in a good season, the boxes would be ready to raise up; at that time there would be about twelve pounds in each box or thirty-six pounds in all. It will now be one week more before they will be capped over, if they are allowed to remain, and in the meantime only three pounds can be put in each box, or nine pounds in all, that will be the amount stored for the week. Now, if they are raised up, they will, in the week that they are capping the boxes, put in the nine pounds in the upper boxes, and have the lower set ready, or nearly so, to raise up; containing the thirty-six pounds added to the nine pounds gives forty-

five pounds for the week, or thirty-six pounds gain, by using the second set of boxes. I usually obtain two sets of boxes from a swarm by treating them as above described, and also one new swarm, but when I obtain three or four sets, as I have frequently done, I am then obliged to call my hive a non-swarmer; and I sometimes think it is the best way to make a non-swarmering hive, as it is usually attended with as good results as any of the pretended non-swarmerers.

COMMON BOX HIVES.

I do not suppose that all I have said in regard to the movable comb hive, and all that is being said daily through the columns of the bee journals, and periodicals which are now having a wide circulation, will convert all bee-keepers from the use of the common box hive; hence I deem it my duty to give my experience in making them, as near to the requirements of the bees, and as much to the profit of the apiarian, as is possible to do. Surely, the common box hive was an improvement on the old straw hive, in one particular, that of being better adapted to the obtaining of surplus honey; while in another it is inferior, that is, in wintering. I am informed by Mr. Asa Chapin, of West Bloomfield, N. Y., that my uncle, Alvin Wilcox, of the same place, (now deceased,) a bee-keeper of some prominence, in the year 1834, commenced the use of hives made from boards and with surplus honey boxes. In the year 1835 he had more than half of his swarms in box hives, and in that year he took honey to New York,

being the first ever taken into that city put up in boxes. I am informed that it met with a ready sale there, and at the moderate price of fifty cents per pound. In the following year he carried to the same market over 5,700 pounds of this luxury. His was so constructed as to allow two boxes to slide in on the top; these boxes contained about ten pounds of honey each, and if I remember correctly, by seeing the last five hives that graced his yard at the time of his death, some ten years since, that they were made with a slanting bottom board.

Mr. J. M. Weeks, of Middlebury, Vt., obtained the first patent on a bee hive that was ever obtained in the United States—I think in the year 1838, but we do not deem it of sufficient importance at the present time, to search the Patent Office records for the exact date of that patent. As this was the only patent bee hive known at that time, and patents were not viewed in the same light that they are now, viz., any thing for a patent, good, bad or indifferent, the consequence was, that it soon passed into general use, so that in due course of time, nearly all the prominent bee-keepers were using them, and without doubt considered them the *ne plus ultra*, as they could now get honey in boxes, while previous to this, such a thing as surplus honey in boxes was hardly known; and all former hives were either common boxes or made of straw, of the sugar loaf form, with no particular accommodations for surplus honey, and whenever any was needed, it was obtained by placing the hive over the brimstone pit. Occasionally now, there are contributors to the columns of

the bee journals who still sing many changes in praise of the old box hive; usually signing a fictitious name to their productions, such as "Old Fogie" and the like; and I am ever pleased to see the editor's remarks at the close, setting forth the fact, that no form of hive can ever again find favor with progressive bee-keepers that does not produce ample surplus honey arrangements, and also for the ready use of the honey extracting machine.

In giving directions for making the box hive, we would recommend the one used in years past, by that practical apiculturist, Mr. M. Quimby, of St. Johnsville, N. Y., as described by him on page 61 of "Bee-keeping Explained." For many years, and even at this date, the hive is known in the State of New York as the Quimby hive, although he acknowledges that he has no claim to the name of the hive, as it was made and used long before his day; but I think he need not be ashamed to allow his name to be used in connection with the hive that was once the pride of his apiary, but which was long ago superceded by the movable comb hive.

DIRECTIONS FOR MAKING BOX HIVES.

Select boards one inch thick, and twelve and fourteen inches wide, which would be the proper width to make the hive twelve inches square inside; fourteen and a half inches deep will be about the right depth to make the hive contain about 2,000 cubic inches, the proper size for this latitude. In making box hives, it is advisable to plane the boards only on the outside, to re-

ceive paint readily, the inside should be left rough, as the bees would experience much difficulty in attaching their comb to a smooth surface, therefore the trouble of planing the inside is worse than useless. The grain of the wood should always run up and down, never cross-wise, unless well painted, as the nails would in a few years draw out.

A hole one inch in diameter in the front, about two-thirds of the way up from the bottom, is a great convenience to the bees, coming home heavily laden, but should be kept open, only during the honey harvest. An entrance should be made in the bottom of one side about four inches by half an inch high, and it would be desirable to place the hive on a bottom board instead of setting on a plank or board that not unfrequently warps out of all shape, so that the bees would have an entrance on the back of the hive, as well as the front to guard from robbers and the miller moth.

For the top of the hive I would recommend the use of slats or strips, instead of a board with holes. Procure eight pieces, 12 inches long, $1\frac{1}{8}$ inch wide, $\frac{1}{2}$ inch thick, place them in the top $\frac{3}{8}$ of an inch apart, and $\frac{1}{4}$ of an inch below the top, and nail through the hive into them, which secures them in their places; these will be sufficient for the bees to fasten their combs to, and they will ascend much sooner into the boxes, than they would through holes in a board. Across these slats should be laid four or five strips, $\frac{1}{4}$ of an inch square, for the boxes to rest upon, if the common box is used; if my style of box, the slats should be

nailed even with the top, as the strip is on the bottom of my box, furnishing all the space under the box that is required.

It is necessary to cover the whole with a cap made to fit over the top of the hive, and for the successful wintering of bees, in this style of hive, see chapter on wintering. This style of hive will admit of the use of two sets of boxes at a time, the same as the movable comb hive, but cannot obtain as large results, continue the life of the bees, or feed to as good advantage, as in the movable comb hive.

NON-SWARMING HIVES.

A perfect non-swarming hive, I think, in the same category as a perpetual motion, a very good thing to talk about, but a thing that has never been accomplished, nor can it be until the nature of the bee is changed. Swarming is its natural instinct, and its only safeguard against utter extinction. If bees are put into large boxes, cupboards, or other unnatural structures, they sometimes fail to swarm; but I have known them to swarm when kept in the chamber of a house, as was practised years ago by a few. Would it be beneficial to use hives that are non-swarmers? I mean perfect non-swarmers? I answer, no; not even in the hands of an experienced operator; one who would watch the age of the queen and not permit her to live to exceed three years of age; one who could keep his stocks strong, even then, I think he would in time, from different causes, such as foul-brood, loss in wintering, &c., find that his apiary was gradually on the decrease.

A few years since, Mr. Hazen, of New York, patented what is known as the "farmer's hive." It was made so that from 2,000 to 4,000 cubic inches of boxes could be attached to the sides and top, but it was not effectual. In giving his reports of the product of his apiary, (and I regret that I have none at hand,) he would invariably report at least one-half swarming during the season, but those that did not swarm, gave a large yield of honey; and I think, instead of using a large, cumbersome hive as his, often being obliged to leave many boxes partially filled on the hive, for so great length of time, to have them completed, that the combs became colored, it would have been better to have used a moderate sized hive, and worked his bees in two sets of boxes at a time, as I do, and I believe that my hive comes as near to being a non-swarmers as it is possible to make one, especially where the box room is to govern the issuing of swarms.

Mr. Quimby has made a hive wherein he has a large amount of box room. His manner of applying boxes, is to set them on the sides, adjoining the combs, and also on the top, directly on the frames, the same as I set my boxes. My hive can be made with the ends long enough to admit of the boxes being put inside, next to the combs, and when the boxes are removed, a partition can be put in next to the comb. But this is not the method he employs to prevent his bees swarming if they wish. He does it by placing in front of his hive, a queen yard, so that the queen coming out with the swarm, her wings having been previously clipped so

that she is unable to fly, and the yard being so arranged that she cannot crawl out and get lost ; on the return of the swarm, which will be in a short time if they have not their queen with them, she will again enter the hive, usually to come forth the following day.

Now the better plan would be, if they are determined to swarm, to permit them to do so, and if you wish to curtail the increase of stocks, as much as is possible, put two swarms together, and work them strong for surplus honey. It would be much more satisfactory to me, than to discourage them by keeping them fluttering away, day after day, trying to swarm. Another view of this case, is this : suppose that they persist in their determination to swarm, for nine days, or until the time we might reasonably look for a second swarm, had the first got away on time ; or until one of the young queens have hatched, and she accompanies the swarm, what preventive had you left, only to have lifted out the combs before any of the young queens hatched, and cut off the queen cells ? Some would say, that two queens do not accompany the first swarm, but I have had such cases happen in my own apiary.

The following figures will show how I estimate the value of a non-swarmer : we will start with one hive, worth \$5.00 ; at the expiration of ten years it is worth no more. The chances of its failing or dying before that time, we will not take into the account ; we will get annually \$15.00 worth of honey ; in ten years it will amount to the aggregate of \$150.00, which, added to the value of the hive, gives a total of \$155.00. Now

suppose we allow the hive to swarm every other year, the first, allow it to swarm and get \$5.00 worth of surplus honey, \$2.50 each from old and new; which is a very low estimate. The second year, from the two hives, suppose we get \$15.00 each in surplus honey, in ten years we will have increased our apiary to 32 swarms, and obtained \$1,085.00 worth of honey, to which add the value of swarms, and we have the aggregate of \$1,245.00. Now for the swarming hives; we will suppose that it throws off a swarm annually, and stores \$5.00 worth of surplus honey, or \$2.50 each for old and new, which is a low estimate, at the end of ten years we have 1024 hives; these, at \$5.00 each, are worth \$5,120.00. At \$2.50 each, the surplus honey will bring at the expiration of ten years, \$5,115.00, which, added to the value of the swarms, gives a total of \$10,235.00, as a result to compare with \$155.00 for the non-swarmers, or with \$1,245.00 the total of a non-swarmers one-half of the time. I do not wish to be understood that every one will realize such a profit, but I think and know it can be done, and this statement tends to show the relative profit between the swarming and non-swarming hive.

OBSERVATORY HIVES.

Every bee-keeper should have one or two for experimental and observatory purposes. They are very convenient to open, in exhibiting to visitors the marvelous works of the honey bee, when it is not desirable to remove the combs from the hive. They can be made full size to accommodate the frames used in the other

hives of your apiary, with glass in the sides, and at the back covered by doors hung on hinges, and fastened with a button or hook. One can be made to receive only one comb from a full swarm, with one or two quarts of bees clinging to it, and will exhibit all the phenomena of a full hive. For such a hive it should be but two inches wide inside, the top made movable, so that the frames and bees may be transferred to a full stock in the fall, as such a hive would be unsuitable for wintering bees in.

STRAW HIVES.

I do not value the straw as possessing any desirable feature for general use in summer, and will only speak of it in the chapter on wintering, as there is where I think its chief merit lies; and it there attains a great superiority over any other form of hives.

CHAPTER V.

THE APIARY.

The next thing in importance, after obtaining the bees and hives, is the location of the apiary. Select, if possible, a sheltered situation, shaded somewhat by trees, with an eastern or southern aspect, and where they may be readily seen or heard from the house during the swarming season. In a sheltered situation, that, when returning from the fields laden with the nectar sweets, they may not be wafted beyond their home, nor yet fall short of it, and thus be destroyed. Shaded by trees, that the hot rays of the mid-day sun pour not directly upon them; in a quiet spot, that undisturbed by the tread of animals, or the jarring sound of machinery, they may ply their avocation; and not too high above the ground, lest they fail of making the alighting board and become lost in the tall grass. A smoothly shaven lawn, free from weeds or grass—house of the toad and spider—or covered with leached ashes, which prevents the weeds and grass growing, and which becomes hard and keeps dry, should be prepared for them, and they will more than repay the trouble and expense bestowed upon them.

If your bees have been wintered in a dormitory, the location should be decided upon as early in the spring as possible; because, having been sheltered from

the rude blasts of winter, they come out in the spring vigorous and ready to take the wing as soon as the warm rays of the sun fall upon the earth ; besides, having been inactive for so many months, they feel the cheering influence and come forth to enjoy the fresh and life-inspiring air. As they issue from the opening of the hive they hesitate, rise on the wing, and instead of leaving a direct line turn their heads toward their home, describe a small circle at first, gradually increasing it as they recede until a large space has been viewed and marked. After having made several excursions, and become familiar with surrounding objects, they leave in a direct line for the fields and return without difficulty, being guided apparently by the way-marks already established.

They now have their location marked. All things being familiar they leave without taking any precaution. Should the hive be moved during their absence, they return, their home is gone, and they know not where to go or what to do ; if there are other hives near, they will, in all probability enter, only to be destroyed, which, were it only one bee, the loss would be slight ; but when we consider the hundreds returning which are thus lost, the aggregate would in a short time reach the sum total of a colony. Therefore, after having once opened the hive in the spring and the bees have gone forth, avoid changing. Do not move the hive from its place, or, at least, but a few inches at a time, that they may find it readily.

Experience has satisfied me that stocks should

occupy their situation for the summer as early in the spring as possible, at least before they have marked their location ; or, if they *must* be moved after that, let it be not less than one or two miles.

Like all animals, bees require water for themselves and their young, therefore it is a necessity ; but large bodies or flowing streams should be avoided. A location near a large body of water is objectionable, as in stormy winds, or returning from the fields heavy laden with honey or pollen, they may fall into the water, become chilled, and unable to rise, thousands of them perish. My attention at one time was called to the matter, by my bees visiting a field of buckwheat about a half mile distant, the river making a curve, so that the bees in flying to the field, their course was necessarily, for nearly the entire distance, over the stream ; and thousands of them falling into the water were lost, and my colonies dwindled perceptibly.

DISTANCE BETWEEN THE HIVES.

As regards the distance between the stands, it should be as great as circumstances will admit. A small yard sometimes makes it necessary to sit them near together, in which case the fronts should be painted in different colors, light and dark alternately, that they may readily recognize their own dormitory. If convenient, they should be placed far enough apart to enable the attendant to pass between without jarring or even touching them, two feet being the nearest that they should be placed ; if less than that sufficient bees

will be lost, by entering other hives and being destroyed thereby, to pay the rent for a good sized bee-yard.

STANDS FOR HIVES.

Is a subject to which too much attention cannot be given, and which is almost entirely overlooked, even by those who devote most of their time to bee culture. It seems that the ease and convenience of these little industrious laborers is not considered of any consequence, some having their hives placed several feet above the ground, making it an unnecessary labor for the bees to reach it ; forgetting that they return laden and weary, with strength barely sufficient to enable them to reach the hive. They alight upon the ground for rest, and if toward evening when cool and damp, even if there is no wind, the result is that they often perish ; while others have no projection from the entrance, and expect them to fly direct from the fields into the hive without making a pause. If such would be more observing of the ways of the honey-gatherers, see them on their homeward journey, observe how frequently they have to alight for rest, and see them sit, panting with fatigue, pity, if not profit, should move them to arrange the surroundings of the hive for their better accommodation.

The stands that I use are made as follows : Procure two planks, one six inches, the other ten inches in width and as long as the hive is wide ; fasten them together by nailing on the ends even with the top, two pieces about three inches wide and one foot longer than

the hive. The piece ten inches wide being placed under the back of the hive, gives it a proper slant or pitch, which enables them to clean their hives more easily, and also causes them to build straight combs both in the hive and box, as the combs run from front to rear. Now nail two pieces of joist to the strips in such a position that the bottom board of the hive may rest upon them. Then nail on the top of these projecting strips a board the thickness of the bottom board, for the bees to alight upon. This board, extending one foot in front of the hive, gives the bees ample room for alighting, and the hive is raised sufficiently from the ground to avoid dampness, and at the same time not be affected by the wind while it allows the air to pass freely underneath.

COVERS FOR HIVES.

Here again we meet with a diversity of opinions ; some insisting upon building bee-houses. These are objectionable, because, being partly enclosed, they prevent a free circulation of air ; besides, they can front in but one direction, and if that is to the south, they only get the mid-day sun—a time when it is least needed, as in hot weather the combs are frequently injured by being melted, while the morning and afternoon sun is excluded when it is essential that it should receive the influence of his rays ; hence, a simplicity in covers is to be considered, if only from an economical point of view. Those elaborate structures are not only expensive but inconvenient in every respect.

We see, in some apiaries, not only one row of hives, but placed above each other two and even three stories, and it is readily seen how very inconvenient it must be to reach and work the two upper tiers.

A cover formed of two boards twelve inches wide, six or eight inches longer than the hive cap, one edge of each beveled and nailed in the form of an ordinary house roof, or the slant to correspond with that of the cap, and placed on loose, can be removed at pleasure, sheds rain, and protects the hive from the too hot rays of the noon-day sun.

PROCURING BEES TO STOCK AN APIARY.

It is presumed that a beginner desires to obtain a quantity of bees for an apiary. He has the location selected; has obtained, what appears to him, the best hive, and now it remains to procure occupants for those hives. He may purchase a colony that threw off a swarm the year before, as then he would be quite sure of getting a young queen; whereas, if the stock is of the current year, he would very probably have an old one, and in one or two years discover, to his great surprise, that his swarm was gradually decreasing in numbers, with a fair prospect of being utterly lost; or, should there be a swarm thrown off accompanied by the old queen, as is usually the case, the new one would in a short time dwindle down to a mere handful of bees.

The best method in all cases, therefore, is to purchase the best stocks, those containing a large number of

bees, a good supply of honey, and that these bees are sufficient to cover almost the entire comb. Before purchasing, be sure that there is no diseased brood occupying the cells, and that no swarms have been lost from this cause. If no disease prevails in the hives, then old stocks are not objectionable, as, if they swarmed the previous season, they have the young queens, who are more prolific than the old ones, who always accompany the first swarms; and as long as they remain healthy are as prosperous as the young swarms.

CHAPTER VI.

BEE PASTURAGE, AND THE METHOD OF GATHERING
HONEY AND POLLEN.

To classify and enumerate all the pollen and honey-producing plants of our country, would, be indeed an endless task; but as it is highly important that each and every bee-keeper should thoroughly acquaint himself or herself, with this particular branch of apiculture, I will mention those which appear to afford these products in greatest abundance.

Mr. Dzierzon, a prominent apiarian of Germany, made the discovery of using unbolted rye flour as a substitute for pollen early in the spring, before the flowers make their appearance,—even while the snow is yet upon the ground and the days mild and pleasant,—and this early feeding will promote early breeding, also establish habits of industry, which are essential points that should be observed by every practical apiarian. The manner of feeding this flour is in shallow dishes, set about in the yard. Sometimes it is necessary to put a few drops of honey upon the edge of the dishes to attract them to it. Old swarms that have a supply of pollen will sometimes refuse to accept it. But imagine for a moment how energetically a young swarm will work upon it that is destitute of pollen, as is often the case. When the flowers yield pollen in sufficient quan-

tities, they will no longer take the rye flour, it being more natural for them to forage for the dust of blossoms, than to take any artificial pollen that may be prepared for them.

Foremost among the pollen producing plants of any especial importance, may be mentioned the willows, although the hazel and filbert furnish pollen to some extent much earlier, being indeed, winter-blooming shrubs. Our swamps produce several varieties of willow that put forth their blooms very irregularly, many of them often lasting for a month. The golden willows produce honey in great abundance the first of the season. Following these are the soft maple, gooseberries, currants, cherries, apricot, pear, and peach blooms; these contribute their share of both honey and pollen.

Sugar maple yields a large supply of delicious honey, and its blossoms hanging in graceful fringes swaying in the passing breeze, will be alive with the industrious gatherers of the nectar sweets. Of the fruit trees, none furnish so much honey as the apple. In good weather a gain of 25 lbs. is sometimes added to the hives during the time of apple blossoms, which is about ten days; but we frequently have cold, rainy weather, at this season, and our swarms come out lighter at the end than they were at the beginning. I claim that the season of apple blossoms, and the length of time intervening before white clover, often decides the prosperity of our bees for the summer, and I would recommend a careful study in another place, of the

subject of stimulative feeding—a subject to which too little attention has hitherto been given.

We now have an interval of several days between apple blossoms and white clover, usually from ten to twenty days, in which there are but few flowers. At this time the locust steps in with its beautiful foliage, and yields much honey, but not in sufficient quantities to supply their wants.

WHITE CLOVER

May be considered the basis of honey-producing plants. It yields large quantities of pure, white honey, and wherever it abounds the bee will find a rich harvest. In most parts of the country it seems to be the chief reliance of the apiary. Blossoming at a season of the year when the weather is usually dry and hot, and the bees gathering its honey after the sun has dried off the dew, it is ready to be sealed over almost immediately. This clover should be much more cultivated for the honey it affords.

