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PHELPS' BEE-KEEPER'S CHART;

BEING A

BRIEF PRACTICAL TREATISE

ON THE

INSTINCT, HABITS AND MANAGEMENT

OF THE

HONEY-BEE,

IN ALL ITS VARIOUS BRANCHES.

THE RESULTS OF MANY YEARS' PRACTICAL EXPERIENCE, TO RENDER BEE-KEEPING
LESS DIFFICULT, AND AT THE SAME TIME MORE SURE, PROFITABLE
AND PLEASANT THAN IT HAS FORMERLY BEEN.

BY E. W. PHELPS,

INVENTOR AND PATENTEE OF THE OHIO COMBINATION BEE-HIVE.

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CONTENTS.

	PAGE.
PREFACE,	5
CHAP. I.—Introduction,	9
II.—The Queen Bee,	10
III.—The Operation of Laying,	11
IV.—The Development of the Brood,	12
V.—The Working Bee,	15
VI.—The Drone,	17
VII.—Longevity of Bees.—Longevity of the Queen,	19
VIII.—The Apiary.—Influence of the morning sun beneficial.— Out-door Apiary,	22
IX.—Hives.—Bee-Hives.—Weeks' Vermont Hive.—Storifying and Subtended Hives.—Bevan's Cross-Bar Hive.— Collateral Hives.—Nutt's Collateral Hive.—Miner's Equilateral Cross-Bar Hive.	25
X.—Formation of Swarms,	40
XI.—Symptoms prior to Swarming.—Symptoms prior to a se- cond Swarm,	45
XII.—Hiving Swarms.—Preparation of Hives for the reception of Swarms,	48
XIII.—Artificial clustering shrubs or bushes,	50
XIV.—Hiver,	50
XV.—Different swarms uniting,	51
XVI.—Uniting second or weak swarms,	52
XVII.—Reunion of the parent stock with a second or third swarm,	54
XVIII.—Equalizing Colonies.—Swarms consist of Bees of all ages,	55
XIX.—The conversion of the Egg or Larva of a worker to a Queen,	56
XX.—Formation of Artificial Swarms,	57

	PAGE.
CHAP. XXI.—Massacre of Drones,	59
XXII.—Driving or dislodging Bees,	60
XXIII.—Spring Management,	63
XXIV.—Summer Management,	64
XXV.—Fall Management,	65
XXVI.—Wintering Bees,	65
XXVII.—Feeding Bees,	68
XXVIII.—Wax made from Honey,	70
XXIX.—Architecture of Bees,	72
XXX.—Sight,	74
XXXI.—Pollen or Bee-Bread,	76
XXXII.—Propolis,	77
XXXIII.—Pasturage,	78
XXXIV.—Purchasing Bees,	79
XXXV.—Transporting Bees,	80
XXXVI.—Bees in large towns or cities,	81
XXXVII.—How the Bees may be driven from boxes,	82
XXXVIII.—Ventilation,	83
XXXIX.—Disease of Bees and Brood,	84
XL.—Tools for cutting Combs.—Pruning,	84
XLI.—To extract Honey from the Combs,	86
XLII.—Bees-Wax,	87
XLIII.—Bee Dress,	87
XLIV.—Cure for Bee Stings,	89
XLV.—Salt and Water necessary,	89
XLVI.—Remarks,	90

P R E F A C E .

IN presenting to the community this brief treatise on the management of the Honey Bee, and the construction of Bee-Hives, the author is not vain enough to suppose that it will meet the views of every Bee-keeper in all respects, for he is well aware that there is scarcely any subject on which such a diversity of opinion exists, as on the form and size of bee-hives, and the general management of bees. But from the universal satisfaction the Ohio Combination Bee-Hive has given, during the last four or five seasons, in several hundred instances, where it has had a thorough trial, and the high commendations it has received from a large number of the best practical bee-keepers in the State of Ohio, where its merits are known, the author is led to believe that when this Hive is once brought before the public and its advantages made known, it will supersede all others, and render the culture of the Honey Bee far more sure and profitable than it has formerly been, and divest it of much that has been perplexing and difficult to understand, and overcome; and, at the same time, much more pleasant and interesting, to every one that has a taste or desire to engage in the culture of this most wonderful and interesting little insect, which has attracted the attention of philosophers and naturalists, and called forth the admiration of wise men

and poets of all ages, and whose mysterious operations are calculated to raise our thoughts to Him who creates and sustains all things.