THE RASPBERRY

Furnishes a most delicious honey. In flavor it is superior to that from white clover. When it is in bloom the bees hold even the white clover in light esteem. Its drooping blossoms protect the honey from moisture, and enables the bees to work upon them when the weather is so wet that they can obtain nothing from the upright blossoms of the clover. For several weeks they are allowed to partake of this exquisite nectar,

as it is secreted at all hours and in every variety of weather.

THE BLACKBERRY

Also furnishes quite an amount of delicious nectar, not as plentiful, however, as the different species of raspberries. Besides these, there are numerous shrubs and trees that afford large quantities of honey. Among the most prominent of these stands the

BASSWOOD, OR LINDEN,

Which puts forth its blooms about the 10th of July, and retains them for twelve days. Its blossoms are long and pendant, nearly destitute of fragrance, but yielding a very rich and pleasant honey, and some seasons in great abundance. It is less likely to be cut off by bad weather than most other blossoms. A bee-keeper once assured me that he had a swarm of bees that gathered 50 lbs. of honey in a single day from the basswood. I think, had he said 10 lbs., he would have come a little nearer the right result. This majestic tree, adorned so late in the season with beautiful clusters of blossoms, is well worth attention as an ornamental shade tree. By adorning the yards of our village and country residences with a fair allowance of such trees as the

TULIP AND LINDEN,

And such others as are not only beautiful to the eye, but attractive to the bees, the honey resources of

the country, would, in course of time, be very greatly increased. Next in importance is the

TULIP OR WHITEWOOD,

Unlike the basswood, its blossoms are bell shape, and usually stand somewhat inverted, so that they frequently hold several drops of pure honey. There is not the least doubt that if this tree were as common as the basswood, it would be classed at the head, for it is certain that it yields the greatest amount of honey of any tree in this country. It has been said by some writers that new swarms would sometimes fill their hives from this source alone.

CATNIP

Blossoms in June, and continues to bloom until the frosts of autumn rob it of its verdure. The blooms are rich in sweetness, and like the raspberry, the bees visit it at all hours of the day and in nearly all kinds of weather. I find nothing to surpass it, and if I were going to cultivate any plant, especially for honey, it would be the catnip. Golden-rod and Erigeron produce a goodly amount of honey, and

BORAGE

Is a plant which would justify cultivation exclusively for bees. It blooms continuously from June, until cut off by severe frosts, and like the raspberry, is frequented by bees even in moist weather. The honey it produces is of a very superior quality, and like the catnip, an acre of it would supply a number of stocks.

RED CLOVER

Secrets much more honey than the white, and is of a delicious flavor. The first crop is seldom visited by the bees, although I have seen a few working upon it, but it appears to be slow business. We can only imagine what would be the success of bee keeping, if they were but enabled to reach the honey that is secreted in those large fresh blossoms in June, it being only the smallest blossoms that will yield up their sweets to them. The second, or seed crop, is oftener visited by them, but not sufficiently so to constitute it one of the honey-producing plants. It was claimed when the Italian bee was first introduced into this country, and were only in the hands of a few persons, and those anxious to make sale of queens, that they would fill their hives and boxes from the seed crop of red clover; but it requires a dry season to check the growth of the blossoms, to enable even the Italian bee to make any progress in honey gathering from the crop. Before red clover can be included in the list of bee forage plants, we will have to devise some method of enlarging the size of the bee or arresting the growth of the blossoms.

ALSIKE CLOVER

Is the name given to a species which originated in Sweden, and was imported to this country by a Mr. Rogers of Philadelphia. If it would prove as good on all kinds of soil for hay and pasturing as the red, it would be a very good acquisition to the success of bee-keeping; but it is only adapted for loamy and heavy

soil, that on dry, sandy soil, not being as certain a crop as white clover. It roots the same as the white clover, and therefore endures cold, wet weather, better than red clover. The stalks grow as tall as the red, but the blossoms are but a trifle larger than the white, and affords an excellent pasture for the bees, while the honey obtained from it I think is not excelled by any other plant. It also seeds like the white, with two or three seeds on each capsule. I once heard a farmer say that it was as good as hay and corn for his sheep;—he meant that there was so much seed that it often yielded seven or eight, and even as high as ten bushels of seed per acre.

BUCKWHEAT.

In many sections of country this plant is highly esteemed for the amount of honey it produces late in the season. I find it often convenient to remove all the white clover and basswood honey from the hive and let the bees fill them from the buckwheat for their winter stores. They probably fancy the flavor of it more than I do, as it has a very pungent taste, and is about the color of good molasses. Still many persons esteem it as highly as they would white clover; but the luxury to many may be the steaming hot buckwheat cakes which so often adorn the breakfast table of the rich as well as the poor, in the winter season. The amount of honey obtained from this plant is very variable and uncertain. Oftentimes large fields will scarcely be noticed by the bees, while in other seasons they will store from 15 to

30 lbs., and not unfrequently is the means of bringing up small swarms to a condition whereby they may pass the winter in safety. Many of the old apiarians have adopted the plan of sowing a few acres of it, expressly for their bees, which may be a good idea; but at the same time I would not recommend it to procure surplus honey from for the market, as the pungent taste and dark color would militate against its selling for anything but a low price, and it not unfrequently injures the sale of the nice box honey when a little is allowed to be put in to finish up the boxes. It is always a good policy to remove all the pure, white honey, as soon as the blossoms cease to yield, and before the buckwheat makes its appearance, as each kind will command a higher price if kept separate than it would if mixed. It is a good practice to use the honey extractor and remove all, or nearly all of the white honey from the body of the hive, just before the buckwheat begins to yield its sweets.

I practice this method, and generally obtain from 30 to 50 lbs. of nice, white, strained honey, per hive, and unless the season for buckwheat proves a poor one, the bees will procure a sufficient amount of stores to carry them safely through the winter. At this season, we who reside in Michigan, are favored with the marsh flowers, which are always in bloom until destroyed by the frost. At the present time (the middle of September,) they are working freely on a yellow blossom with which our marshes abound, and they are proving quite an acquisition to our bee-keeping interests.

HONEY-DEWS.

The true theory of honey-dew has not yet been fully explained. But there are two hypotheses for its production; but of the reliability of them I cannot vouch, as, having but recently removed to Michigan from the State of New York where they are rarely seen. I have never yet seen anything that I was satisfied in my own mind could be called honey-dew. I have heard it stated, however, by good reliable men, that they had seen it on the low bushes and grasses in such profusion as that it would adhere to their garments in passing through it; but such instances are not recorded in our bee books and journals, therefore we must conclude that they are not of frequent occurrence. The theory most frequently mentioned in the journals, is, that it is the excrementitious discharge of aphis or plant lice.

About the middle of the present month (September), I noticed, when passing under a willow tree, that the walk, fence and stones, were covered with spots of a wet shining substance. Upon examining the tree, I found that nearly all the smallest branches were covered with a species of large aphis, apparently engaged in sucking the juices from the twigs, and occasionally discharging a minute drop of a transparent liquid. I did not discover any bees collecting it, but found great numbers of ants, wasps, hornets and flies, collecting it from the grass beneath the tree. This, I suppose, is what is termed a species of honey dew, although not deposited on the upper side of the leaves of the trees as stated by Mr. Worthington, in the *American Bee*

Journal. He says, "the honey is beautifully clear, and of good consistency." On examining the trees, he found the under side of the leaves covered with small, green aphides, about the size of a large flea, and of very much the same shape. The dew was evidently voided by the insects, there being none of it on the under side of the leaves, and no aphides on the upper side, which would have been the case had they been eating the dew. I think the cause of the dew being on the upper side of the leaves, is well explained by Mr. Faul, of Council Bluffs, in the November number of the *American Bee Journal* for 1870, from which I copy in full. He says: "I have at last caught the chaps that rain down what is called honey-dew. In localities where the common willow grows, I found the most. On the Missouri river bottom, which is literally covered with willows, I find in June and July they are covered with small insects, which at a certain age get wings and fly off in swarms, going for miles. Sometimes they will stop in the air, over some trees, and fly around in a circle for an hour. If you get them between your eye and the sun, you will see them discharging the so-called honey-dew. They will stop in one place, the same as gnats or mosquitoes, which you have often seen about as high as a man's head.

Now, if any person wants to really test the correctness of this, let him go to a willow grove and he will find those insects (or willow lice) just before sun-down; and getting the willows between him and the sun, he will see them rising from every part of the tree, in small

squads, and collecting till they form a large swarm. Then they will be seen discharging continually a fluid which resembles a fine sprinkle of rain. I have often seen those same insects discharging a fluid on a limb, where they were hatching; and then saw large ants, wasps and yellow jackets working on it. And I often wondered how it got on the very tops of the trees, where no insects were to be found. I think this observation will settle the matter about the origin of honey-dew.

In conversing with Mr. O. C. Perrene, the honey merchant of Chicago, I find that he does not esteem the honey made from honey-dews very highly; neither should I from the above theory; but from my own views herein advanced, there can be no honey purer, or more beautiful. Sugar being one of the natural products of growing vegetation, floats to a greater or less extent, in the sap of all trees and plants, from which honey is elaborated by the flowers, and is deposited by exudation in minute particles or drops, in the bottom of the calyx, or flower cup. This honey, not being collected by insects, or absorbed by the plant, is evaporated by the noon-day sun, and passes into the atmosphere, filling it with infinitesimal particles of saccharine matter, together with the aroma of the flower from which it is distilled. As the shades of night approach, the atmosphere being free from clouds, to prevent radiation, the plants become much cooler than the surrounding air, and consequently condense upon their surfaces the moisture of the atmosphere, together with the particular substances with which it may be load-

ed ; and this process being carried on during the entire flowering season, the air becomes surcharged with sweets, and when condensed upon the leaves and grass, the moisture being partially evaporated, it leaves the saccharine matter adhering to their surfaces, and thus forms honey-dew. / It is true that the honey-dews are so abundant in many places in California, that the Indians gather large quantities of it by fastening bits of cloth to the end of poles, and passing it around among the foliage of the trees and shrubs upon which it is condensed, until the cloth becomes saturated, with the saccharine matter, then wringing it into a vessel. He is thus enabled to furnish himself with a good supply of honey, and that too, without the trouble and expense of the honey bee.

GATHERING AND STORING HONEY.

The worker bee is furnished with a tongue or proboscis, exceedingly curious and complicated, but my limited space forbids a full description of it. It is by means of this little organ that she obtains the honey from the flowers, and through it conveys it to her honey bag or first stomach. When distended, the stomach will hold about one drop, and is of the size of a common pea. In this sack the bee carries the honey from the field to the hive, and in the same pure state, that it is taken from the flower. The size of the sack can be readily seen when full, by observing a bee on a window glass, between you and the light, and presenting an appearance of transparency just back of the waist.

I have often heard it stated, and indeed many peo-

ple believe that the bees make the honey. This is a great mistake; they do not make it, but simply collect it from the flowers, or the feeding trough. There are also many bee keepers who believe that bees can be fed on sugar or molasses, and that they will convert it into nice white honey. This is very well in theory, but in practice it will be found to be sugar or molasses still, retaining the flavor, but liquified with saliva or water. The sack or stomach is surrounded by a muscular fibre which enables the bee to compress it, and empty the contents, through the proboscis into the cell. In discharging her load, she goes to the bottom of the cell, deposits a particle of honey, and brushes it into the corners and angles, with her tongue, or proboscis, carefully excluding all the air. As it is filled, that next the sides is kept in advance of the centre, making the surface of the honey, concave. This is just as a chemist would say it should be done, as they may be termed chemists as well as mechanics. If the cells were filled at once and no care taken to attach it to the sides, the external air would not keep it in place as it now does. The bees often commence filling the cells when they are not more than one-fourth of an inch in depth, and as they lengthen the cell they continue to add honey, keeping it within one-eighth of an inch of the end of the cell. When the cell is full, it is allowed to remain a short time unsealed, for the purpose of evaporating the moisture, as it is quite thin when first gathered. When honey is stored in worker cells, the honey seldom touches the sealing; but when

stored in drone cells, it usually touches the ceiling about half way up.

THE GATHERING OF POLLEN,

Or bee bread, is accomplished in quite a different manner. On the posterior legs of the worker, there is an admirable provision made, for enabling it to convey to its hive this most important part of its store. On the outside of each limb, is a small spoon-shaped cavity, or basket, to receive the pollen of flowers, which is the principal ingredient composing the food of the young. Many inexperienced bee keepers think that the pollen is the material from which they manufacture the comb, but such is not the case, it being the principal food upon which the young bee is fed, previous to being closed up in the cell. It is just as essential that the hive should be well supplied with pollen, as with honey.

The manner of collecting pollen and packing it into the little baskets on their legs, has been witnessed by but few persons. When collecting it, they alight upon the flowers, and passing over the stamens, detach a portion of the dust, which lodges upon most parts of their bodies, and is brushed together by their legs, and packed into the little baskets, while on the wing. When they gather flour as a substitute for pollen, from the feeding trough, the process is more readily seen. The pollen gathered from the pumpkin blooms, is not packed into pellets, and conveyed to the hive in the baskets, but their little bodies are completely covered with the yellow dust, and they may be seen in the mornings of August or

September entering their hives, in this condition. The cause of their not packing it at this season, I cannot explain, therefore will have to assume that it is a secret of their own, to be made clear, at some future day, by the researches of the naturalist. The manner of depositing their pollen in the cell, may often be seen in a glass hive. The legs holding the pellets are thrust into the cells and a motion like rubbing them together, is made for a few seconds, when they are withdrawn, and the two little loaves of bread may be seen at the bottom of the cell. This bee apparently takes no further care for it, but another, supposed to be the young one, not yet old enough to go to the field, will pass along, enter the cell head first, and pack it close. The cell is filled about two-thirds its length in this way, and almost invariably of the same colored pollen; generally yellow, but sometimes of a pale green and reddish, or dark brown.

After the cell is filled sufficiently with pollen it is then covered with honey, to prevent it from souring by coming in contact with the moisture of the hive in cold weather. It is then sealed over, a portion of it for winter or spring use, before fresh can be obtained from the fields. It is always a noticeable fact that they will always use the fresh in preference to that which has been wintered over. It often proves a serious detriment to a colony to have pollen stored in a hive, in such large quantities as to occupy all the cells, as they never remove it from the hive to make room for the use of the queen. In the spring they are fed, or should be fed a little rye flour. The old swarms who have a quantity of the pollen in

store, some of it perhaps several years old, will seldom touch the flour, while young swarms will carry it home in great quantities; but as soon as fresh pollen can be collected from the field, old swarms will be as assiduous in gathering it as the young ones, who are sometimes destitute at this season of the year.

PROPOLIS—HOW GATHERED AND ITS USES.

As this is another article which the bees gather principally from the forest, and is of some account to them, it is proper that I should explain their manner of gathering it and the uses to which it is applied, as it will not again be referred to. This is a resinous gum exuding from certain trees, and collected by the bees in the manner as follows: It is not, as some suppose, an elaboration like wax, although is sometimes used with wax more frequently in new swarms. It is used to cement or plaster the inside of the hive, in the corners and cracks, to render it air tight. It differs materially from wax, being more tenacious when new, and very hard when old. It is carried into the hive in large quantities in the month of August, and I find it much more abundant in Michigan than in the State of New York. When the hive is well filled a covering is spread over the entire inside, and if the bees hang out late in the summer the hive is usually partially covered where they have clustered. It seems to be their whitewash, for a new layer is annually applied in a strong colony of a thickness proportionate to their age. Propolis is a natural exudation from some varieties of trees, such

as Balsam Fir, Balm of Gilead, Tamarac, etc. It is collected in small pellets on the legs, and carried to the hive the same as pollen, but being gummy the bees are unable to discharge it themselves, therefore it is taken off by the plasterers and applied wherever most needed, and many times in unnecessary quantities.

CHAPTER VII.

SWARMING.

What season of the year will the bee fancier be more anxious to have return, than that of the swarming season? I must say that, for myself, it is the most exciting season connected with bee-keeping. To the beginner, the prospect of an increase of colonies is looked forward to with as much anxiety as the large bee-keeper would to the honey harvest. Although many who use the movable comb hive prefer the artificial multiplication of colonies, still few would be willing to dispense entirely with the pleasing excitement of natural swarming. The multiplication of colonies by swarming or dividing is the only safeguard against the possibility of extinction of the race, and also makes its labors in the highest degree useful to man. The laws of reproduction, in the honey bee, are different from those of other insects. They being obliged to associate themselves together in large numbers, in order to maintain a certain degree of warmth, while with the wasp, hornet and humble bee, the males perish in the fall, and the impregnated female remains dormant in her winter quarters until the warm days of spring restore her to life and activity, and she goes forth to become the mother of a new colony. How admirable are the arrangements of the Creator, that they may become a source of profit to

man! The bees having their hive well supplied with all the requisite materials, they are enabled to add thousands to their already numerous population before the warm rays of the sun will awaken the other species from their still dormant state. They can thus send off early colonies, and of sufficient strength to take full advantage of the honey harvest, and to provision the new swarm against the approach of winter.

WHEN SWARMING COMMENCES.

The swarming season in this latitude sometimes commences as early as the 15th of May, and at other times as late as the 1st of July. The time, however, depends very much on the season; and also the secretion of honey in the flowers. I have known instances, with abundance of early spring pasture, when nearly the whole apiary have swarmed while working on the apple blossoms, but such seasons are rarely known, and cannot be mentioned as the general rule. They usually commence to swarm about ten to twenty days after white clover comes into bloom, being governed principally by the abundance of spring supplies. If they have been abundant, so as to maintain a brisk activity in breeding, that the stocks may be very strong and populous, you may then look for swarms soon after the first appearance of white clover. June may properly be called the swarming month, here in Michigan, while in New York we have rarely had a swarm until July.

STIMULATIVE FEEDING TO PRODUCE EARLY SWARMS.

I maintain that one great secret to successful bee

keeping consists in knowing how to keep all stocks strong, or having them strong with brood in all stages of development at the commencement of the honey harvest. When the harvest commences, I aim to have every stock completely filled with comb, brood in all stages, nursing bees in abundance and less than sixteen days old, honey gatherers over sixteen days old, and they are in the very best possible condition to immediately commence storing surplus honey. The consequence is, that I will receive a profit in surplus honey and swarms, and therefore pronounce the season a good one; while the apiarian who allows his bees to do as they can will often think the same season a bad one. I hold it to be a fixed fact, that the spring is the proper time to feed. Keep your bees in the best possible condition to store honey, and when the harvest comes they will improve every moment in storing it. The process of feeding is very simple, and requires but a small portion of a man's time, but he must exercise some judgment in regard to the time of doing it. I usually commence as soon as the bees fly out in the spring, by giving them unbolted rye flour, in order that those swarms that require pollen may avail themselves of the opportunity of procuring it. I then observe the honey harvest closely, and days when they cannot procure honey either on account of bad weather, or because there is none distilled by the flowers, I give them at night, and occasionally in the morning, about one or two table spoonfulls of honey or white sugar dissolved in water and boiled to a syrup. I have frequently fed them by

pouring it directly upon the combs, but would now recommend the use of Mr. Van Deusen's bee feeder for this purpose, with which you can feed them in such quantity as you may desire, and without the least possible chance of being disturbed by robber bees. It can be placed directly over the cluster, and so placed as to prevent the escape of any of the heat of the hive, which is much needed at this season of the year. The reader will understand that it is not the quantity of honey fed, for that might be a detriment instead of a benefit, but the secret lies in having a small amount of honey coming into the hive daily, which will stimulate them to breeding, so that when white clover does make its appearance, in any great quantities, they are ready in strong force, to confiscate its sweets to their hive in great profusion.

WHY DO BEES SWARM?

Much has been said in regard to this, by some of our most scientific bee keepers, but I think the majority of them believe that the bees swarm from a lack of room on the inside of the hive, although I have been led to think that they were influenced to this, by instinct, to prevent the extinction of their race, when I have seen them swarm from a hive or barrel, when not over half filled with comb. But when it does occur, that they swarm with plenty of room in their hive, it is only when there is a copious yield of honey in the field, and there has been a premature construction of queen cells. I think it safe to say, as a general rule, that bees swarm

for lack of room, or for the want of thorough ventilation inside the hive.

SIGNS OF SWARMING.

I know of no sign from external appearance, by which we may be guided, without some knowledge of the indications of its swarms. We often watch in vain, for weeks, perhaps, remaining at home and neglecting other important business, in the fruitless expectation that the "bees will swarm." The mere clustering of them on the outside of the hive is not to be depended upon, for I have often seen them cluster there all summer, refusing to swarm. And here is where it is that the right kind of hive, with surplus honey boxes attached in an enticing way, should be used, that your swarms may not become a dead weight on your hands. With the hive I use, I have never seen them cluster on the outside in the early part of summer; only during the hot sultry days of August and September. I find it necessary to look inside the hive for reliable indications. With the movable comb hive it is very little trouble to explore for queen cells; if any are found containing eggs, or any that are sealed over, you may expect a swarm, on the first fair day, generally, between the hours of 10 A. M. and 2 P. M. Still, I have had swarms come out as early as seven in the morning, and as late as five in the afternoon, on sultry days. But if your bees are in box hives, in order to make an examination, a little smoke should be blown under, the hive turned over and the bees driven back with a little more smoke,

and the queen cells examined; there is always a possibility, however, that some cells will be out of sight. If at or near the close of the season, we again examine, and find the cells destroyed, we at once conclude that they are done swarming. To a person who has never inverted a hive full to overflowing with bees, or has never seen it done, it appears like a great undertaking, but after the first trial the magnitude of the performance is greatly diminished, and will become less with each operation, until there is not the least dread accompanying it.

I have found the requisites for all regular swarms to be, the combs crowded with bees, and they must contain a numerous brood, advancing from the egg to maturity, and the bees obtaining honey from some source. A surplus of bees, with a scarcity of honey is not sufficient to bring out a swarm; neither will a plenty of honey suffice, without the bees and brood.

DELAY IN SWARMING.

Always, before any queen cells are constructed, several hundred, and sometimes thousands of drones are reared. This may properly be said to be the first indication of swarming. It is frequently the case that the drones are reared when the bees are at work on fruit blossoms, and not unfrequently the strongest stocks commence to rear their queen cells, when the income of honey ceases, and the prospect of honey from white clover is several days hence. Famine is close at hand; something must be done to save the colony. The

drones are sacrificed for the good of the community; even the immature drones are dragged from their cells and destroyed. At one time I had over one-fourth of my apiary kill off their drones in a single day. To me the sight was discouraging to behold. I was looking forward to an early increase of my colonies, and knowing that to these swarming must be delayed from three to four weeks before another family of drones could be raised, and it is almost invariably the case that those swarms who have killed off their drones will not send out new swarms the same season. These stocks are usually those that were the most forward in the spring, while colonies possessing but a moderate supply of bees and honey usually work on safe principles; they cannot afford to rear drones, and when the scarcity between fruit blossoms and white clover occurs, they pass the crisis without any sacrifice of life, and are ready to take advantage of the first yield, and will throw out swarms long before those who were apparently far more prosperous in the opening of spring. This demonstrates how a second-rate stock may sometimes surpass a first-class one in swarming, which has been quite a mystery to many bee keepers. Here is where Johnson comes in with his stimulative feeding. Ever since that spring, I think the year 1863, I have practiced feeding at such times, and on all days when they did not procure honey from the field. The result is, that I have not had a repetition of that fatal act since.

As above stated, it is not the amount of honey fed, but in having a little coming into the hive daily, which

keeps the colony steadily increasing, so that, when the honey season does commence, my swarms are awaiting it, with drones on hand, ready for swarming.

WHICH BEES FORM THE NEW SWARM.

That the old queen leads with the first swarm, is so easily proved, with the movable comb hive, that it is not necessary to occupy much time on the subject, in proof of which you have but to lift out the frames, to be assured that she is nowhere in the hive. The absence of eggs in the cells after three or four days is another proof of her migration with the swarm. I have known instances of two queens accompanying the first swarm, but it was in consequence of bad weather, preventing the issuing of the swarm on time, or not until after the hatching of one of the young queens; and in such cases the old queen is very unwilling to make war against her young daughter, and she is therefore permitted to accompany the mother with the first swarm. I have had one swarm that lived in that condition three days after being hived, and then leave, fly in the air for a few minutes, finally divide into two parts, one portion return to the hive, the other go to the woods.

It is needless to say that the above occurrence took place in my very first days of bee keeping; were it to occur now, I should know the remedy and apply it. The actions of the bees, for the three days that they remained in the hive, were something like this: They would cluster inside of the hive, and about every half

hour the cluster would fall, bees run out of the hive in all directions for a few moments, then return, to fall again and again, until they come out on the third day. Had I known the cause, and removed one of the queens, I should not have been annoyed by seeing my bees decamp to the woods.

There are many conflicting theories in regard to the workers that accompany the first swarm, but I am happy to say, that it is only among the old fashioned bee keepers. The observing bee keepers, I believe, all agree that they issue promiscuously, old and young. That young bees leave, any one may be satisfied on seeing a swarm come out, a great many too young and weak to fly will drop down in front of the hive, having come out for the first time, perhaps not an hour out of their cells. They may be readily distinguished by their color. Many times there will not be one-fourth as many bees left in the hive, as there were in the spring, which shows conclusively that the young bees constitute a portion of the swarm, and also, the every day laborers may be seen with the new swarm, their legs laden with pollen.

ISSUING OF SWARMS.

I have repeatedly witnessed, in my observing-hives, the whole process of swarming. On the day fixed for their departure, the queen is very restless, and instead of depositing her eggs in the cells, roams over the combs, and communicates her agitation to the whole colony. The emigrating bees usually fill themselves with honey, just before their departure. A short time before the

swarm rises, a few bees may be generally seen sporting in the air, with their heads turned always to the hive; and they occasionally fly in and out, as though impatient for the important event to take place. At length, a violent agitation commences in the hive; the bees appear almost frantic, whirling around in circles continually enlarging, like those made by a stone thrown into still water, until, at last, the whole hive is in a state of the greatest ferment, and the bees, rushing impetuously to the entrance, pour forth in one steady stream. Not a bee looks behind, but each pushes straight ahead, as though flying "for dear life," or urged on by some invisible power, in its headlong career.

We often hear it said that the old queen leads the swarm, but it is only necessary to watch for her presence when it will invariably be found that she does not come forth until the swarm is half out. The reader will bear in mind that we are only speaking of first swarms: subsequent ones, conduct themselves differently.

The bees, when first rising from the hive, describe circles of but few feet, but as they recede, they spread over an area of several rods. Their movements are much slower than usual. In a few moments thousands may be seen revolving in every possible direction.

When all are out of the hive, or soon after, some branch of a tree or bush is usually selected upon which to cluster. In less than half a minute after the spot is indicated, even when the bees are spread over an acre, they are gathered in the immediate vicinity, and all cluster in a body, in from five to ten minutes after leav-

ing the hive. They should be hived immediately, as they show impatience if left long, especially in the sun; also if another colony should send out a swarm while they were hanging there, they would be quite sure to unite.

METHODS OF HIVING BEES.

It makes but little difference how they are put into the hive, provided they are all made to enter. There is one thing essential at this time, and that is to have your hive in readiness. To prepare your hive after the swarm has issued, shows bad management; your hives should be stored in some cool place, as the bees will enter one that is cool, much quicker than one that has stood in the hot sun during the day. It is a common custom among the old fashioned bee keepers, after the swarm is out, to prepare a table, covered with a white cloth upon which to set the hive. This is all unnecessary labor. A shorter and simpler method is, to place upon the ground under the swarm-cluster, the hive, with a large piece of board, laid just in front of it upon which the bees can be poured. If they are to be hived in a box hive, one side should be raised one inch, by placing under the two front corners, two small blocks or sticks, to hold it up from the bottom board. If they are to be put into a movable comb hive, raise the front, if on a movable bottom board, if not, open the entrance as wide as possible. If the comb frames are not fastened in their places, they should be adjusted, and the surplus honey boxes turned down, that the bees may not enter them for

a few days ; and then all is in readiness for the swarm. If the swarm has clustered on a small branch or limb, it may be cut off, if not detrimental to the tree, and brought down, and the bees shaken off in front of the hive ; a portion will discover it, and at once commence a vibratory motion of their wings, which seems to be a call for the others. A knowledge that a new home is found, appears to be communicated in this way, as it is continued until all have entered. A large number may linger about the entrance, nearly or quite closing it, and preventing others from going in ; you can expedite their progress by gently disturbing them with a small twig or quill. When gentle means will not induce them to enter in a reasonable time, and they appear obstinate, a little water sprinkled upon them, will greatly facilitate operations. Care must be observed, however, not to overdo the matter by using the water too freely, as they may be made so wet that they will not move at all. When the entrance to the hive is so small as to prevent the bees passing in freely, the honey boxes may be removed, and the bees poured or shaken directly upon the top of the comb frames. They will enter the hive very readily in this way, but they must all be made to go down, and the honey boxes placed in position, and not be left until evening, as some would do. When they cluster on a limb that you do not wish to cut off, they may be shaken into a basket or box, and brought down to the hive. When brought down in this manner, it is very well to sprinkle the cluster with a pailfull of cold water ; (ice water not objec-

tionable,) which will cause them to cluster closer together, and scarcely one will leave the basket or box while being conveyed to the hive. If you succeed in getting nearly all the bees at the first effort, merely shaking the branch upon which the cluster formed will be sufficient to prevent the remainder from alighting, and will turn their attention below, where those who have already found a home, are loudly calling them to come.

When they alight very high, it is often difficult to secure them with safety to them and ourselves, unless one keeps at command the necessary implements. I have often brought them down when they were 30 feet and over from the ground. I make an implement for the purpose in this manner. Procure a light pole from 10 to 15 feet in length, upon the end fasten a ring or hoop about 12 to 15 inches in diameter. See diagram.



Attach to the ring or hoop a bag about three feet in length, made of coarse burlaps, or some material that is not too tight to exclude the air. At the bottom of the bag, a short string should be attached, by which it may be shaken when inverted. To get the swarm into it, you have only to draw it gently under the branch, when the bees will fall into it; as soon as they have fallen, turn the pole half way over, which will close the mouth of

the bag, and there is no possibility of escape^g; they are then hived as above directed. I have carried a swarm over a half a mile in this way, and find it much more convenient, than to carry a hive to the swarm. If any are left on the branch, they can be shaken so that they will cluster, then treat as before, or they will return to the parent stock, if they do not observe the call from those in the hive, unless you do not succeed in getting the queen. Should such be the case, you may very soon know it, by the bees leaving the hive, and clustering again on the limb, when the operation will have to be repeated, until the queen is secured.

Another method of hiving, and one which I can recommend above all others for dispatch, (and that is very necessary, when many swarms are kept, to prevent their going together,) is as follows: Procure several poles of different lengths, and two pieces of board $\frac{1}{4}$ inch thick, $6\frac{1}{2}$ inches wide, and 12 inches long; also two pieces 7 inches wide, and 12 inches long, nail these together, so as to make a box 7 inches square by 12 inches long, without ends; now bore several $1\frac{1}{2}$ inch holes through each side of the box, and nail it to the small end of one of the poles, or better, fix each of the poles to fit the same box, so that they may be adjusted without a moment's delay. It is highly necessary that the bee keeper should be on hand ready for business, as soon as the bees commence to alight, and before a pint of bees have collected on the limb, the box must be adjusted to a pole that is long enough to reach from the ground to the branch, then place the box im

mediately under the place chosen for the cluster. The result will be, that almost the entire swarm will alight on the box, and in it, before one has time to arrange the hive for their occupancy. As soon as the bees have clustered, the box and pole can be let down, and the bees hived in the usual manner. To expedite the business as much as possible, as soon as a quart or two have settled on the box, they may be taken down, and put in the hive; and as the call is set up, (if the cluster is not too high,) the limb may be shaken with the pole, and the balance of the swarm may go immediately to the hive instead of settling on the limb. Should any bees be left on the limb after taking down the first box full, it can be violently shaken, and the box placed under it, when the balance will settle on the box and can be taken down as before. I do not claim the originality of the foregoing, as it was kindly furnished me by Messrs. Fish Bros. of N. Y., soon after I commenced bee keeping, and I have used it ever since, with decided success.

Perhaps the greatest perplexity will be felt in hiving bees that have clustered on the body of a tree, on the fence, in the grape vine, or the currant bush. I must say that I never experienced much trouble in hiving them from such inconvenient places. The best method usually is, to place the hive, as nearly as possible, under the cluster, or if they are down to the ground, so much the better; then place the hive close to the swarm, and put a few of the bees into the hive, by dipping them with a common dipper. As soon as those in the hive discover their new home, they immediately

set up the call ; then dip the remainder of them in, or brush them, with a small twig or quill, up to the hive and they will enter very soon. Never use a broom or stiff brush, as it only serves to irritate them, and renders them less pleasant to handle. I feel that further instructions in regard to hiving bees will be unnecessary, therefore will proceed to describe the subsequent management, which is just as important, as the simple act of hiving.

ALL SHOULD BE MADE TO ENTER.

It is of the utmost importance that all should be made to enter the hive at once. A cluster outside may contain the queen, unconscious of a home, and the consequence might be, her departure for a home in the woods. The theory advanced by some of the old style bee keepers, that the queen always enters the hive first, is not invariably the case ; usually she is with the greater mass of bees, and by the use of a small twig, any small cluster about the hive should be brushed toward the entrance until they are all in. As soon as this is done, it is highly important that they should be

SET ON THE NEW STAND.

If the bees remain long on the tree before hiving they send out scouts, searching for a home. If the swarm is hived, and set on the new stand, the scouts, on their return, will fly to the limb on which they were clustered ; not being able to find their swarm, they will return to the parent stock, with the few scattering bees left after hiving. Were the scouts to find the new

swarm, as would be the case if left where they were hived until evening, they often entice them to flee to the woods. I have almost invariably found that swarms, which abandoned a suitable hive for the woods, were left to stand near the spot where they clustered, the bee keeper, intending to remove them in the evening or early next morning.

Bees that swarm early in the day will generally begin to range the fields, very soon after they are hived, and if they are left where they are hived during the day, many hundreds will have left, in search of honey. Each bee, when it leaves the hive, will mark the location, and return to the same place. Now suppose the hive is removed to a new stand in the evening; in the morning the bees that left the hive the day before, to work in the fields, will invariably fly out, without marking its location, and when it returns, will go directly to the spot the hive occupied the day before; this explains why we often see hundreds of bees flying about where the swarm was hived. They are evidently lost, and will perish in their search for the hive; while, if the swarm had been immediately moved to the new stand, the few remaining bees, even a pint or more, would return to the parent hive, and the following day no bees would be seen flying about where the swarm was hived. It will require no longer time to move them one time than another. It is useless to object, and say it will take too long to wait for all the bees to go in. I consider it an essential feature in their management, that they all be made to enter, and be placed on their new stands at once. I do not say that

my directions will always prevent their going to the woods, but I can say that I never lost a swarm, when thus treated. One thing more is very essential in the treatment of new swarms just hived, and that is

SHADE IMPORTANT.

We often hear bee keepers complain "that they lose most of their bees after they are hived, that they do not like their home, and away they go." Now, kind reader, I shall insist that the fault lies with you in most cases, and not with the bees, or hive if clean. It is of great importance that swarms should be protected, from the hot rays of the sun, for several days after having been hived. If the heat is very oppressive, they will cluster on the outside, being unable to stay within, and attend to their work of comb building. Often the comb they have built will melt and drop down, thus discouraging them, until they will seek a home in the cool shade of the forest. Immediately upon setting the hive on the stand, it should be covered with a temporary roof, (see chapter on hives) or some pieces of boards laid on to shelter it for a week or two. I would not recommend sitting them in the dense shade of an orchard, but would rather prefer sitting them in the open field, that they might get the rays of the morning and evening sun, enabling them to work earlier and later.

I had the pleasure of visiting the apiary of Mr. J. H. Townley, of Jackson Co., a few days since, and was much pleased with the arrangement and cleanliness of the apiary, which indicated that the proprietor was

“master of the situation.” His apiary was not located in a dense orchard, nor in the vicinity of hen roost, pig sty, and the like, but out in the open field as it were, with here and there a young fruit tree, not yet large enough to be beyond his reach. I asked him if on these trees was where his bees clustered. He said it was, and that they were sufficient. Mr. Quimby in his “Mysteries of Bee Keeping Explained,” says, that he prefers a place for his apiary, where there are no large trees for his bees to alight upon. He prefers simply the use of small bushes 6 or 8 feet high, set in the ground in holes prepared for them. On the clustering of the swarm they can be lifted out and hived without difficulty. I only wish that I were located under as favorable circumstances, without being surrounded by large trees, as I am obliged to be while I am living in a city with its shade trees, and an occasional large fruit tree, which we otherwise would highly prize.

LOSS OF BEES BY FLIGHT.

I know of many bee keepers who lose one-quarter of their bees by flight to the woods, and in nine cases out of ten the fault is with the apiarian. It often happens that a hive is to be constructed, or an old one cleansed and repaired, and the bees are left to hang on the limb. It is unnecessary for me to say that not one swarm in two hundred flies to the woods without first settling; but should such be the case, it is not necessary to bring all the old tin pans and bells into requisition, but simply go in advance of the migratory col-

ony with an ordinary mirror and persistently throw the sun's rays upon the head of the column. I know of nothing more effectual. We often read accounts in the bee journals of swarms being stopped by the use of the small pocket glass, an operation which might prove very profitable to a person living in the vicinity of negligent bee keepers.

DO THEY HAVE A PLACE SELECTED BEFORE LEAVING?

The inquiry is often made, do swarms have a place selected before leaving the parent hive? My judgment is, that not one in one hundred have any knowledge as to where they are going. I could refer the reader to many instances, did space permit, to substantiate my idea. Should a swarm leave after having been hived a day or two, or should they fly directly away on issuing from the parent stock, I should then anticipate that they had their home selected. How far they will go in search of a home, is also uncertain. I have known of their going fourteen miles, but do not think the scouting party went that distance in search of the spot, but a more plausible theory is, that they kept halting and sending out scouting parties until that great distance was reached. Perhaps some one will ask how I knew that the swarm went that distance. It was a swarm of Italians, and there were none kept within that distance, and the only person keeping Italians in that section had a swarm leave, and in the autumn the tree was found, the bees purely marked, and was evidently a swarm of that season.

A GOOD CLEAN HIVE GOOD ENOUGH.

It is quite unnecessary to go through with all the maneuvers that some of the old style bee keepers practice, even at the present day—for instance, that of washing the hive with a litte honey and water, sugar and water, salt and water, and a variety of other knick-knacks, or hickory leaves with salt and water rubbed on the inside to induce them to remain when put in. If the hive is clean, cool and new, I feel no hesitation in saying that they will like it just as well as if bedaubed with any of the things supposed to attract them.

SWARMS RETURN TO PARENT STOCK.

Occasionally a swarm will return to the parent hive, even after clustering. I have hived them, and then had them return. Usually, the cause of their leaving is the inability of the queen to accompany them, either from the effects of old age, or from the burden of eggs; and sometimes it is from her wings having been clipped or worn off. On the return of a swarm, if the bee keeper will look carefully in the grass around the hive, he will often find the queen. I have found her thirty feet from the hive by tracing a line of bees following in her tracks. She should be carefully picked up and returned to the hive. It is usually quite certain that they will make the effort the following day, if the weather is pleasant; on their second issue she may succeed in flying with the swarm, although I have heard of instances of their returning six times. As they are leaving the hive the second time, the bee keeper should

station himself near the hive to look for her, and if found, she can be put back with the swarm and hived as usual, or she may be confined in a cage or tumbler for a few minutes. Remove the old stock 20 or 30 feet, place the new hive on the old stand, set the queen at liberty in the new hive when the swarm commences to return, and they will soon hive themselves, when the new hive can be moved, and the old one returned to the stand.

Usually, the hives standing near the swarming hive will receive some of the bees on their return. If such is the case, they should be covered with a cloth for a short time. If it is known that the cause is in consequence of the age of the queen, it is of little consequence if she is lost; perhaps it would be better for the bee keeper to destroy her, and wait eight or nine days for the swarm which would be sure to have a good young queen, one likely to maintain the strength of the colony, and not risk the chances of losing the old queen when there were no eggs from which to raise another, and perhaps no drones flying to mate with a young one.

TWO OR MORE SWARMS CLUSTER TOGETHER.

If there are a number of colonies, the chances are that two or more will issue at the same time, and when they do, they will very often cluster together. The greater the number of colonies kept, the greater the chances are multiplied. For the bee keeper who has all the colonies he may desire, this would be no serious

objection, if abundant room for storing surplus honey can be given them, as in the hives I use, large quantities of honey are generally obtained from such stocks, if they issue early, and the season is favorable. But to the apiarian who wishes to increase the number of his stocks to the utmost extent, a division should be made. I have always succeeded with very little trouble, by shaking the bees on the center of a sheet spread on the ground; sprinkle them with a little cold water, set your hives on the sheet corresponding in number with the number of colonies that have united; direct a few bees to the entrance of each hive, and have ready some tumblers; a sharp lookout for the queens must be kept. If three colonies are united, two of the queens should be found and covered with the tumblers; if the third is not found, you will know in a few minutes which hives have no queen, and one of those caged can be given them.