“The industrious Bee has ever been viewed by intelligent naturalists as an interesting species of insects, and the fruits of its industry as among the choicest productions of nature,” and affording a most delicious luxury to the human race.

This treatise is intended rather as an accompaniment to the “Ohio Combination Bee-Hive:” but while giving directions for constructing and using the Hive, the author has thought it might not be considered out of place to give his views on the general management of bees, and the construction of bee-hives, which are the results of more than twenty years’ experience, during which period he has devoted a large amount of time and expense in experimenting with hives of various forms and sizes, and improving every means in his power to gain all the information possible from others engaged in the culture of bees. And while studying the instinct and habits of the bee, to combine in one hive as many requisites as possible, suited both to the wants of the bee, and convenience of the apiarian. And the inventor has now the pleasure and satisfaction of knowing that the “Ohio Combination Hive” does receive the unqualified approbation of ninety-nine out of every hundred bee-keepers that have given it a trial or examination.

The inventor would here state that in bringing this hive before the public at this time, that it is no new untried experiment, but that it has stood the test of four or five seasons in several hundred instances, and that many that have used it during that period, have testified that the longer they use them the better satisfied they become of their great utility and superiority over every other hive known to them. In my remarks in the following pages on the physiology of the bee, I am indebted to a considerable extent to Huber and Dr. Bevan, both of whom stand high as Naturalists and Apiarians, where-

ever they are known. I have availed myself also of the information of several American authors, and with my own, which is the result of many years' practical experience, I have endeavored in as brief and explicit a manner as possible, to lay them before the reader, hoping that they may accomplish the object aimed at by the author, viz. : a more easy, pleasant, profitable, and humane method of managing the *Honey Bee*.



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CHAPTER I.

INTRODUCTION.

THE object of this treatise is not to enter into a detail of the physiology and anatomy of the Bee, and a scientific definition of its peculiar construction, but to place before the public a practical work, the result of actual experience, whereby the veriest tyro in Bee-keeping will be enabled, with the aid of proper hives, to enter upon their culture, with almost a surety of success. We, therefore, have left out the scientific disquisitions of those who profess to be learned in the physiological structure of this interesting insect, and proceed at once to describe the different classes into which the common honey bee is divided, a thorough knowledge of whose peculiarities, habits, and offices, which each individual class is called upon to perform, in the municipal regulations of the hive, is necessary for their successful culture. Many works are published upon this subject, which contain much which is not easily understood by the general reader, and of little practical use to the common bee-keeper, who in most instances has but a little time to spare, to search through rubbish after practical truths, and who requires a treatise easily understood, and as easily put into practical use. Such as require a more extended work, we refer to those of Huber, Bevan, and many of the larger works upon the subject to be found in our bookstores. We proceed to describe the three classes of bees which are necessary to constitute a successful working hive, viz.: the QUEEN BEE, the WORKING BEE, and the DRONE.

CHAPTER II.



THE QUEEN BEE.

THE Queen Bee is at once the mother and mistress of the Hive. She is distinguishable from the rest of the community by certain marks, which render her detection very easy, by any one once acquainted with her peculiarities. She is longer in the body than the common bee, and moves with a more deliberate and measured tread. Her wings are shorter than those of the worker or drone, whose bodies are entirely covered, while those of the queen scarcely reach beyond the middle. Her body tapers gradually to a point, her under jaws are shorter, her head rounder, her trunk more slender, and not half so long as that of the working bee. Her legs, though longer, have neither brushes nor baskets, or cavities in the thighs for the conveyance of farina and propolis. Her colors distinguish her also: the upper surface of her body being a much brighter black, and the under surface and the legs of a dark orange or copper color, that of the hinder legs being somewhat deeper than the rest. We think the above explanation of the appearance of the queen will enable almost any one to distinguish her from the other bees in the hive, and if necessary to remove her when requisite, as is sometimes the case in managing bees.

The office of the queen is to increase the species by the laying of eggs, which she deposits in cells constructed for their reception.