Some attention should be given to the amount of bees going into each hive; if more are going into one of the hives than into another, it should be moved back a little, so that the bees may be divided as equally as possible. One first swarm, if of the usual size, will contain bees enough to form a good strong stock, and usually yield some surplus honey. The old adage is true, that "an ounce of prevention is better than a pound of cure," we can if we are watchful, often prevent the issuing of more than one swarm at a time. If they have been kept back by bad weather, for a few days, as soon as the sun shines forth in the middle of the day, many that are ready will

then issue. Raise the cover to the hive, and if the bees are all quiet in the glass boxes as usual, no swarm need be expected immediately, but should you discover the bees running to and fro in the boxes, although quiet at the entrance, you should lose no time in sprinkling those outside with water. They will instantly enter the hive to avoid the shower. In half an hour they will be ready to start again, during which time the others may be secured ; when, however, a portion of them are already on the wing, it is useless to attempt to arrest their flight.

AFTER-SWARMS OR CASTS.

This name has been given to all swarms that issue after the first. They seriously reduce the strength of the parent stock, since by the time they issue nearly all of the brood left by the old queen has hatched, and no more eggs can be deposited until all swarming is over. Then there will be but few bees left to sustain the requisite warmth to protect the eggs deposited by the young queen from chill ; hence, she cannot replenish the hive sufficiently to protect it against the ravages of the miller moth, therefore I consider it important to allow but one swarm in a season. .

It has already been stated that, if the weather is favorable, the old queen usually leaves near the time that the young queens are sealed over to be changed into nympha. In about a week, one of them hatches ; and the question must be decided whether or not any more colonies shall be formed that season. If the hive

is well filled with bees, and the season is in all respects promising, it is generally decided in the affirmative, although, under such circumstances, some very strong colonies refuse to swarm more than once; while the repeated swarming of weaker ones often ruins both the parent stock and its after-swarms.

If the bees decide to swarm but once, the first hatched queen, being allowed to have her own way, rushes immediately to the cells of her sisters, and stings them to death. The other bees probably aid her in this murderous transaction; they certainly tear open the cradles of the slaughtered innocents and remove them from the cells. Their dead bodies may often be found on the ground in front of the hive.

If the bees of the parent stock decide to send out a second colony, the first hatched queen is prevented from killing the others. A strong guard is kept over their cells, and as often as she approaches them with murderous intent, she is bitten, or given to understand, by other most uncourtier-like demonstrations, that even a queen cannot, in all things, do just as she pleases.

Like some human beings who can not have their own way, she is highly offended when thus repulsed, and utters, in a quick succession of notes, a shrill, angry sound, not unlike the rapid utterance of the words, "peep, peep." If held in the closed hand she will make a similar noise. To this angry note one or more of the unhatched queens will respond, in a somewhat hoarser key, just as a cock, by crowing, bids defiance to his rivals. These sounds, so entirely unlike the

natural steady hum of the bees, or the fluttering noises of unhatched queens, are almost infallible indications that a second swarm will soon issue. They are occasionally so loud as to be heard at some distance from the hive. About a week after first-swarmling, the apiarian should place his ear against the hive in the morning or evening, when the bees are still, and if the queens are "piping," he will readily recognize their peculiar sounds. The young queens are all mature, at the latest, in sixteen days from the departure of the first swarm, even if it left as soon as the royal cells were begun. If, during this period, these notes are not heard, it is an infallible indication that the first hatched queen has no rivals; and that swarming, in that stock, is over for the season.

Young queens, whose ovaries are not burdened with eggs, are much quicker on the wing than old ones, and frequently fly much farther from the parent-stock before they alight. After the departure of the second swarm, the oldest remaining queen leaves her cell, and if another swarm is to come forth, "piping" will still be heard; and so before the issue of each swarm after the first. It will sometimes be heard for a short time after the issue of the second swarm, even when the bees do not intend to swarm again. The third swarm usually leaves the hive on the third day after the second swarm. I once had five swarms from one stock, in less than two weeks. In warm latitudes, more than twice this number of swarms have been known to issue, in one season, from a single stock.

The second swarm usually issues on the second or third day after "piping" is heard, though they sometimes delay coming out until the fifth day in consequence of an unfavorable state of the weather. Occasionally, the weather is so extremely unfavorable that the bees permit the oldest queen to kill the others, and refuse to swarm again. This is a rare occurrence, as young queens are not so particular about the weather as old ones, and sometimes venture out, not merely when it is cloudy, but when rain is falling. On this account, if a very close watch is not kept, they are often lost. As "piping" ordinarily commences about a week after first swarming, the second swarm usually issues nine days after the first, although it has been known to issue as early as the third and as late as the seventeenth; but such cases are very rare.

It frequently happens in the agitation of swarming, that the usual guard over the queen cells is withdrawn, and several are hatched at the same time, and accompany the swarm; in which case the bees often alight in two or more separate clusters. I have known five queens to issue with one of the after-swarms. When they alight in separate places, they should be hived together, and those who use the old box hive, I would recommend that they always hive two or more of the after-swarms together, that the stocks they have may be kept full and strong.

HOW TO UNITE.

I have said that first swarms have bees enough, but

second swarms are usually only one-half as large as the first, and the third only half as large as the second ; thus it will require two of the second swarms to make one as large as the first, or four of the third. Whenever these swarms issue at the same time, they may be hived together, or if you have one hived, on the issue of another, they may be put into the same hive ; they will go together the same day, and the day following, without any trouble, but after that it will be necessary to treat them differently. Those that come out on the second and third day after hiving the first, should be hived in a temporary box until evening, when they should be scented with a little oil of anise or peppermint, also the swarm with which you wish to unite them, and just before dark they may be poured out of the box, before the one already hived. In the morning you will find the surplus queens on the bottom board, the bees having decided which one to retain, and destroyed the others. It is unsafe to attempt to introduce them after three days. These instructions are for the box hive ; but a different method may be used, for the movable comb hive, if it is desired. Each after-swarm can be hived separately, but I would recommend hiving only the second swarms, removing the queens from third swarms, and return them to the parent-stocks. Those that are hived, if light, can be strengthened by removing an empty frame and exchanging for a frame from a good, strong colony, one that is well filled with brood and honey, always taking the precaution to brush off the bees, and by this means they can be brought up to the same strength of the other colo-

nies. Such colonies are usually the best ones we have for the next season, because their queen is young and prolific.

HOW TO PREVENT AFTER-SWARMS.

Too frequent swarming is often detrimental to the profits of the apiary. If the bee keeper does not wish after-swarms, they can be prevented by the use of the movable comb hive, but with the box hive, I know of no means by which they can be prevented, so as to make success certain.

(About six days after the first swarm comes out, the parent-stock may be opened, and all the queen-cells removed, except one. If done earlier than this, the bees may start others, in the place of those removed. Those only who have thoroughly tried both plans, can appreciate how much better this is, than to attempt to return the after-swarms to the parent-hive.)

I will here give my method of preventing after-swarms, and it is accomplished without trouble. With the hive I use, and the manner I use it, it is needless to look for but one swarm from a stock in a year. My way is to put the surplus boxes on, early in the season, about the time that white clover first makes its appearance. The result is, that each stock invariably fill their boxes about one-half or two-thirds full of honey, before the issuing of the first swarm. But, some will say that I delay swarming, by putting on boxes; such is not the case. I know of no one, who has earlier swarms than myself. I will not say that putting on boxes before they swarm, does not delay swarming; it does, unless they are

brought up to a high standard by stimulative feeding, previous to the appearance of white clover; if they are, they will prepare themselves for swarming, and issue just as soon as one that has not been fed, and I will be the gainer of 20 or 30 lbs. of surplus honey. Now the question will often be asked, if my parent-stocks are strong, why they do not cast after-swarms? The reason is simply this: as has been stated, when the first swarm issues, every cell in the parent hive is filled with brood, except those that are occupied with honey and bee bread. Now this brood when it hatches as what the after-swarms are principally composed of, the old bees nearly all having gone with the first swarm; when the young bees hatch, and view the inside of the hive, they find plenty of labor to do, in finishing up the surplus boxes, and I feel safe in saying in nineteen times out of twenty, that I will have no after-swarms; but if there had been no honey deposited in the boxes, or in other words, that work had not been commenced in them, then I should almost as soon expect the issue of after-swarms, as though there were no boxes on the hive. But when it occurs that a first swarm does issue without storing honey in the boxes, I have only to give them one or two boxes from other swarms that are partly filled, when my ends are attained.

THE QUEENS.

It will be remembered, that both the parent-stock from which the swarm issues, and all the colonies, except the first, have a young queen. These queens never leave the hive for impregnation, until they are established as

heads of independent families. They generally go out for this purpose, early in the afternoon of the first pleasant day, after being thus acknowledged, at which time, the drones are flying most numerous. On leaving their hive, they fly with their heads turned towards it, often entering and departing several times, before they finally soar into the air. Such precautions on the part of a young queen are highly necessary, that she may not, on her return, lose her life, by attempting, through mistake, to enter a strange hive. More queens are thus lost than in any other way.

When a young queen leaves for impregnation, the bees, on missing her, are often filled with such alarm that they rush from the hive, as if intending to swarm. Their agitation is soon quieted, if she returns in safety.

The drone perishes in the act of impregnating the queen.

The queen usually begins laying about two days after impregnation, and for the first season, lays almost entirely the eggs of workers; no males being in colonies which will throw no swarm until another season. She is seldom treated with much attention by the bees until after she has begun to replenish the cells with eggs; although if previously deprived of her, they show, by their despair, that they fully appreciated her importance to their welfare.

A first swarm will sometimes swarm again, about a month after it is hived; but in northern climates this is a rare occurrence.

Intelligent Apiarians will see, from these remarks,

that with movable-comb hives, natural swarming can be carried on with greater certainty than ever before, many of the perplexing discouragements under which they have hitherto prosecuted it, being effectually remedied.

I have endeavored, even at the risk of being thought too minute, to give such directions as will qualify the novice to hive and manage a swarm of bees, under almost any circumstances, knowing that however necessary, suitable information is seldom found even in the best treatises on bee keeping. Vague or incomplete directions fail, at the very moment that the inexperienced attempt to put them into practice.

Natural swarming may, unquestionably, be made highly profitable; and as it is the most obvious way of multiplying colonies, and requires the least knowledge or skill, it will undoubtedly be the favorite method with most bee keepers, for many years, at least.

I will give a few theories in regard to artificial swarming, and leave the reader to decide for himself, which course he will pursue.

CHAPTER VIII.

ARTIFICIAL SWARMING.

Artificial swarms are those that are made by driving or dividing. It is quite a common practice with some of our leading bee keepers, but should not be resorted to, unless the season and size of swarm will warrant it. There are advantages, as well as disadvantages, attending it. The amount of labor required in making artificial swarms, is about the same as in hiving natural ones. If the bee-keeper were sure of one issue, and but one, from a hive, and could attend to them without particular inconvenience, natural swarms would be much preferred, if they would work as well; but the complaint is often made that they do not work as well. Now, I would ask if any person ever saw a swarm of bees that showed any desire to be swarmed artificially? I think that every bee keeper would answer positively, "no!" but on the contrary, did any one ever see a colony that manifested a desire to swarm naturally? this, would surely be answered in the affirmative. They will ever act in accordance with the instincts of their nature, which is to leave the old hive, and establish for themselves a new home; they go forth with this intention, rarely returning to the parent-stock, but enter the hollow body of a tree, when nothing better presents. And what arrangements have they left at home? Surely they have left the

combs full of brood in all stages; they have left the means of raising another queen, to take the place of the old one, and they have left abundant stores for the young bees to live upon until they are able to go to the field. Now suppose you divide this swarm of bees into two equal parts, with an equal number of bees in each, they have each to fill the one-half of their hives that are supplied with empty frames, and it is known by all apiarians, that bees in large bodies will build comb faster, and gather more honey than when in small bodies.

For artificial swarming as it is generally practiced, the swarming season is the best time, as then the stocks are constructing queen cells, preparatory to migrating, and if my method is strictly followed, there can hardly be a failure. With the box hive, I would not advise dividing until preparations are made for swarming, as it is essential that the old stock be given a laying queen, or a cell just ready to hatch. If they have made no preparations for swarming, and have bees plenty, and it is the desire of the bee keeper to increase his stocks, I would, in all such cases, recommend that you procure a laying queen, or a cell. It is very plain that a fertile queen, or a queen from a finished cell, must be ready to deposit eggs several days sooner, than one that is raised in the hive, after the necessity for one exists. There is still another advantage: the sooner a young queen can take the place of the old one in her maternal duties, the less time will be lost in breeding, the more bees there will

be to defend the combs against the miller moth, and the sooner the guarantee for surplus honey.

HOW TO MAKE ARTIFICIAL SWARMS WITH BOX HIVES.

In dividing bees that are in the box hive, I would not recommend putting the new swarm made into an old box hive, but rather procure a good movable comb hive, that would not cost but two or three dollars, and make your start in the world on good sound principles. When you are ready, take a stock that can spare a swarm, and at such time when there is plenty of honey in the field. If the bees are on the outside, raise the hive on one edge, setting it on a little block ; sprinkle them with a little cold water, blow some tobacco smoke among them, and disturb with a small twig until they all enter. They should then be smoked a little again, and gently removed a rod or two from the stand and inverted ; have ready a hiving-box, or another hive of the same size to set over them. It will be necessary to wrap a sheet around the hive, where the two are joined, so that no crack or crevice be left, through which the bees may crawl. Now place an old hive on the old stand, as near like the one removed as possible, for a decoy hive, that the bees returning from the field will not enter the neighboring hives, but stay around this decoy for a few minutes. All things being in readiness, with a couple of small sticks, not more than one inch in diameter, proceed to beat the sides of the old hive for a minute, and then rest for about five minutes. This is very necessary, as it will allow the bees to fill themselves with honey, as

all regular first swarms go forth thus laden. The amount of honey carried out of a hive by a good swarm, together with the weight of the bees, (which is not much) is from six to ten pounds. When the bees have filled their sacks with honey, proceed to drive them into the upper hive by striking the lower one rapidly from five to ten minutes, a loud humming will mark their movement upward. The upper hive may be lifted off, and examined without fear of being stung, and if you have a good swarm in it, it may be set aside for a few minutes, and return the old hive to the old stand to allow the bees that are in, and around the decoy hive, to return to the old stock. The bees that have returned from the field, and have lost the old hive while in the drumming process, if allowed to go back into the old hive, will seldom desert it again. When all are in, remove the old hive to a new stand two rods or more from the old one, and set the new bees on the old stand. A few minutes will decide whether you have the queen with the swarm, as they will remain quiet if she is present, but if she is not they will be uneasy and run about in search of her; when it will be necessary to drive them again. As soon as it is ascertained that the queen is present, the bees may be changed from the driving box, if wished into another hive, simply as is done in hiving a natural swarm. The work is now completed, if the queen is present with the new swarm, except to look at the condition of the queen cells in the old hive. If none are near completion, one should be removed from another stock and inserted into the hive just driven, by cutting

out a piece of comb large enough to receive the cell with some comb attached so as to guard against any bruising of the cell ; or what would be better, to introduce a laying queen. Should the night or day be cool after the swarm is driven, it would be necessary to cover the old stock with a blanket, or remove it to a dark room to prevent the brood from being chilled, by the loss of so many bees. Another method, and one which I much prefer to this, is to make

ONE SWARM FROM TWO.

The proceedings are the same as far as driving is concerned. After the swarm has been driven into the new hive, set it directly on the old stand ; then remove another hive a rod or two away from its own stand, and place it on a new stand. The old swarm that has just been driven may be set on the old stand of the one just removed to the new stand, and all is done if you have secured the queen in the new hive. Here some caution should be exercised in swarming in this manner, and only attempt it when the bees are gathering honey. As the bees from the hive that is moved to the new stand will return to their old stand, and there find the old hive just driven, the bees being strangers, will not receive the newcomers to their home, unless they are loaded with honey. The old hive will not show signs of losing any of their bees, but the hive that is removed to the new stand will be very much reduced ; when in fact, this is the hive that has been swarmed, and will not be in condition to pass through the same process again for several days.

The old hive, having only lost their queen, and as soon as she has cells finished, she may again be used, but only to be the one moved to a new stand. It could not be driven because it has no queen.

Artificial swarming from the old box hive, I think, could be of no profit to the apiarian only in treating stocks that refuse the entire summer to swarm, I would give them sufficient time to swarm naturally, and did they decline to do so, I would force them; but I would put them into the movable comb hive, where I could artificially swarm them with ease, or build them up from other strong stocks.

MADE EASY WITH MOVABLE COMB HIVE.

The drumming process does not have to be resorted to, with these hives. There are several different ways by which it may be done, but I will mention only a few cases, which are the best and safest to adopt. To divide a swarm, you have but to procure an empty hive, of the size of the one you desire to divide. Place your stands by moving the old one a little to the right or left, and place the new one at the side of it, so that both will occupy the old position. Blow a little smoke among them, and carefully loosen all the frames before lifting any of them out, as the bees resent a slight jar, during this operation, more than the removal of the frames. They will need a little more smoke during the operation to keep them quiet. Take out just half of the frames, with bees, and put in the new hive. By this method of dividing, it is necessary that the queen

should be found and all of the queen cells, if any are commenced, should be cut off, and also the cells should be removed from the part that has no queen, and a laying queen should be caged, and placed between the combs for a day or two, or until the bees will receive and accept her as mother of the colony. The hive should then be filled with empty frames, and you may consider your labors done except to divide the bees. More may go to one hive than to the other, in which case the one receiving the most, should be moved a little away from the other, until they are equal. If a laying queen is not given to the portion that has no queen, the bees will only build drone comb, which would prove very detrimental to the value of the swarm, and also, if there are queen cells that are not removed from each portion, they will often swarm; the dividing seeming not to deter their preparations. I would not recommend the foregoing plan, unless to be practiced by a thorough bee keeper.

AN EASY METHOD.

The question now arises, how shall we accomplish it, and have the two hives in the same condition, as when they swarm naturally? Let us look into the inside of the parent stock after it has swarmed. It will be seen that it has but few bees, and no queen. It is, however, full of combs filled with young bees in every stage of development, from the larvæ to the full-grown bee issuing from the cell, and young queens which will be matured in about nine days. Such then is the condition of the pa-

rent stock, after a first swarm has issued in the natural way. The first swarm after being hived is in the following condition : An empty hive, neither combs or honey, but a laying queen, and a large number of bees. Now, how shall we divide a colony so as to secure the same conditions to both stocks? If we could do this, and make our swarms a few days earlier than if left to themselves, and save the trouble of watching for them to come off, and the loss of bees going to the woods, it would certainly be very desirable. I will give my method, and the reader may see how near I keep to nature ; and I will then show, that I am far from nature, and would be, were I to divide my swarm only one hour before they would have swarmed naturally. I cannot sort out the old bees, and young ; and leave some at home in the parent stock, and remove others to the swarm, as they would do in swarming naturally ; neither can I give them the energy and determination which they exhibit when left to themselves ; but this method is the nearest I am able to get to nature.

I wait until I see some signs of swarming, or near to swarming time, generally to about the time queen cells are being started. I then go to the hive I wish to divide and search for the queen by looking over each card of comb carefully. As soon as I discover her, I put the card of comb on which I find her in a new empty hive from which I have removed one frame. I then put the frame in the old stock, in place of the card of comb I removed. I now remove the old stock away some distance to one side, putting it on a new stand ; and set the

new hive, in which I put the queen, on the stand where the old hive stood. The result is, the bees will rush out of the old hive, return in large numbers to the old stand and enter the new hive, where they find their queen, but an empty hive.

It will now be seen that the old stock or hive will lose a large proportion of bees and the old queen, the same as in the case of a first swarm going off naturally; but it will contain all the combs, honey, and young bees, save what are contained on the one card removed. If queen cells were not already started, they will at once start them, and a queen will be matured in ten or twelve days, only a day or two longer than when a swarm issues naturally. The swarm in the new hive will be in just the same condition as a first swarm would, except that they have a card of comb instead of an entirely empty hive, and the next day even this card of comb may be removed, first shaking off all the bees and the queen, and replaced in the old hive again, leaving the swarm to build all new combs, as in natural swarming.