These cells vary from one another in size, according as they are to be used as depositories of eggs that are to become drones, or of those that are to become workers. The cells of the drones are built at the lower edge of the combs generally, and are about as large again as the cells of the workers, and the combs containing them are also much thicker. The store-cells and drone-cells are of the same size. There are but two diameters for the cells of the combs of the honey bee, one for the brood-comb of the workers, the other for drone and store combs. The brood-combs are, however, occasionally used to store honey in. The royal or queen cells are about as large as a peanut, and bear a great resemblance to that nut, and are always placed on the edge of the comb, either on the outside or on the side of a hole or passage-way through the comb, with the mouth downwards.

CHAPTER III.

THE OPERATION OF LAYING.

THE queen commences laying as early as January and February, if the weather is moderate, and lays to a greater or less extent according to the temperature of the weather, the strength of the stock, and amount of honey in the hive, and much earlier in a southern than northern climate.

She first lays worker eggs for several weeks in succession in that portion of the combs denominated brood-combs, and occupying the central part of the hive. The following description of the operation of laying (which is correct to the letter) is given by the "Rev. M. Dunbar, Minister of Applegarth, England," and Dr. Bevan says "they are quite in accordance with similar experiments made by Mr. Golding and himself." Mr. Miner, also, and several American authors, have certified to the correctness of the statement. "Mr. D. states that when the queen is about to lay she puts her head into a cell and remains in that position for a second or two, probably to ascertain the fitness for the deposit which she is about to make. She then withdraws her head, and curving her body downwards, inserts her tail into the cell. In a few seconds she turns half round upon herself, and

withdraws, leaving an egg behind her. When she lays a considerable number she does it equally on each side of the comb, those on the one side being as exactly opposite to those on the other as the relative positions of the cells will admit. The effect of this is to produce a concentration and economy of heat, for developing the various changes of the brood." During the process of laying she is usually accompanied by several workers, who appear to bestow upon her a great degree of attention and respect. She continues laying worker eggs for several weeks in succession, during the latter part of which she lays to a greater extent than in the former. Some four weeks before the time for swarming, she commences laying drone eggs. These are deposited in cells of larger size prepared for their reception. The number of drone eggs amount generally to from four to six hundred. It is during the laying of drone eggs that the *royal* cells are prepared, (and if it is decided by the bees that a swarm can be spared,) the queen deposits eggs in these at intervals, as has been stated, so as to mature at the time a swarm would probably immigrate. The form of the eggs of the queen are of a long oval shape, about the size of that produced by the large green fly, but curved a little, and of a transparent bluish-white color, and are besmeared with a glutinous substance which adheres them to the bottom of the cell, in which position they remain for three or four days, (according to the temperature of the weather,) when a small worm or maggot is produced. The workers immediately commence nursing and feeding them with farina (or bee-bread) and honey, with which they supply them most bountifully.

CHAPTER IV.

THE DEVELOPMENT OF THE BROOD.

THE following description of the development of the brood in its various stages, from the egg to the full-grown Bee, is from Dr. Bevan's work, and accords with my own observation and apiarians generally. Dr. Bevan says, "The eggs of bees are of a lengthened oval shape, with a slight curvature, and of a bluish-white color: they are about the size of those which are laid by the butterfly

upon cabbage-leaves, are composed of a thin membrane, filled with a whitish liquor, and being besmeared at the time of laying with a glutinous substance, they adhere to the bases of the cells, and remain unchanged in figure or situation for four days; then they are hatched, the bottom of each cell presenting to view a small white worm or maggot, with several ventral rings. On its growing so as to touch the opposite angle of the cell, it coils itself up in the shape of a semicircle. To use the language of Swammerdam, it coils itself up like a dog when he is going to sleep, and floats in a whitish transparent fluid, which is deposited* in the cells by the nursing bees, and by which it is probably nourished; it becomes gradually enlarged in its dimensions, till the two extremities touch one another and form a ring. In this state it obtains indifferently the name of *worm*, *larva*, *maggot*, or *grub*, and is fed with farina or bee-bread. The slightest movement on the part of the nursing bees suffices to attract it to its food, to receive the welcome morsels of which it eagerly opens its two lateral pincers, and a most liberal supply is afforded to it, though by no means trenching on the bounds of prodigality. So nicely do the bees calculate the quantity which will be required, that none remains in the cell when the larva is transformed to a nymph. It was the opinion of Reaumur, and is still that of many eminent naturalists, that farina does not constitute the sole food of the bee larvæ; but that it consists of a mixture of farina with a certain proportion of honey and water, partly digested in the stomachs of the *nursing bees*, the relative proportions of honey and farina varying according to the age of the young. The compound at first is nearly insipid, but gradually receives an accession of sweetness which increases as the insects approach maturity.