It will be seen at a glance that nothing can be nearer nature than the plan I give. "But," says some one, "it is difficult for me to find the queen, and I would like some method that I could practice, without searching for the queen." Here it is, then:

DIVIDING WITHOUT FINDING QUEEN.

When you wish to make a swarm, first remove the stock you intend to divide a short distance away, and set an empty hive on the stand where the stock

stood. Now remove each card, carefully shaking off or winging off all the bees back into the hive, and place the card in the empty hive. By the time you have placed them all in, there will be bees enough return to nourish the brood. Having put frames into the old hive from which you have just removed the cards of comb, place it again on its stand, removing the new hive into which you have put the cards of comb to a new stand. It will now be seen that the queen and a large portion of the bees will be on the old stand, in the old hive now filled with empty frames, and like a first swarm will go to work and fill the hive with new combs. Care must always be taken that the hive containing the combs has bees enough to nourish the brood.

I would here remark that whatever method is practiced, it is absolutely necessary that the old queen be in the empty hive, as bees always build drone comb when they have no queen ; and every method that does not recognize this fact should be rejected.

NEW WAY OF MULTIPLYING.

Mr. Mitchell, editor of the *Illustrated Bee Journal*, has advanced a theory for the multiplication of stocks, which, I think, would be preferable to any mode that has been hitherto introduced to apiarian science. A skillful bee keeper can, by careful attention during the honey season, increase his stocks very rapidly, and to almost any extent. If it is desired to work his bees for surplus honey during the early part of the season on white clover, and basswood, he may do so, and

permit them to swarm naturally, and immediately after the principal sources of honey are gone, he may increase his stocks to the desired extent on buckwheat and other flowering plants, which usually yield honey sufficient. By careful attention to keep the stocks and by so doing evade the buckwheat honey in the surplus honey boxes; and thus have the choicest crop of honey in surplus boxes, and leave the buckwheat to build up the colonies, and for their winter's store. It is easily done, and is practicable, so much so that the inexperienced could perform it, without danger of loss. To practice it successfully, it will be very necessary that a supply of queens should be ready, that one can be introduced to every new colony made. We will suppose that we are using the movable comb hive with eight frames, although any number of frames can be used, his theory is substantially this, to illustrate which we will suppose that we have seven colonies of bees, all in good condition, full of honey and bees. We will proceed to procure an empty hive, set it down near the seven old hives, open up the first hive, removing one comb with what bees may be upon it. Be careful not to get the old queen out of the hive, set that frame in the new hive, put an empty frame in the old hive, close up; then open the second and remove one frame as before, setting up in the new hive, and in that way open all the hives, taking one frame from each hive containing brood, honey and bees. You will now have eight colonies. We will now, for instance, imagine the bees taken from seven different colonies. They would commence a war of extermination upon each other, re-

sulting in destruction to everything, and despair to the bee owner. On the contrary all is peace and harmony; all the bees find themselves surrounded by strangers, and in place of seeing that commotion there which you would naturally expect, they will be unusually quiet; for at least twenty-four hours scarcely a bee showing itself at the entrance; they seem to be determined and decided what is best to be done. It may be that they are preparing for future operations. You may set them wherever you wish, and but few will ever return to the old colony. You will be safe to let a queen bee go among them, whether she be fertile or otherwise. The bees will receive her with all the courtliness and deference her majesty demands.

The above directions should be followed strictly, taking care to keep the bees strong at all times, and dividing as fast as filled up. In that way the careful apiarist may increase his stocks to almost any number in one season, and have each hive full of both bees and honey. Here let me caution the bee keeper wanting to make artificial swarms to be sure to take a frame from each hive containing both brood and honey. It is a well known fact that bees scarcely ever forsake their brood.

Here permit me to remark that through the best portion of the honey season, swarms can be made every other day, using the new stocks, as well as the old ones, they having established themselves as an independent colony, and will soon have their empty frames filled with brood and honey.

CHAPTER IX.

LOSS OF QUEEN.

To detect the loss of the queen bee is a point in apian science which every bee keeper should thoroughly understand. She sometimes dies of old age, or disease, when there is no brood in the cells to supply her loss; but such cases are rare; for either, the bees build royal cells, aware of her approaching end, or she dies so suddenly as to leave young brood from which they can rear another one. Even were there brood, and no drones for the impregnation of the young queen, the result to the colony would be just as disastrous; nothing but utter annihilation for their destiny. Queens are not only much longer lived than the workers, but are usually the last to perish in any fatal casualty. She rarely dies of old age, unless during the season when her strength is severely taxed in breeding, and then drones are usually present to impregnate their successors. Some writers assert that the workers prepare royal cells when the old queen begins to lose her vitality, previous to superannuation, believing that the workers destroy the old one, and rear a new one in her place. I have no doubts to express on the subject, never having had a case come to my notice. I can only hope that it may prove true. But if such were the case, I can not but think that the workers are very much demoralized in colonies that are living with

unimpregnated queens, or perhaps fertile workers, when they will not destroy such; to receive a fertile queen, or the means of rearing one, when such overtures are made to them.

More queens perish whose loss cannot be supplied by the bees, when they leave the hive to meet the drones than in any other way. After the departure of the first swarm, the mother stock, and all the after-swarms, have young queens who must leave the hive for impregnation. They often become a prey to the birds, or by a sudden dash of wind are blown against some hard substance, or they may fall into water and perish. They are not exempt from the mishaps common to the humblest of their race. Notwithstanding their caution in marking the position and appearances of their home on leaving, they not unfrequently, on their return, by mistake, enter the wrong hive, and are destroyed. This is one very urgent reason why hives should not be placed too close together, when of one uniform color; they should be painted in different colors, or set in different positions, that they may be more easily recognized, and thus save many mishaps to the beginner. Rev. L. L. Langstroth acknowledges that he once made a great mistake in arranging several hives in a row close together, all alike, and of the same size and shape. He soon found that nearly all of his hives became queenless; he gave them other queens, but it was of no avail, they were unable to mark their location. Had he not been a practical bee keeper, he would have attributed his loss, if the bees had died, to the moth worm, or some other enemy of the bees. If

the bee keeper, from limited space, or other reason, has to set his colonies close together, it would be well to paint the fronts of his hives in different colors, or have some shrub or other mark, by which the young queen as well as workers may be guided aright. The bees are sometimes so excessively agitated when their queen leaves for impregnation, that they exhibit all the appearance of swarming. They seem to have an instinctive perception of the dangers which await her, and will sometimes gather round, and confine her, as though they could not bear to have her leave. If the queen is lost, the bees of an old swarm will gradually decline ; those of an after swarm will sometimes unite with another colony, or soon perish.

INDICATIONS OF LOSS OF QUEEN.

The following morning after a loss of this kind has occurred, and occasionally at evening, the bees may be seen running to and fro in the wildest consternation, on the outside of the hive. Some will fly off a short distance and return ; one will run to another, and to another still, in the vain hope of meeting their lost queen, and all this will be going on while the other hives are quiet at work. Towards the middle of the day the confusion would be less marked, but the next morning it would be again enacted, though not so wildly, and after the third or fourth day cease entirely, and they apparently become reconciled to their fate. They will continue their labors as usual, storing honey and pollen, although they do not manifest that energy or agility that is seen in a prosper-

ous colony. Some authors say that they will not gather pollen when queenless; but such indications are not always reliable. It is highly necessary that the bee keeper should glance at every swarm in the morning for a few days after swarming, so that, if any such loss should occur at this time it may be remedied at once by the introduction of a cell, or a fertile queen. In early spring, every swarm should be examined for her presence. In the box hive, a little smoke may be blown in, and the bees driven back; if any brood can be discovered, it is a sure indication that she is there, and fertile. In the movable comb hive, it is only necessary to raise out one of the combs in the centre of the cluster, and the condition will be recognized at once. If a few imperfect bees are found on the bottom board or in front of the entrance in early morning, it shows that the colony has a fertile queen, and further examination is unnecessary.

CHAPTER X.

MODES OF SECURING SURPLUS HONEY.

That the profit in bee keeping consists principally in securing surplus honey, I believe is an undisputed fact, and a few hints or suggestions in regard to the different manners of procuring it, would not be unappreciated by the beginner. The putting on of boxes should be done at the proper time ; if they are put on too early, they will allow the heat of the hive to escape into them, at a time when it is most needed in the hive to keep the brood warm ; also, the moisture from the hive may accumulate in them, causing mould to form on the inside. Experience and judgment are necessary, to know about what time boxes are required. There can be no definite time given, which would be applicable to all sections of country, but I find the best time to be when the hive is full of bees and honey ; or a day or two previous would be the proper time. They should be put on just before the bees begin to cluster on the outside of the hive, or on the appearance of white clover, so that they may cluster in them instead of idling away two or three weeks on the outside of the hive, as they often do while preparations are being made for swarming. Too much room in surplus boxes, might retard swarming a few days, but if the bees are crowded outside it indicates want of room and the boxes can make no difference. By stimu-

lative feeding, I usually get my boxes partly filled before my neighbors bees begin to swarm, simply, by my bees having work to do, while other's bees are idling away their time on the outside of their hives doing no one any good. (For description of the boxes I use and the mode of use, see chapter on Hives.)

GLASS BOXES PREFERABLE.

The advantage of using boxes with one or more sides made of glass, is that while being filled, the progress can be watched until they are finished. As soon as they are filled, they should be at once removed, to preserve the purity of the combs. If they are allowed to remain after being finished, every day that the bees are permitted to run over them, necessarily renders them darker. One reason for a large proportion of the dark colored honey we see in market, is attributed to the old fogé whim, that it is not time to take off honey until fall. But I shall insist, notwithstanding all such whims, that as soon as the honey is capped over, it should be removed at once, and empty boxes placed in their stead. When bees are a long time in filling the boxes, the comb is not as white as when filled expeditiously. Two weeks is about the shortest time in which boxes are filled and finished. The time of course depends on the yield of honey, and the size of swarm; although the average time is from three to four weeks. Occasionally a swarm will contain too many bees to work to advantage in one set of boxes. In such cases, when the first are well advanced they should be raised up and another set put un-

der them with holes for communication through both top and bottom. (See description of in chapter on Hives.)

HOW TO REMOVE BOXES.

This can be done at any time during the day. I usually prefer to remove them in the forenoon. It is accomplished with apparent ease, by the use of a little tobacco smoke blown under the box after raising one side of it a trifle, and then let it remain for a minute or two and the most of the bees will run down into the hive from the smoke, when it may be removed, and another put on, without fear of being stung, or of exciting their anger in the least. If they are removed at a time when honey is plenty, in the field, they may be turned bottom side up, directly in front of the hive, close up to, and against the alighting board. They should never be carried away to the cellar or house, as some are in the habit of doing; because there are many young bees in the box that have never flown, and when they come out, they cannot find their home, and will often loiter around where the box was until they perish. If they are set close to the hive when they come from the box, they will run direct into the hive, and be well received. The box should not be allowed to stand in the sun, in the middle of the day, as the combs will soon melt; but should be covered with a small piece of board. When there is no yield of honey from the field, the bees are disposed to rob, and a different method must be adopted in order to secure it from the robbers. In fact I like it

so well, and it is so little trouble, that I always use it even to remove honey when there are no robber bees to contend with. I make a box of thin boards, sufficiently large to hold all the boxes I wish to remove from one hive, at a time ; this I place directly in front of the hive, and against the alighting board. I now put my honey boxes in the box, in such a manner that the bees can get out of them, and cover it with a piece of white cloth to admit the light. The bees will leave the boxes, crawl to the top and get on the cloth. Turn this cloth over a few times, and you will dispose of all the bees in a short time. The old bees may take wing, but will soon alight at the entrance of the hive, and very soon call all of the young ones, so that none will be lost ; and your boxes will not be troubled with robbers.

BOXES ON NEW SWARMS.

Some writers argue that it is not good policy to put boxes over new swarms ; but with such I beg leave to differ. If my swarms are large and early, after a lapse of two or three days, I put the boxes over, and from a good swarm I frequently get more honey than from the old stock, even if it does not cast but one swarm. I would not recommend putting the boxes on the same day they were hived, because they would often commence building comb in the boxes first ; but if they were compelled to commence in the hive first, there would then be no danger of their deserting it for the boxes. Occasionally, if the swarm is not large, it would be best not to give them more than one or two boxes,

and economize the heat of the hive as much as possible. At the end of the honey season, the boxes should all be removed, as, if they remain on too long, the bees will carry the honey down into the hive; and if the boxes are allowed to remain on all winter, they will become sour and mouldy from the dampness arising from the bees, and are unfit thereafter for storing honey therein.

HOW TO SECURE HONEY FROM WORMS.

I have often been asked the question, how I keep the worms out of the boxes, after they are taken off, even after having taken all possible pains in pasting paper over the holes in the boxes; and still they will persist in getting in. The matter is still enveloped in mystery, and I believe Mr. Quimby was the first man to advance a theory that looked reasonable in the mind of the bee-keeper. His theory is that the eggs are deposited on the bottom-board, on the combs, or in the joints of the hive, by the miller whenever it can gain access to the hive; and that the eggs are carried to the boxes by sticking to the feet of the bee. Were the eggs to hatch in the box while on the hive, the bees would remove them, but when the boxes are taken off, with some of the miller eggs in them, if set in a warm place and in warm weather, they soon hatch and commence their depredations on the comb. The comb or wax is the food of the worm, and it never touches the honey.

• Mr. Quimby's remedy is to set the honey in a dry, cool cellar; but it must be dry, for if damp it would soon sour the honey; and if kept cool enough to pre-

vent the eggs hatching, there will be no trouble with worms in honey boxes. Another method he recommends is to put the honey, after the eggs are hatched, in a box or barrel, and burn a brimstone match under them keeping it confined closely for several hours; this will destroy the worms, but caution must be exercised, and not use too much, as it will cause the combs to look green. I have never tried his method of burning brimstone, but I think it would be an effectual remedy after the eggs have hatched; but before, it could have no influence whatever. It is seldom that I am troubled with worms in boxes, unless the bees go up into them to store bee bread; in which case, they will generally be found. I cannot recall one instance in which I found them, that there was not bee bread in the cells. Why it is so, I am unable to state, unless the eggs are deposited with the bee bread, and if they were, I cannot but think that they were carried there by the bees, because the miller, as shy as she is of the bees, would never pass through the colony to the boxes to deposit her eggs.

GLASS JARS, TUMBLERS, ETC., FOR HONEY RECEPTACLES.

There are few, even at this day of improvements, who try the experiment of having honey stored in glass receptacles; and many a one is often perplexed by watching day after day, and week after week, and indeed the entire honey season, to see their expectations realized; while with a little knowledge and experience, the wants of the bee-keeper may often be realized, by inserting in the glass jars a small piece of white comb

where the combs are desired. The bees do not enter and commence their combs as readily, in glass jars, as in boxes made of wood. I find it a very great advantage and it often decides whether we have surplus honey or not, to insert small pieces of comb, if not more than one inch square, in the tops of the boxes, in the direction you desire the bees to work. This will induce them to commence work several days sooner, than if they have to start the combs themselves. When guide combs are used, and the boxes put on as soon as the honey harvest commences, the bees will at once begin storing honey in them, which will leave more space in the body of the hive for the queen to deposit eggs, and thus facilitate breeding and bring the colony up to a high standard of strength in numbers, so that they are well prepared to lay up a profit for their master. Guide combs may be readily fastened in the boxes, by melting one edge by a lamp, or dipping it in a little melted beeswax, and applying it to the place before it cools, that it may adhere to the board. One point should always be observed, and that is, to put the combs into the boxes the same edge up as when made by the bees. In selecting pieces of comb for guide, drone comb is preferable, as it requires less wax to hold the same amount of honey, than it would to construct it of the small or worker cells; although when the worker comb is used, and honey is very plenty in the field, the bees will often change and build drone comb, knowing as they do, that it takes less wax to make it.

LARGE VS. SMALL BOXES.

Much has been written in the last few years on this subject. I believe it is now a settled question among practical apiarians, that bees will store much more honey in large boxes, than in small ones. I have often noticed the bee keeper who always uses the old box hive, will put on one box at a time, and that, not until after the hive is done swarming, for fear that he will not have any swarms, if he puts it on before. His box will hold, perhaps, six pounds, and perhaps twelve; and when it is filled, he will remove it, and put on another; as in almost every case, if bees will work in one box of six pounds, they will work with about the same energy in four at one time, and will fill them very nearly as quick, making a vast difference in the amount of honey produced in the season. Now if the capacity of the four, is in one large box, they will fill it sooner than they would the four. The large box will answer the purpose of the bee keeper best, if he has but a few stocks, and does not wish to market his honey; but if he has a large number of stocks, and desires to sell honey, then some other box is required. Why? because the honey in the large box will not command so large a price per pound as it would in small boxes. One writer recently gave his experience in the *American Bee Journal*; that he received seven cents more per pound for honey in boxes of three pounds weight, than he did for boxes holding six pounds. My experience is, and I have had not a little of it, since having been engaged in the bee and honey business, that honey, at the prices it

has been in Chicago and New York this year, would bring 20 cts. per pound in twenty pound boxes net weight, and in six pound boxes, it would be a drug on the market at 23 cts. per pound, while in single frames, or about two or three pound boxes, my orders have been in advance of my shipments, or in other words it is sold at 30 cts. per pound box and all, without tare. I find that I can get more honey, and in better shape, from my bees, in boxes that hold fifteen pounds each and then separate them into five boxes each holding three pounds. I thus have the advantage of the large box, in storing honey, and the small one in selling, which makes a vast difference in the returns from my apiary, especially if I put upon each side of the three pound box a light of 5x6 inch glass, which in fact improves the looks of the package, and makes it sell better; as boxes of this size are always sold without deducting the weight of box, it necessarily gives me a good profit on the glass. (For full description of my box and mode of use, see surplus boxes, in chapter on Hives.)

CHAPTER XI.

THE MELL EXTRACTOR.

It is now about six years since the news came across the mighty waters of the Atlantic Ocean, that a German by the name of Von Hruschka had devised a machine which would extract honey from the comb without injuring it in the least. It was found, however, upon trial, to be imperfect, but as soon as Yankee genius had learned the first principles of the operation, their inventive talents were set at work, and a perfect machine was soon produced, and we now have honey extractors that are both simple and convenient. It has been a study for years, by some of our most practical apiarians, even bringing into requisition the suction pump, and other appliances to produce the desired result. Mr. Langstroth says, that for years he had studied, and sought a knowledge of mechanics, but all to no purpose; but, says he, if any one had said to me "Centrifugal Force," I should have shouted, "Eureka." The invention and its merits have spread with greater rapidity than did the invention of the movable comb frame. The bee keeping community had but just begun to learn the advantages of movable frame, when the extractor made its appearance, and together they have revolutionized the whole science of bee keeping, and words fail to express the feeling of gratitude everywhere existing toward the in-

ventors of the movable comb frames and the mell extractor. I must say with others, that like the movable comb hive, no apiary is complete without it; and the name of Von Hruschka deserves to be placed side by side with that of the inventor of the movable comb frame.

ADVANTAGES OF THE MELL EXTRACTOR.

When we take into consideration that from fifteen to twenty-five pounds of honey are used to make a single pound of comb, besides the time consumed in its construction, the advantages of such machine will be readily seen. The machine has already been sufficiently tested to prove that twice, and even thrice the amount of honey may be obtained from the same stock of bees, and with about the same care, as formerly without it. It is an established fact, since the introduction of this machine, that in an abundant honey harvest, the bees will gather more honey, and faster, than they can build comb to receive it. When empty combs can be furnished, the yield of honey will be many times greater than by the old method. It occasionally happens that some stocks seem determined to store honey only in the breeding department of the hive; in such cases, a good yield of honey may be obtained, by throwing out the honey with the machine, and thereby to give the queen an opportunity of depositing eggs in the cells just emptied, thus increasing the numbers of the stock, until they can be induced to store honey away from the breeding department. This is frequently the case with the Italian

bees, with their eager propensity for gathering honey, and storing it in the body of the hive, which greatly circumscribes the number of breeding cells; so much so, that we have almost decided that, to keep the Italian species, it is necessary to throw the honey from the brood combs, or suffer our swarms to be reduced to almost a handful of bees at the close of the honey season. I think it of great advantage to use it on a parent stock that has thrown off a swarm, just as the young queen commences to lay, as, until that time, the bees will fill the cells with honey, as fast as the brood that was left by the old queen comes out, consequently there will be but little room left for the use of the young queen. The yield will be great, as several days will have elapsed, after the young brood has received the food necessary for their development, while all the honey that is gathered will be stored in the empty cells. There are many other advantages to be derived from the use of the mell extractor, but space will not admit of their enumeration.