The larva having derived support in the manner above described, for four, five, or six days, according to the season, continues to increase during that period, till it occupies the whole breadth and nearly the length of the cell. The nursing bees now seal up the cell, with a light brown cover, externally more or less convex, (the cap of a drone-cell is more convex than that of a worker,) and thus differing from that of a honey-cell, which is *paler* and somewhat *concave*. The larva is no sooner perfectly inclosed than it begins to

labor, alternately extending and shortening its body, whilst it lines the cell by spinning round itself, after the manner of the silk-worm, a whitish silky film or *cocoon*, by which it is encased, as it were, in a pod or pellicle. The silken thread employed in forming this covering proceeds from the middle part of the under lip, and is in fact composed of two threads, gummed together as they issue from the two adjoining orifices of the spinner.* When it has undergone this change it has usually borne the name of nymph or pupa. "The *working bee nymph* spins its cocoon in thirty-six hours. After passing about three days in this state of preparation for a new existence, it gradually undergoes so great a change as not to wear a vestige of its previous form, but becomes armed with a firmer mail, and with scales of a dark brown hue, fringed with light hairs. On its belly six rings become distinguishable, which by slipping one over another enable the bee to shorten its body, whenever it has occasion to do so; its breast becomes entirely covered with gray feather-like hairs, which as the insect advances in age assume a reddish hue.

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

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

* Kirby and Spencer.

or male passes three days in the egg, six and a half as a worm, and metamorphoses into a fly or perfect bee on the twenty-fourth or twenty-fifth day after the egg is laid."

"The young bees break their envelope with their teeth, and are assisted as soon as they come forth by the older ones, proceed to clean themselves from the exuviae with which they were surrounded," and in the course of a few hours are busily engaged in the labors of the family. "We have seen her," says Wildman, "the same day issue from the cell, and return from the fields loaded with wax like the rest." Others suppose they remain in the hive for two or three days before they commence their labors.

The royal cells, instead of being near horizontal, as the brood and store-house cells, are placed in perpendicular position on the edges of the combs, near the centre of the hive, are of much larger dimensions, and are not adjoining each other, but occupy different positions on the edges of the combs, and resemble in form the shell of a peanut, as previously stated in Chap. ii., and from three to twelve in number. At the time the nymph is about to change to the perfect queen, the bees cut or gnaw away the wax or covering of the cell, rendering it very thin. In this position the young queen is supplied with food by the worker bees, by means of a small hole in the covering, through which the confined queen receives its food from the worker bees. Bevan says, "Probably the young queens are thus temporarily imprisoned, the more complete to ensure success to them in their first efforts to fly, which would seem to be an object of considerable importance. In furtherance of this, they are provided with capacious shells, which, by enabling them to expand their wings, before they emerge, fit them for immediate flight, whereas the workers and drones issue from their cells with folded wings." It has been supposed by some apiarians that the worker bees stand very much in awe of their *sovereign*, and that she has them perfectly at her command and control. Huber declares that he "has heard it on various occasions, and witnessed the striking effect which it has always produced." Other apiarians have, however, expressed different opinions, and have never witnessed any such effect produced as has been stated by Huber, and I doubt very much whether the queen *has*, and does

exercise that authority over the colony in all their avocation, that has been attributed to her by many writers. That she is very much esteemed and prized by her subjects I readily admit; but it appears to me that they are governed more by the impulse of a *natural instinct*, for each to voluntarily fill and occupy the sphere designed them by the Creator, than by the command of the queen; for, unlike man, each appears to know their place, and gladly occupy it, and have no ambitious spirit to gratify, having no mutineers or revolutionists in the colony, but all united, and if you insult or injure one individual, you rouse the ire of the whole family.

CHAPTER V.



THE WORKING BEE.

THE next class for consideration is the worker bee. We have given the process of laying and hatching the bees in the preceding pages. We now give a description of the working bee.