HOW CONSTRUCTED.

There are several different patterns of machines now in use, among the most prominent is the one called the "Peabody Honey Extractor." They all employ the one means of action, which is centrifugal force. They are simple in construction, being nothing more than a square box or can, of any desired size, usually about 18 inches long, 14 inches wide, and 12 inches deep; at each side or end we secure a piece of coarse wire cloth, about one inch from the side against which the comb is

placed. Passing perpendicularly through the centre of the box, is an iron shaft, made to turn in a stand set on the floor. The box is secured to the perpendicular shaft and revolves with ease; in the bottom of the box there should be a place to draw off the honey. I have constructed one for my own use, so arranged that the honey will flow out through the centre of the shaft, directly into a bottle or other receptacle, while the machine is in motion. When made of tin and iron alone, they are easily kept clean, and less liable to become sour than when made of wood. Some are made with a set of gearing, by which the box is caused to revolve rapidly, forcibly throwing out the honey, and also more liable to throw the young larvæ from the cells, if brood comb is being worked; although with a little experience, they can be operated without disturbing the brood in the cells. I must here give a word of caution to all bee keepers who may be in quest of a honey extractor. There is a man in Kentucky, by the name of D. L. Adair, who advertises largely in the bee journals to send the best extractor now in use, for fourteen dollars. I sent, last May, the amount in a registered letter. In a few days I received a receipt from our P. M., signed by Mr. Adair, and stating that the money was received; but from that day I have not heard a word from him, neither have I got a machine; and I find upon inquiry that he is a humbug, and a swindler of the first water. I have written him three times since, and the P. M. at his office informs me that he delivered the letters to him personally, so that there can be no mistake in the action he has taken. He

also advertises queens, hives, &c., for sale. I would advise all persons to beware of him.

METHOD OF USING.

When it is desired to remove surplus honey from the combs with the extractor, it is essential that a movable comb hive, of some style, should be used. The old-fashioned box hive will be of no use with the extractor, unless a sectional honey box should be used like the one I have recommended: if they are employed they can be separated, and the honey thrown out, and then returned to the hive. The usual amount of honey can be more than doubled in this manner, and at the close of the season the boxes can be left on until the bees seal them over. The boxes on the movable comb hive can be treated in the same manner, and are of great advantage to be used on hives, instead of using a double hive.

Many use a double hive, that is, one hive placed above the other, but unless you have frames filled with comb to put into the hive, it will be some time, even in a good honey season, before there will sufficient comb built and filled, ready to be emptied. I would not advise throwing the honey from the body, or breeding chamber of the hive, only at such times as mentioned above. I think it better to have a surplus chamber, either a two-story hive, or the sectional honey boxes; then your honey is always sure to be clear and pure, and there is no danger of being mixed with larvæ &c., which is frequently the case, when removed from the brood chamber.

To remove the honey from the combs, a little smoke is necessary to drive the bees, and render them quiet, the same as is necessary on any other occasion; a few bees will remain on the comb if of the common or native variety; but if of the Italian, there will be many adhering to it; they are not so easily driven from their stores as the black bees. After the comb is removed from the hive, give it a quick, sharp shake downward, and many of them will be dislodged from the comb. Care must always be observed in shaking not to use force sufficient to break the comb; if new it is very tender, and when loaded with honey is easily broken. One reason why I prefer the sectional honey box frames for the extractor is, that the combs are only five by six inches, and invariably the comb is attached to the bottom, as well as to the sides and top. They can be handled more roughly to get the bees from them than when a large comb frame is used from the double hive, or from the breeding chamber. After shaking, which should always be done over the colony, or immediately in front of the hive, so that if the queen is removed, she may return safely to her home. There will be some adhering, which it will be necessary to brush off with a small brush or twig; never use a broom, because if a bee becomes entangled in the brush it becomes enraged, and you will soon have lively times on the retreat, but no danger need be apprehended if caution is exercised.

Should any of the cells from which you desire to throw the honey be capped over, the caps must be removed by a thin, sharp knife, a common case-knife will

do, but there are those made especially for that purpose, that I think are preferable. After the caps are removed, it is ready to be placed in the machine against the wire cloth and a few revolutions of the extractor will empty the honey from the comb, when it may be turned around, treated as before, and it is ready to go to the hive again. If many hives are to be treated in this manner, and the double hive or sectional box is used, it is advisable to have ready some frames to take the place of those removed, so that all manipulations can be done at one time, and thus obviate the necessity of disturbing the bees the second time to replace the frames. The frames of the sectional honey box I use may be hung in a hive, or box, set upon the top of the breeding chamber, of sufficient depth to receive one or two tiers of the frames. If they are hung in a frame just large enough to receive three or six at a time, it is the most convenient and profitable method for the use of the extractor, much more so, than to use frames with large combs, which increases their liability to break down, and often cause much trouble; and I firmly believe that after having once tried them, no bee keeper will ever use any other method for extracting honey.

LARGE YIELDS OF EXTRACTED HONEY.

I will mention a few reports as given to the public, as true statements, and of being correct in every particular, I have not the slightest doubt. Mr. M. Quimby, of St. Johnsville, N. Y., reports that from one swarm of bees he extracted over 360 pounds of honey. Mr. A. J.

Root, of Ohio, better known to the readers of bee journals by the name of "Novice," reports for the year 1869, from 46 colonies, 6,162 pounds of honey, and 18 new swarms. Miss Kate Grimm of Jefferson, Wisconsin, a young lady of seventeen years, reports, that unaided, she extracted 10 barrels of honey (3,700 lbs.) from 159 swarms, 20 of which were double, and all but 48 were young swarms. I might give many more reports, and some even larger than these, but instead will refer the reader to the different bee journals, published for the benefit of those who are already in the business, or contemplate making it a source of income; to all I would recommend them, if they desire to attend to bee keeping understandingly.

TREATMENT OF EXTRACTED HONEY.

Extracted honey, as is readily seen, is in the liquid form, and when strained through a cloth, is free from all impurities, has a clear transparent look, and a shade receiving its hue somewhat from the plants from which it is gathered; very different in appearance from that which is often exposed for sale by the old brimstone bee keepers; an admixture of honey, bee-bread, brimstone fumes, *et cetera*. The best method of putting it up for market is, undoubtedly, in good self-sealing glass fruit cans, holding from two to four pounds each. Those who have it in large quantities put it into barrels, and sell it in-bulk, being satisfied with the low price it brings in such shape. Extracted honey does not find as ready sale, nor command as high price, as honey sold in the

comb, but each bee keeper must do as Mr. Borher says, establish for himself an honorable reputation to secure its ready sale, or his customers may have suspicions of adulteration. The cheapness in price, usually one-half or two-thirds the price of good box honey is more than compensated for in the extra yield, being often three or four times the amount of box honey, so that the profits are not lessened by the use of the mel extractor. Many have complained of the honey becoming candied after being extracted; but it soon returns to the liquid state again by placing the vessel containing it in a dish of water and heating it. One writer affirms that if heated as soon as extracted, for twenty minutes, and then sealed in air-tight cans while hot, there will be no trouble of its candying. This heating process not only drives off the moisture which would have evaporated, had the honey been left in the hive until sealed, but it also expels the *apis matifica* or bee poison, which renders honey so pernicious to some constitutions.

CHAPTER XII.

WAX AND COMBS.

Most apiarians previous to Huber's time, supposed that wax was made from bee bread or pollen, either in a crude, or digested state; and even at the present day we occasionally find those of the old style bee keepers who think that the pollen which they carry in, is for the manufacture of comb; but such is not the case. Wax is a natural secretion of the working bee, and may be called their oil, or fat. When gorged with honey, or any liquid sweet, if they remain quietly clustered together, it is secreted in the shape of thin delicate scales, in



small pouches on the abdomen. The annexed cut will exhibit its appearance; it can also be seen with the naked eye, when they are building comb in glass honey boxes; some with only one or two scales, others with every sack

or pouch full, I have often observed them when loaded with wax to appear lazy, moving sluggishly, and having the appearance of feeling uncomfortable; and I have no doubt, that at that time such were their feelings. Huber proved beyond a doubt, by confining a swarm of bees and furnishing them with honey and water, and after five days confinement he perceived that they had consumed the whole of their provisions and had constructed several combs of beautiful wax. These combs

were removed and more honey given them, and the result was the same. This removal was made five times successively and on each occasion, being supplied exclusively with honey, they produced new comb; thus putting it beyond dispute, that this substance effected the secretion of wax in the body of the bee. And further, to ascertain whether the saccharine principle were the real source of wax, he supplied the captive bees with sugar in the form of syrup, and the result was still the same; wax was produced, and that in a shorter period and in greater abundance than from honey; as the reverse of this experiment would prove whether pollen had the same property, instead of supplying the bees with honey or sugar he fed them only on fruit and farina, They were kept captives eight days under a glass, with a comb, having only farina in the cells; yet they neither made wax nor were there any scales of wax on their abdomen, as was the case when honey and sugar were used.

Upon the whole, until I meet with a more probable theory supported by facts, I must give it as my humble opinion that the wax is produced in only one way; and in all cases upon the abdomen of the bee in very minute scales, and that wax cannot be produced unless the bee feeds upon honey or sugar, or what honey and sugar is produced from, and that bees do not produce wax continually, but only at such times as comb is needed in the storing of honey. At such times bees consume a much greater amount of food than when there is no need of comb.

HOW THE COMBS ARE BUILT.

When a swarm of bees are about to leave the parent hive, the majority of them will fill their sacks with honey. When located in their new home, of course no cells exist in which to store it, and it must remain in the stomach of the bees for some time, and the consequence is, that white scales are formed on the abdomen about one-sixteenth of an inch in diameter, and nearly round. With their legs they detach one of these scales and convey it to their mouth, when they pinch it with their forceps or teeth, until one edge becomes somewhat roughened, it is then applied to the place where wanted, either on the comb, or to the top of the hive. Frequently the rudiments of the comb may be seen within one hour after the bees are hived. Upon examining we may often find three or four pieces of comb, as large as the hand, have been built in the first twenty-four hours that the bees have been in the hive, and I have seen the comb hanging to the limb of a tree, where a swarm had remained over night. The bee keeper may readily know when the swarm is building comb by observing the bottom board the morning after the bees are hived. Many small scales of wax will be found, that have either fallen from their grasp accidentally, or been thrown away as useless; and the quantity continues to increase as long as comb building goes on, until it not unfrequently amounts to a handfull or more. As a proof that may be relied upon, that the bees are building comb, and without disturbing them to examine the inside of the hive, we have only to brush the scales from the bottom

board every day, and by a little experience we can easily judge of the rapidity of their progress. It is asserted by some that the bees gather up the scales, and use them; but I have failed to discover, in all my observations, that such is the case. I should sooner think that the scales were blown out of the hive by the bees fanning the hive with their wings to maintain the desired temperature within, and are thus lost, and are not used to construct comb. I have often seen comb built from small pieces, by a swarm that had been recently transferred. It is of a darker color, thicker and heavier, than when made of wax scales from the body of the bee.

CELLS UNIFORM IN SIZE.

The size of the cells in which workers are reared never vary much. The same may be said of drone cells, although they are much larger. Those that are built for store comb vary greatly in depth, while in diameter they are of all sizes, from the worker to that of the drone cells. Five worker or four drone cells, will measure about one linear inch. Thus, a square inch of comb will contain on each side twenty-five worker, or sixteen drone cells. The cells of bees are found to be a perfect mathematical problem. Thus, let it be required to find what shape a given quantity of matter must take, in order to have the greatest capacity and strength; occupying at the same time, the least space, and consuming the least labor in construction. When this problem is solved the answer is, the hexagonal or six-sided cell of the honey bee, with its three angled base of one cell,

which forms a part of the base of three other cells, on the opposite side of the comb, and each of the six sides of one cell forms one side of six other cells. Thus it will be seen that this shape will make the strongest cell, each angle forming a perfect brace, and answers the purpose, for the development of the larvæ, better than any other shape, except the circle, which would cause a needless expenditure of space, as well as material.

DRONE CELLS.

These are rarely made in the top of the hive or breeding chamber, but they will often commence to build them, about one third of the distance from the top. As bees, in building their cells can not pass immediately from one size to another, they display an admirable sagacity in making the transition, by a set of irregular five-sided cells. Thus they are enabled to pass from one size to another; but I do not remember of ever having seen the transition from drone to worker, but always from worker to drone. It often occurs that there is too much drone comb made for the prosperity of the colony, as, whenever it is in the hive, the bees will raise thousands of drones, more than are required. They are correctly named, the idlers of the hive, and I have seen colonies in which there were so many, that they would consume the honey about as fast as the little worker could gather it.

It is not unfrequently the case in a very prosperous honey season, for some swarms, especially the Italian race, in their zeal to gather honey, that they will

build whole cards of drone comb, to their own detriment in the future. To remedy this evil, the drone comb may be cut out, but the space should always be filled with a piece of worker comb, and not be left for the bees to build new comb in, for they will invariably fill it with drone comb again. Hence the necessity of saving all pieces of good comb, the worker to take the place of the drone comb, and the drone comb for the honey boxes.

VALUE OF EMPTY COMB.

Careful experiments have proved that from fifteen to twenty-five pounds of honey are required to make a single pound of wax. As wax is an animal oil secreted chiefly from honey, this fact will not appear incredible to those who are aware how many pounds of corn or hay are required to be fed to cattle that they may gain a single pound of fat. Many bee keepers are utterly ignorant of the value of empty comb, it should, therefore, be considered a first principle in bee culture, never to melt good comb. Unfortunately, in the ordinary box hive, but little use can be made of empty comb, unless it is new, and can be put in the surplus boxes; but by the use of the movable comb hive, every good piece of worker comb may be given to the bees again.

ARTIFICIAL COMB.

In the year 1870 the bee keepers of the country were in high glee in anticipation of the introduction of the greatest improvement in bee culture; namely, ar-

tificial comb. It was announced by two of our most prominent apiarians, Messrs. Quimby and Mitchell, that they had made the long looked for and greatly desired comb. One was of metal, the other of paper and wax, and it was thought that when two such men had devoted their time and money, and had heralded it forth to the public, that it must be a success; but the thing has died away to be numbered with the things of the past, as the instinct of the bee refuses to accept an article which it is unable to appropriate. (I have not a doubt, but that a foundation can be made, and will be made in a short time, with the rudiments of cells started, so that the bees may have their work laid out for them, in the direction that we may desire them to work; but as for human ingenuity ever making comb just like that made by bees, it never can, never will be done. I have no more faith in it than I have in a perfect non-swarmling hive ever being made.)

HOW TO REDUCE COMB TO WAX.

There was introduced into this country, from Switzerland, last year, a machine for extracting wax. It is very simple in its construction, and must come into favor with the apiarian. The wax is rendered, by steam, and it has the highest praise wherever used; but as the old method will be practiced by the majority of bee keepers for years to come, I will describe the best method. The comb should be put into a bag, made of strong, coarse strainer cloth, filling it as full as possible; put this into a kettle of boiling water; as the wax melts,

and rises to the top, it may be dipped off into a vessel to cool; when the wax is all melted, the sack should be sunk two or three inches below the surface of the water by placing upon it some heavy article as a stone or iron, anything which will keep it below the surface until the wax floats to the top, when it should be allowed to cool, and the wax can be removed. This process will render it much more free than can be done by pressing or squeezing, and will be found much cleaner than any other method, except by the use of the steamer.

CHAPTER XIII.

WINTERING BEES.

More bees are lost by wintering than by all other troubles combined. I consider this one of the most important points in bee keeping; yet it is most sadly neglected by the masses. But very few bee keepers give much attention to their bees in the summer, and I must say fewer still ever give them any protection in the winter. There are so many different modes and theories recommended that it is difficult to determine on any one of them with a prospect of perfect success. We are told to bury them; put them in the cellar; put them in a winter depository; leave them on their summer stands; and a dozen other methods are recommended; until the inexperienced are driven almost to despair. We will first examine the condition of a stock left to nature, and see if it affords us any hints as to how we shall protect them. As soon as cold weather arrives, the bees cluster compactly together in their hives to maintain their usual amount of warmth. In very severe weather, every inch of space within their circle is occupied, even each cell not containing honey or bee bread, holds a bee. Were you to pass a thermometer to the centre of the cluster, it will show a summer temperature, even when in the open air it is many degrees below zero. When the cold becomes intense, they keep up an incessant, tremulous

motion in order to develop more heat by active exercise ; and as those on the outside of the cluster becomes chilled, they are replaced by others. As all muscular exertion requires food to supply the wastes of the system, the more quiet they can be kept, the less they will eat. It is highly important, therefore, to protect them as far as possible in winter from every degree, either of heat or cold, which will arouse them to great activity. The old custom of leaving them on their summer stands in cold climates, has its objections ; while in milder climates, perhaps no better plan could be devised.

To winter bees successfully, it is important that each stock should contain a sufficient amount of honey, bee bread, and bees. Experiments have proved that it requires more honey to winter on the summer stands than when placed in the cellar or depository. For out door wintering each hive should contain from thirty to thirty-five pounds of honey, while within doors from five to ten pounds less will be sufficient. A swarm with too much honey will not come out in the spring as prosperous as one that has just enough. In the months of September and October, each stock should be examined, and if any are found deficient in honey, they should be fed before cold weather prevents their storing it in their cells and sealing it over. If the stock is too light, two small ones should be united. If in the box hive, this may be accomplished by inverting the best stock, or the one you wish to retain, and place over it the one you wish to drive the bees from ; now smoke the two with puff ball, smoking the upper hive

the most ; the bees will soon drop down among the others, and all having the same odor, there will seldom be any discord among them. They should be closed by tying over them a piece of cloth, so that the air may be admitted, and at the same time prevent the escape of the bees. They should be thus confined for twenty-four hours or more. If they should require more honey, they may be fed by giving them honey or simple syrup, with a bee feeder ; the one patented by C. C. Vandusen, I consider the best, as it can be placed on the top of the box hive, and does not require to be covered, while robber bees are unable to get at its contents without passing through the colony. The hive from which the bees have been taken, may be set away in a cool, dark room, and should be thoroughly frozen during the winter, that all the eggs of the miller moth may be destroyed ; and there be no danger of any trouble from them before June. The hive may be used to put a new colony into, and thus save the comb and honey, which will give the new swarm something of a start to begin with.

If the movable comb hive is used, they can be equalized with much less trouble. It often happens that a strong colony will store much more honey than they require, and by taking out one, two or three full frames, and exchanging with a weak one, both are benefited by the transfer. It is conceded by most of our practical apiarians, that there should be at least three or four quarts of bees in every hive, for successful wintering on the summer stand, in order to protect the queen from the frosts of winter. Let us for a moment examine the

theory lately advanced by Mr. Hosmer, a western apiarian, who is as successful as any in our acquaintance. He says that when bees are wintered in a warm place, beyond the reach of frost, a large number of bees are unnecessary; one quart being sufficient for the safety of the queen. If such colonies have food, both honey and pollen, they rear brood abundantly in the latter part of winter, and come forth from winter quarters much more populous than if they had been stronger in numbers in the fall. The theory is, that the old bees who have consumed honey all winter, die soon after they first fly in the spring; while younger bees have a lease of life before them, and form a more vigorous force for cherishing brood, which is about all they to do in the first few weeks of spring. He rears surplus queens in small boxes, and about the same season of the year that we unite our weak colonies; he divides his strong ones, so that with each queen, he has only a moderate amount of bees, with honey and bee bread in proportion. He goes so far in recommending his process as to say that he would reduce the numbers of all colonies, even if obliged to kill the bees, rather than to winter large stocks. I must say for myself, that in my opinion, there is more truth than poetry in his theory. By referring to my own observations during the past few years, I find those colonies that are weak in numbers after being buried or kept in a warm house, come out much more vigorous in the spring, and do the best the next season. The plan is well worth experimenting with, on a small scale, and I would recommend a trial; and if it is found to be

safe, the theory may substantiate the one I have recommended in my article on swarming, that it is better to work your bees for surplus honey in the early part of the season, and increase them to the desired number in the latter part. In whatever manner you may winter bees, one point should always be observed, and that is,

UPWARD VENTILATION.

It is well known that all animals or insects that breathe, exhale at every breath a moisture, or a small portion of water from the system unperceived in warm weather, but which condenses into particles large enough to be seen in a cold atmosphere. The food of the bee, being all liquid, nearly all will be exhaled in this manner. The small particles of moisture will lodge on the sides of the hive, and on the combs, in the form of frost, which accumulates as long as the severe cold weather continues. When the temperature of the hive is raised by milder weather, in the middle of the day, this begins to melt, first near the bees, but more particularly above the cluster. A succession of cold nights will prevent the evaporation of this moisture, and this process of freezing and thawing, will, after the lapse of a week or two, fill the hive completely with ice and frost. It often happens when the weather is warm enough in the middle of the day, to melt the ice or frost, and cause it to run down to the bottom-board, that when it comes in contact with the cold air at the entrance, it is again congealed there, and frequently closes it, so that no air can enter the hive, and the consequence is, the colony is smothered.

But smothering from an accumulation of ice and frost in the hive is not the only accident to which bees fall victims ; starvation is a greater evil than suffocation. If the weather continues cold for three or four weeks, the frost will form so thick on the combs, that the bees cannot venture away from the cluster. If all the honey in their immediate vicinity is consumed, they cannot reach it through the frost, and without timely intervention of warmer weather, all would perish from what ? from starvation, with, perhaps abundance of stores in their hive. This is what many call freezing to death ; but I call it starving to death. It frequently occurs that they freeze to death ; but it is caused by the frost above the bees melting and running down, so as to wet them, and by a return of very severe freezing, the whole mass of bees will be found frozen in one solid body. Even when the bees are not destroyed, they are often in a pitiable state of health, caused by the water from the melting frost, running into the cells containing honey or bee bread, and by the dampness of the hive it produces fermentation, which produces disease in the bee when it feeds upon it, either dysentery or diseased brood.

Usually, where much frost has been present during the winter, the combs are found to be mouldy in the spring, presenting a sad sight. The remedy for this moisture or frost, is simply giving the colony upward ventilation, not too much, but moderate. If the common box hive is used, it is necessary that a few holes be made in the top and covered with wire cloth, or a piece of common factory cloth, and over the cloth place a

box filled with straw, chaff, or corn cobs; and in the side of the box make a hole one inch in diameter. This will permit the moisture to arise from the bees, into the straw, and escape through the hole; there will be no moisture to congeal on the combs, and the combs will be found as bright in the spring as they were before winter set in. With the hive I use, I remove the surplus boxes, and place over the comb frames another frame covered with strong cloth, I then fill the cap or cover with straw, and put it in place on the hive. The frame to which the cloth is attached will hold the cloth up from the comb frames, so that the bees can pass over them, from one comb to another. In a few days after the cloth is put on, the bees will be found clustered together up against the cloth, it being evidently the warmest place in the hive; now put four shingle nails through the side of the cap into the frame, that has the cloth attached, and the interior of the hive can be inspected at any time without trouble; and frost on the combs will never be found. As soon as cold weather is past, it is best to remove the cloth and straw, and put on the honey boxes, with their sides down, in order to keep the breeding chamber as warm as possible, while they are raising brood rapidly. By whatever method bees are wintered, upward ventilation is absolutely necessary.

WINTERING ON THEIR SUMMER STANDS.

If the colonies are strong in numbers, and in stores; if they have upward ventilation, and the hives and entrances are sheltered from the piercing winds, they

have all the conditions necessary for wintering in the open air. Great injury is often done by disturbing a colony of bees, when the weather is so cold that they cannot fly. Many, who are tempted to leave the cluster, perish before they can regain it; and every disturbance causes an increased consumption of food. If upward ventilation is neglected, no amount of protection that can be given the hives, in the open air, will prevent them from becoming damp and mouldy, even if frost is excluded. A thin hive, unpainted, so that the heat of the sun will penetrate it, will dry on the inside much sooner than one painted white. If the bees are left to winter on their summer stands, by following the above directions, the loss in an ordinary winter, will not exceed two per cent, and by using the movable comb hive, all the above conditions can be made perfect.

OTHER METHODS.

If the apiarian should desire to bury his bees, a high mound or knoll should be selected, in light sandy soil, in order to avoid dampness. The plan to arrange the clamp, is very simple. First, set the hives, one above another, in a pyramidal form, not over four tiers high; leaving a space of six inches between the hives for the circulation of air. The bottom tier should be set on scantling, or timbers, to keep them from the ground, and allow a free circulation of air. If more swarms are to be wintered than will form a pyramid, the clamp may be made long enough to accommodate any number, but from seventy-five to one hundred

are sufficient to winter in one clamp. Upward ventilation should be given to each swarm, the same as for wintering in the open air; the bees should be confined by placing over the entrance a piece of screen wire, that they may have air; and for a pyramid of thirty hives, there should also be about four tubes or pipes leading from the outside to the inside of the mound, under the hives, to supply fresh air; and in the top a ventilator or chimney, to allow the impure air to escape. Place some boards against the hives to keep off the covering, and they may be covered in, the same as roots or potatoes are covered.

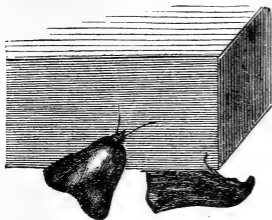
With extra care, some will winter their bees without much loss, in this manner, while others will lose many colonies, and of course condemn the practice at once; but for in-door wintering, perhaps a dry, dark, cool cellar would be the safest; but the majority of cellars are too damp, and the combs become mouldy. If your cellar is not suitable, a winter dormitory may be made, with double walls filled in with saw-dust or tan-bark, to prevent the sudden atmospheric changes affecting the bees. One hundred swarms are sufficient for a room or cellar, as the warmth from them will keep the room sufficiently warm in the coldest weather. If the room should be too warm toward spring, a little ice or snow should be put in to cool the air, and keep the bees quiet; should they become restless before it is time to set them out in the spring, they may be carried out on a fair warm day, allowed to fly, and returned, and kept confined until the cold weather is past.

Colonies that have but a moderate amount of bees and honey, may be wintered with better success, in the clamp, cellar or dormitory, than on their summer stands ; but for strong swarms, I cannot say that they will do any better. For in-door wintering, the smallest colonies should be placed on the upper tier ; as it is found that they consume much less honey there, than on the bottom tier. I have heard of small swarms being wintered on the top tier of a mound, and losing less than eight pounds in weight, while those on the bottom tier would lose about the same as those on the summer stands, gradually decreasing in each tier upward.

CHAPTER XIV.

ENEMIES OF BEES.

There is no enemy of the bee that is so much dreaded by the ordinary bee keeper, as the moth miller. Those who still persist in using the old fashioned box hive, are unprepared to attack and dislodge it from its stronghold. The moth miller as represented in the an-



nexed cut, is not the one that commits the ravages. It is the progeny of the miller, several hundred vile worms, that feed upon the comb or wax of the hive. It appears that they are the only insect which

makes the comb their special food. No habitation for bees has yet been made, and I firmly believe that none ever will be made, that will give free ingress and egress to the bees, that does not give the same to the miller. During the day, the miller may be seen on the outside of the hive, usually on the corners, with about one-third of her body projecting over the edge. She rests in quiet repose, until the approach of evening, when she throws off the appearance of inactivity, and commences a vigorous search for a place in which to safely deposit her eggs, and woe to the colony that has not bees enough to keep her from the combs. She is very rapid in her move-

ments; will search out the entrance to the hive, enter, and in a moment dodge out again, either from fear of the bees, or from having actually encountered them. This is sufficient proof, that if our stocks are strong and vigorous, they will not permit her to deposit her eggs upon the comb, which instinct teaches her, is the proper place. In fact, when the practical apiarian is asked the best method for protecting their stocks against the moth or miller, he will invariably answer (unless he is interested in some patent moth trap) that a strong stock of bees is the best remedy. But she must deposit her eggs somewhere! When she cannot reach the combs, the next best place is the cracks and flaws about the hive. Between the hive and bottom-board, if the bottom is loose, is a very good place. When the young after hatching can crawl into the dust on the bottom-board, which is mostly small pieces of comb, and when once where it can get a start to live, it will soon crawl up on the combs and commence its depredations. The miller will often, when no cracks are found, deposit her eggs at the entrance of the hive, and many times they are carried in by adhering to the bees as they enter. They are frequently found upon the combs of the best stocks, and I can conceive of no other method by which they could get there. No colony of bees is so strong, but that some time, there may be worms in it, but the stronger the stock, the less danger of being troubled with them.



The annexed cut gives a very good representation of the worm. When the worm has

once effected a lodgement on the comb, it makes its way directly to the centre, if possible ; if not, it will get between the heads of the young bees and the sealing ; and as it proceeds, eats a passage, which it lines with a silken web, and gradually enlarging it, as it increases in size ; fastening the young bee in its cell, until the web is removed by the bees, or by the hand of the bee keeper. If the worm can get to the centre of the comb, it will escape the notice of the bees for sometime ; but when they do detect it, they will bite away the comb on one side, and remove the brood or immature bees in one or two rows of cells, sometimes for several inches, until they reach the intruder, and carry him out. This accounts for the number of immature bees found on the bottom-board, mornings in spring. Where a worm has been removed from the centre of the comb, it frequently leaves a hole through the comb, which the bees never fill. This loss of immature bees will often in one season, amount to a good sized swarm, if we take into account the loss of cells which are destroyed to remove the worm ; hence the stronger the stocks are kept, the easier it is to keep them strong.

When the combs are filled with honey, the worms work on the surface, eating only the sealing. In strong stocks, the worms are harrassed by the bees that do not usually attain to more than half the size that they would if left undisturbed among the combs where they can thrive, and grow fat at their leisure. In queenless stocks, the guards, or sentinels at the entrance, do not protect their combs with that vigor they would manifest, if in a

prosperous condition, and the miller often effects an entrance, with apparent ease, and when once admission is gained, and from one to five hundred eggs are deposited, destruction has already commenced. The labors of the bees are increased to drive the worms from the combs, and if the swarm is queenless, or small, they soon become discouraged, and the combs are easily confiscated by the worms. Whenever colonies have become reduced from over-swarming, or from any other cause, the ravages from worms may be expected ; hence, the necessity of using a hive in which you are able to govern the swarming, and thus keep your stocks strong. I never have any fear of losing a stock, by the moth worm, in the movable comb hive, and if a person will follow my mode of bee-keeping, I can safely say that not one swarm in one hundred will ever be troubled by them. It is almost an every day occurrence to hear bee keepers (those who use the common box hive, or that have no control over their bees) say that the millers got at them, and used them up, or, that they swarmed themselves to death, or that the swarms were so small that they were overpowered by the worms and destroyed.

Here is where the inventor of some of the many styles of moth trap will step in, and tell you that his hive or trap will catch the moth miller, or the worm, that he may be summarily dealt with ; but kind reader ! if you will study the habits of the miller, you will soon discover that you are the miller the inventor is looking after, and when once caught in his trap, you will try in vain to entrap the moth miller, and in doing this, you

will injure the strength of your colonies or furnish the miller a good place to thrive and increase unmolested. But to return to our subject. The rapidity of the growth of the worm depends as much or more on the temperature in which they are, than upon their good living. A few days of hot weather would develop the full-grown worm, while it would require weeks and even months in a lower temperature. The worm when full grown seeks a place of refuge and safety from the bees; and if such places are to found on the inside of the hive, they are sure to find them; hence the necessity of having the internal arrangement of your hive as simple as possible. A full sized worm will crawl into a small crack or opening, and eat away the wood until it has sufficient room to spin a cocoon around itself; it soon changes into a chrysalis, and remains inactive for several days, when it makes an opening in one end of the cocoon, and comes forth a perfect miller, ready to lay its hundreds of eggs, for the perpetuation of the race, which are propagated very rapidly.

Now let us go back, and see how the miller or worm passes the winter. The discovery that eggs and worms can be frozen to death, has led to a plan by which the whole race of moths may be exterminated from an apiary, and only re-appear from those of our neighbors; but if the combs are not frozen there will be some eggs in the immediate vicinity of the cluster of bees that do not hatch until the temperature of the hive is raised sufficiently to hatch them. A moth will rarely be found before the middle of May, and but few will be seen pre-

vious to the middle of June ; after which they increase at a rapid rate until the end of the season ; therefore it is highly important to destroy every one found early in the season, for every one destroyed then, may be the means of preventing the appearance of thousands later in the season. It should always be the rule of the apiarian to destroy all worms or millers wherever or whenever found, particularly in the early part of the season. A careful inspection of the hive should be made daily, and every miller found resting on the hive, should be despatched, although she is very much like a flea, when you put your finger on her, she is not there ; but a cautious and quick movement must be made, else she darts away. Oftentimes many worms may be induced to web up under a piece of split elder, the peth being first removed ; they may be placed against the hive or under it, but care should be taken that they be examined at least once a week and the worms killed.

CHAPTER XV.

DISEASES OF BEES.

Bees are subject to but few diseases which deserve especial notice. There appears to be but two distinct types noticed by apiculturists to which they are subject in this country, viz., *Dysentery* and *Foul Brood*. The former of these generally makes its appearance in the spring, and may be recognized by the bees discharging their excrements over the combs; the interior of the hive; and especially around the entrance. The color, instead of being a natural yellow, is of a dark, muddy appearance, and a sickening, offensive odor, which becomes intolerable. It never has been my ill fortune to have a case in my apiary, where I have given upward ventilation to the hive. The cause may properly be assigned to the moisture in the hive condensing into water and mixing with honey in the cells; the bees feed upon it, and take more water than they are able to generate heat to throw it off. If the swarm is old, and many cells are filled with dead brood, which prevents the bees from packing close enough together to generate sufficient heat to throw off the moisture of the honey; in such cases, upward ventilation would not save the life of the swarm unless they were removed to a warm room. Colonies affected with dysentery are usually lost, the bees dwindling away one by one, unless warm weather timely

intervenes, or they are removed into a warm room, so that the water in the honey may be evaporated, which will generally terminate the trouble.

DISEASED OR FOUL BROOD.

In the destruction of the nymph or pupa of the bee, by some derangement which causes it to undergo decomposition in the cell, arises a disease known as foul brood. When it makes its appearance in a colony, it spreads over that portion of the combs used for brood. Upon examination, the caps of the cells appear indented, and slightly shriveled, emitting a very disagreeable odor that is often perceptible in passing a hive affected with it several feet distant. On removing the caps of the cells, instead of young bees, they are found to contain a mass of dark, grayish, putrid matter, and an extremely disagreeable smell. The views in regard to the cause of this disease are of a very conflicting nature, some believing that it is produced by the brood being chilled in the cells; others, that it is caused by the fermentation of bee bread and honey. In the year 1869 we read in the *American Bee Journal*, that a Mr. Lambrecht, a noted German apiarian could produce the disease in a perfectly healthy stock, in a short time, and could cure it as readily. He made a public trial, before a committee of bee keepers, some of whom had seen the effects of the disease to their own sorrow. In about seven weeks after the introduction of fermenting bee-bread and honey, the committee were satisfied that the colony were in a deplorable condition, from malignant foul brood.

The hive was then treated for a cure, and in eight weeks time the committee again met, and pronounced the colony in a prosperous condition, being entirely free from the cause of disease. Mr. Rood, of Wayne, Michigan, read a paper before the "Michigan Bee-Keepers' Association" at its last session in 1871, on foul brood. He recommends that whenever the disease is found, it should be summarily dealt with, and the way to exterminate the disease entirely is to bury it, hive, bees, and all, beyond any possibility of resurrection: I cannot see why, by Mr. Quimby's method, in the hands of a skillful operator, it could not be treated without a liability of spreading, and save the bees, honey, wax, and hive; which would amount to several dollars in value, particularly if any great number of hives were invaded. Mr. Quimby has, without doubt, had more experience with foul brood than any other man in the United States. It appeared in his apiary something like thirty-five years ago, at a time when he could gain no information from his bee keeping acquaintances, nor from the books published at that time, and for his untiring perseverance in studying and experimenting for the cause and cure of the disease, the bee keepers of the country owe him a lasting tribute.

That the disease is contagious, is settled beyond a doubt, as much so as that measles, small pox, etc., are contagious in the human subject. Suppose a stock has a few cells, wherein is dead brood; by the excessive heat of the hive it becomes putrid, and the adjoining cells are soon found to be in the same condition, all the

breeding combs very soon become one decomposing mass, with the exception of an occasional cell that may have developed a perfect bee. The stock must evidently soon diminish to a very small family, not large enough to guard their own stores, and they are easily plundered by other stocks; they carry out the honey that is in the hive with the thousands of decomposed dead bodies, of which it has absorbed a portion, and in this manner it is carried into healthy colonies, which soon fall victims to the scourge, and in their turn contribute to propagate the malady, which only ceases with the destruction of the last colony in the apiary, and perchance the last in the neighboring apiaries. The moth is ever ready to deposit her burden of eggs when the combs are bare, and soon the careless bee keeper will lay the trouble to the worms who are just finishing up the job. By a little care the old adage may be proven true, that "an ounce of prevention is better than a pound of cure," if the bee-keeper will examine his stocks in early spring; also examine the parent stock three weeks after throwing off the first swarm; and whenever the disease is known to prevail, they should be examined in the fall, after they are done breeding. If any are found in the spring, or after swarming that are affected, I maintain that they can be saved without being buried. I have never had but one case, and that I cured; and have, in several instances seen it cured in other apiaries. The method is after Mr. Quimby's plan, that of driving out all the bees (see transferring) and putting them into a new hive without combs. If you wish to put them into a hive with

combs, they should be kept in a box for three or four days, and fed just enough to keep them alive, until they have consumed all the honey they took from the old hive ; they may then be changed to a hive with combs, without danger from the impurities of the old hive. The hive from which the bees were driven must be secured from robber bees, as any of the honey, being carried into other stocks, would prove their destruction. The honey may be purified by adding to it a little water, boiling it for a few minutes, and removing the scum. The combs must be either melted or buried, to be beyond the reach of the bees. The hives may be renovated by the use of a powerful disinfectant, but I prefer to make kindling wood of them, especially if of the common box pattern ; they burn well, and it is the safest disposition that I can make of them. If a colony is found to be affected in the fall of the year, too late to build comb, and no combs on hand to put them in, perhaps the best disposition that could be made of them would be to consign them to the brimstone pit, rather than attempt to feed them through the winter, to lose them in the spring.

CHAPTER XVI.

FEEDING BEES.

Few things in practical bee keeping are more important and require a more thorough knowledge, than the feeding of bees ; and, ordinarily, no other point is more grossly neglected and mis-managed than this. In attempting to winter too small colonies, thousands often perish in the winter or early spring, and in consequence, many abandon bee keeping in disgust and despair. Colonies, in the common box hive containing few combs and but little honey, should be fed in the latter part of September, or in October, an amount sufficient to carry them safely through the winter, or until warm weather. If fed at this season of the year, they are enabled to store the food in the cells and cap it over, thus preventing the moisture of the hive coming in contact with it, causing it to sour, and thus exposing them to dysentery.

The chances of success are much more certain with the movable comb hive than with the box hive, where the requisite amount may be obtained from other strong stocks, where it has been sealed and evaporated sufficiently to be beyond danger of producing dysentery, by simply changing a light card from the weak colony for a heavy one from the strong stock ; both are usually benefited by the transfer. If feeding is neglected

until winter, it may then be done by placing the hive in a cellar or moderately warm room. At such time only the best thick honey should be used, or pure sugar candy, free from all flavoring and coloring. If candy is used, and the box hive, it may be inverted, and the candy laid directly on the combs; some may be put in between the combs perpendicularly, but never horizontally. In the movable comb hive the candy may be laid on the top of the frames over the cluster, or by passing it down between the combs. If liquid honey is fed, I have never found any feeder among the many that have been invented, that is as simple and possesses as many good qualities as the one patented by Vandeusen. It can be placed over an opening in the top of the box hive, over the cluster of bees, and the warmth of the hive will keep the honey warm and no heat is allowed to escape. The honey does not drip from the feeder, but the bees draw it out as they want it. The feeder can be used equally well on the movable comb hive, over an opening in the honey board, if one is used. For spring or fall feeding it is a sure protection against robber bees—they cannot get at the honey, even if the feeder is not covered.

In the spring the prudent bee keeper will no more neglect to feed his destitute colonies than to provide for his own table. At this season, being stimulated by the returning warm weather, and being largely engaged in breeding, bees require a liberal supply of food, and many populous stocks perish which might have been saved with but trifling trouble or expense. I have known

of a bee keeper losing one-fourth of his colonies in the few days intervening between the failure of apple blossoms and the appearance of white clover. It is needless to say that he used the common box hive—never could see any benefit to be derived from the use of the movable comb hive. I think, could he have taken a peep into the inside of a few swarms just then, and discovered their condition, he would have been converted; but instead, he gave up the bee keeping in disgust, as well he might, if he had found by examining his hives that one or two pounds of honey per hive would have saved the loss of one-fourth of his apiary, it would have been a good paying investment. Bees, in this latitude, usually commence the rearing of drones as soon as a good yield of honey is obtained; and if the yield is cut short, they often destroy them, even to dragging the immature drone from its cell, which is good evidence that they are nearly destitute of stores, or that the yield of honey is cut off. At this time they should be examined, and if no honey is found, they should be freely fed; but if there is sufficient honey in the hive they should be fed daily a little to stimulate them, (See stimulate feeding—Chap. VII,) to encourage breeding and arrest the slaughter of drones, which often proves disastrous to the multiplication of colonies.

If a colony is *over fed*, the bees will fill their brood combs so as to interfere with the production of young, and thus the honey given them is worse than thrown away. The prudent apiarian will regard the feeding of bees (except the little given by way of encouragement)

as an evil to be submitted to only when it cannot be avoided, and will much prefer that they should obtain their supplies from the field. To build up small colonies by feeding, requires more care and judgment than any other process in bee culture, and will be rarely required of those who use the movable comb hive. It can only succeed when everything is made subservient to the most rapid production of brood. There is one point that is certain in bee keeping—that if a colony is stimulated carefully in the spring, they and their first swarm that issues will have honey sufficient in the fall to winter them through, unless the weather proves very unfavorable for the production of honey.

WATER NECESSARY.

Water is indispensable to bees when building comb or raising brood. They will take advantage of any warm day in the spring to bring it to their hives. They may be seen drinking around pools, pumps, drains, and all moist places. Later in the season they sip the dew from the leaves and grass. Every prudent bee keeper will see that his bees are supplied with water, by placing shallow wooden troughs or vessels filled with straws or floats, so that they may drink without danger of drowning. A location near *small* bodies of water will be sufficient for a supply; but locations near large bodies are often injurious.

CHAPTER XVII.

ROBBING AMONG BEES.

It is instinctive in the nature of the bees for one colony to rob another as soon as they can leave their hives in the spring. The stronger begin to assail the weaker, like some wealthy oppressors in the human family, ever eager to prey upon the meagre possessions of others. If the marauders who are ever prowling about in search of plunder, attack a strong and healthy colony, they are usually glad to escape with their lives from its resolute defenders. The bee keeper, therefore, who neglects to feed his needy colonies and to assist such as are weak or queenless, must expect to suffer heavy losses from robber bees. They are never inclined to rob when there is plenty of honey in the field ; thus their instincts lead them to obtain their living honestly when they can, forcibly when they must. It is sometimes difficult for the apiarian to decide which are the robber bees ; but with a little practice they may be readily recognized. They usually fly about the entrance and all cracks and flaws in the hive, with their legs hanging straight down, and when one alights to gain an entrance his guilty, nervous agitation, once seen, can never after be mistaken. It does not, like the laborer carrying home the fruits of honest toil, alight boldly upon the entrance board, or face the guard,

knowing well that if caught by these trusty sentinels, its life would be the forfeit. If it can glide by without touching any of the sentinels, those within taking it for granted that all is right, permit it to help itself. After an entrance has been made into the poorly garrisoned hive, and the condition within ascertained, the robbers return to their homes and present themselves again with additional numbers, which keeps increasing until the whole colony is in commotion. The weak colony seeing their helpless condition, immediately join the marauders and assist in carrying their own stores to the robbers' hive, and themselves become a portion of its inmates. This is always the case with those that survive after being overpowered.

A very good method to determine when a swarm of bees is being robbed, is to catch a bee that is coming out. If it looks larger and plumper than those entering the hive, and if you pull the head and thorax from the body the first stomach or honey sack will appear between the two portions either full or empty; if full, it is proof positive that the hive is being robbed, and means should be instituted at once to prevent it. Another method is to sprinkle a little flour on their backs, and have an assistant to watch the other hives to see if they enter them; if they do, all is not right.

There are many remedies prescribed for this evil which I consider worse than the evil itself, and are often the cause of it. One is, to move the hive a few rods, which is most fatal, as it will soon be found. One says, close it up! and this may cause suffocation to the

bees or break out some of the comb in the hive of the robbers, and set the honey running, thereby giving them work at home. This is a very bad practice, and too often indulged in, as it will entice others to the hive, and not unfrequently many bees are killed in battle and the colony destroyed. When there are a large number of stocks in an apiary, and one is robbed, it is not usually done by a single colony, but several unite to share the plunder. I do not mean to be understood that ten stocks in one yard will join to rob one stock in another yard. Some persons think that is the case, which often prevents them from starting in the bee business; but no trouble need be apprehended in that quarter, if the stocks are always kept strong. A few small pieces of camphor gum thrown into the entrance will often prevent the robbers from trying to get in; but when not effectual, I would recommend closing the opening by laying a little block in front, so that but one or two bees can pass at a time. This will give them a better opportunity to defend themselves against the marauders and protect their stores. If this is not sufficient, at night or early in the morning, I would recommend that the hive be removed to a cool, dark cellar, (and ventilated so that the bees will not suffocate) for two or three days, when it may be returned to the stand. When the hive is moved to the cellar, the entrances to the adjoining hives should be contracted, and in fact, when robbing has once commenced, the entrance to *all* hives should be contracted somewhat, and every means avoided which will tend to incite rob-

bing, such as setting dishes of honey or other sweets where the bees can get at it, for when once they get a taste of it, they are hard to control thereafter.

CHAPTER XVIII.

TRANSFERRING BEES.

Transferring is the name given to changing a colony of bees, combs, and all the contents of a hive from one to another. It should only be done in the spring or summer, to be successful. Some patent hive venders will transfer in the winter, but it is usually attended with destruction of the colony. If the yield of honey is large from the apple blossoms, then is a good time for transferring, care being taken to feed them a little when days occur that they cannot gather honey from the flowers. I have usually had the best success to first stimulate the swarm that I wish to transfer, so that they may throw off an early swarm; and on the day that the second swarm issues, if they do swarm a second time, I transfer them and put the second swarm with them in the hive and return them to the old stand. If they do not cast a second swarm in thirteen days after the first one issues, I transfer them then. In either case the most of the brood is hatched and the cells are filled with honey, which I throw out with the honey extractor as I remove the combs, before putting them into the new hive, thus giving the queen an opportunity to replenish the stock rapidly with brood; and I can put in more comb when it is not filled with honey so as to settle down. Transferring may be done at any time of

the day, if it is pleasant. I prefer the middle or latter part of the day instead of the fore part. The best place to make the transfer is in some shaded locality, a few rods from the stand, or in some clean building. For the operation it will be necessary to have a few tools in readiness—such as a box the size of the hive and about one foot deep, for a driving box, an axe, a saw, a large knife, some twine, some goose quills, a dish of water to wash the honey from your hands, and a few dishes to put the honey and pieces of comb in; also some kind of table or bench should be arranged to lay the combs upon, and everything is in readiness.

The swarm to be treated should have tobacco smoke blown in among them, not only to drive the bees up among the comb, but also to subdue them. The hives should be removed to the place of transfer, placing another as near like it as possible on the old stand, for a decoy, that the returning bees may not join other hives and perhaps be killed. Invert the hive, and place over it the driving box, wrap a piece of cloth or a sheet around where the two join, to prevent the escape of bees. Procure two round sticks about fifteen inches long and one inch in diameter, with these commence beating the sides of the hive for a few minutes; then stop about five minutes to allow the bees to fill themselves with honey; then commence beating again for ten minutes, by which time nearly all the bees will have left the hive and clustered in the box. The sheet may be taken off and spread on the ground or floor, and the driving box set upon it, the same side up as when

on the hive, and a small stick placed under one side to allow the air to enter. With a long knife loosen the edges of the comb from two sides of the hive, and with an axe split the sides off, that the combs may be taken out whole. As the combs are removed, the scattering bees may be brushed down by the side of the driving box, when they will readily join the colony. Lay the comb upon the table, and over it place the frame. Cut the comb a trifle larger than the frame so that it will fit in tightly; observing always to have it the same side up in the new hive that it was in the old. While cutting the comb the brood should all be saved with a *little* honey, —too much honey often causes the combs to settle in the frames. After the comb is fitted in, it may be secured in its place by tying around the frame a piece of cotton twine, until the bees fasten it in with wax, as they will do in a day or two. The frame may now be hung in the new hive; continue the same treatment with the other combs, until all of the good worker comb is secured, leaving out all drone comb. If a comb is a little crooked, it may be straightened by cutting the comb half way across, even if it is filled with brood. Care should be taken when the frames are placed in the hive to have the brood occupy as compact a position as possible in the centre of the hive, so that the bees can cluster over it. If any pieces of comb remain that are too small to fill the frame from top to bottom, they may be placed in the top, and held there by putting a small stick under them, either letting it into the end pieces by cutting small notches, or by

tying a string around to hold the stick in place. Should there not be sufficient comb to fill all the frames, the balance should be put in—the hive empty at one side or on both sides of the combs, and in a few days changed to the centre of the hive between the full frames. A cover should be put over them—either the honey boxes turned over on the side so that the bees cannot enter them, or they may be covered with paper or cloth, or with anything that will confine the warmth below. The hive now being in readiness for the bees, they may be put in, the same as in hiving a natural swarm, and be placed back upon the old stand, with the entrance contracted, and the ventilators left open during the heat of the day.

In about two days they will have the combs fastened in their places, when the strings may be cut loose and drawn out and the boxes put on. If the bee keeper has other stocks in the movable comb hive, it would be well to give the swarm just transferred one or two frames with combs, if there is room, and thus build them up strong; and in two or three days you will find them working just as well as though they had not been forced to vacate their old domicile. In transferring, I would caution the bee keeper against transferring all his stocks in one day, if he has more than two or three and if set near together. It is much better to take two or three days for it, and select from different parts of the apiary, instead of commencing at one end of a row of hives and transferring in rotation; the bees losing their old home are set in a terrible commotion and often become

bewildered. If the adjoining hives are not disturbed there will not be much difficulty in their being mixed up with other hives. It is also essential in transferring, that it be done as quickly as possible, that the eggs and unhatched brood may not become chilled. The instructions I have given are sufficient for the inexperienced, by carefully studying them, to successfully go through with the operation, and without any danger as to the result.

CHAPTER XIX.

CONCLUSION.

In conclusion, I would urge all who keep bees, or who are about to enter upon apiarian pursuits, to study the subject well. This is highly important in order to attain to perfect success. It has been said that a part of those who commence bee keeping must fail; but we must suppose that the cause of failure arises from ignorance and inattention, and is not wholly the fault of the bees. To the beginner, then, I would say, if you expect to succeed you must give heed to these two maxims:— First, *SEE YOUR BEES OFTEN* and have a thorough knowledge at all times of their condition. This one maxim is of more worth than all others that can be given; it stands at the head of all the duties of the apiarian. Second, *KEEP YOUR STOCKS STRONG*, is the grand secret of success against all their enemies. With proper and persevering application of the above maxims, you cannot fail to realize all your expectations.

Many persons, after reading the elaborate treatises that are written in the interest of some patent bee hive, are often induced to enter into the business with very visionary prospects as to increase and profit. Elated with the extraordinary increase of stocks some one has made, they rush into it with a will, to very soon discover that failure and disappointment are the only re.

wards of their labor, and this, by attempting to increase their stocks at a too rapid rate, and forgetting the good old maxim, "KEEP YOUR STOCKS STRONG." I would also advise the beginner to avoid over anxiety for a rapid increase, and be satisfied with one good swarm from a stock annually; your chances of future success will be better than with a sudden increase of numbers. By following the methods as given in this manual, your stocks will easily double each year, thus increasing in a few years to an almost incredible extent.

Within the last thirty years apiculture has made rapid progress, both in this and in the old country; and is yielding, to-day, double the income to the apiarian, with far less capital than any other branch of rural industry. We are pleased too see the scientific world engaged in apiculture; we are also gratified that the fair ladies of our land are turning their attention thitherward. At the "North American Bee Keepers' Association," which convened at Cleveland, Ohio, Dec. 6th, 1871, there were present the most prominent bee keepers from nearly every State and Territory in the Union. It is cheering to state that nearly one-eighth of the number were ladies, and some of them were reported our most successful apiarians. There appears to be a general interest manifest throughout our entire land. Ladies and gentlemen of talent and refinement are to-day making apiculture a great success. Their feelings have become assimilated with that of rural life, and they are enabled to enjoy and appreciate the invigorating influence of pure and wholesome air. The farmer has the pledge

that forevermore there shall be seed time and harvest ; here is his dependence ; here lies his confidence. So, too, with apiculture ; when the earth is made to yield its bountiful crops the blossoms will elaborate their delicious nectar in abundant quantities. This the practical apiarian fully understands.

To the reader, I would say, if you have a natural taste for the business, and are willing to study the subject thoroughly and practice what you learn, engage in bee keeping. I know of no other pursuit that will afford such generous returns, if the requisite amount of care and attention are given to it ; nor are the benefits to be derived altogether of a pecuniary nature. What pursuit can be named that engages the attention of our people, that is better calculated to strengthen our better nature, and lead us to admire the wisdom and goodness of Him who created all things ? In view of the achievements which have been wrought in the past, and of what may be accomplished in the future, let us press nobly forward, giving our best energies to our delightful avocation, until it shall occupy the position it merits among the other industries of our nation.

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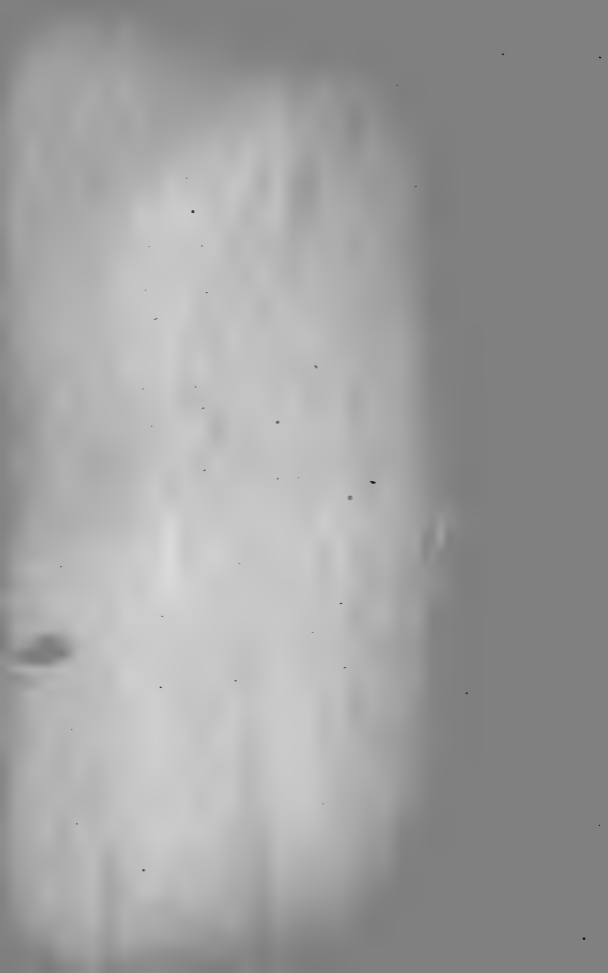
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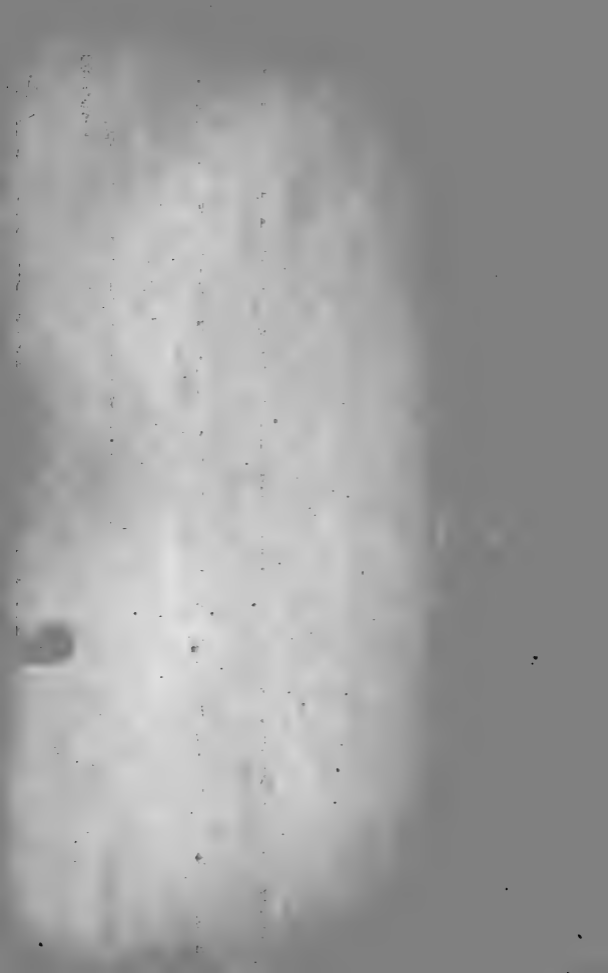
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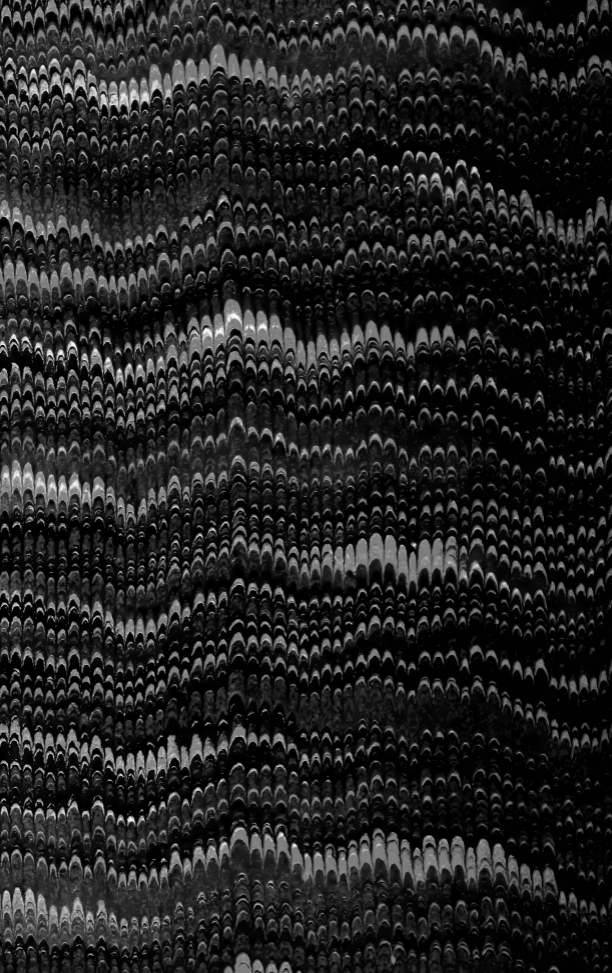


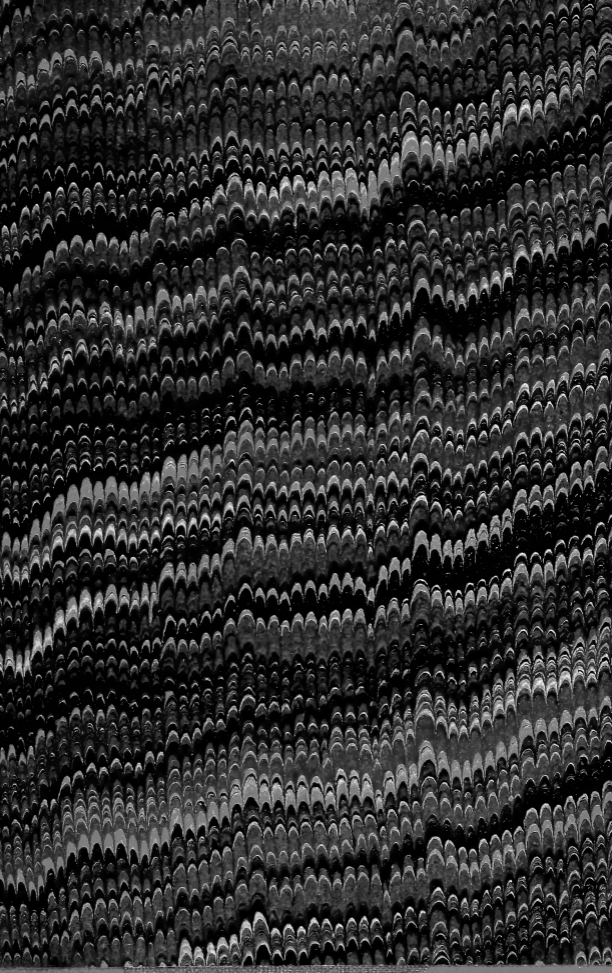












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