These are by some called *neuters* or *mules*; by others *female non-breeders*. The latter is, undoubtedly, the more appropriate title, the workers being sterile females with undeveloped ovaries. In a single hive the number of these varies from 12,000 to 20,000. If swarming is prevented by affording room, a single family, in summer, may contain 50 or 60,000. They are the smallest members of the community, are furnished with a long flexible apparatus known by the name of proboscis, have a peculiar structure of the legs and thighs, on the latter of which are small hollows or baskets, to receive and carry the propolis and farina which they collect, and they are armed with a straight

sting. Upon them devolves the whole labor of the colony ; they rear the young, guard the entrances, elaborate the wax, collect and store the provision, and build the cells in which it is warehoused as well as those which contain the brood.

CHAPTER VI.



THE DRONE.

THE drones or males number from 300 to 600 in a family, according to its strength. These make their appearance about the end of April, and are seldom to be seen after the middle of August, except under peculiar circumstances. They are one-third larger than the workers, somewhat thicker and of a darker color ; they have shorter jaws as well as a shorter proboscis, and are more blunt at the tail than either the queen or workers ; the last ring of the body is fringed with hairs, extending over the tail and visible to the naked eye. They make a greater noise in flying, are destitute of baskets on their thighs, and have no sting ; are rather shorter than the queen, but generally much larger. Underneath the tail two small protuberances of a yellowish color may be seen, which are regarded as the distinctive marks of their sex. In some swarms no drones are observable ; probably these are first swarms, which, being always led off by old queens, have no occasion for drones.

We have before stated that the queen was the parent of the bee colony ; the working bees are the laborers who gather and store the sweets for the supply of the family, and the drones are evidently for the purpose of impregnating the queens. We give Huber's account of this discovery of the uses of the drone in a hive of bees. It also accords with all writers on this subject at the present day.

"Aware that the males usually leave the hive in the warmest part of the day in summer, it was natural to suppose that if the queens were obliged to go out for fecundation, instinct would induce them to do so at the same time as the others.

"At eleven in the forenoon, we placed ourselves opposite to a hive containing an unimpregnated queen five days old. The sun had shone from his rising, the air was very warm, and the males began to leave the hives. We then enlarged the entrance (which had been contracted to prevent the egress of the queens) of that selected for observation, and paid great 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, but during a little time traversed the board, brushing her belly with her hind legs, neither workers nor males bestowing any notice on her. 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 then flew away, describing horizontal circles twelve or fifteen feet above the earth. We contracted the entrance of the hive that she might not return unobserved, and placing ourselves in the centre of the circles described in 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 entrance of a habitation which she had left for the first time. Having found no external evidence of fecundation, we allowed her to enter. In a quarter of an hour she re-appeared, and after brushing herself as before, took flight; then returning to examine the hive, she rose so high that we soon lost sight of her. This second absence was much longer than the first, it occupied twenty-seven minutes. We now found her in a state very different from that in which she was after the former excursion, the organs distended by a substance thick and hard, very much resembling the matter in the vessels of males, completely similar to it in color and consistence."

There is not the least doubt in my mind as to the correctness of Huber's opinion on this point, but many seem to doubt it, and I have

often had the question asked me, why are so many needed in a hive containing one queen; my answer to this is, that the queen in her flight may be sure of coming in contact with one, and not be under the necessity of hazarding her life by repeatedly leaving the hive. Nature provides bountifully for all her wants; not more so in this than in a thousand other instances.

CHAPTER VII.

LONGEVITY OF BEES.

THE length of life allotted by the ancients to the working bee, was much greater than has since been, by modern writers; as the former supposed it to reach the term of from *seven to ten years*, but the latter have thought it not to exceed one year. Dr. Bevan, after experimenting on the subject, has given it as his opinion, that it does not exceed six or seven months. And from the attention I have paid to the subject, I am of the opinion that it does not much exceed that term; though I think that probably some may exceed that period.

I find that there are many bee-keepers at the present day, that are not at all prepared to believe this statement, and do really suppose that the bee generally lives several seasons. But I think that after a little reflection, every one must be convinced that the average life of the working bee does not at most exceed eight or nine months, and that a large proportion do not reach the age of six months. Let any one who doubts this put a swarm into a bee-house, or room fitted for the purpose, and of such dimensions as will prevent swarming, as many have done in the State of Ohio, and then let him observe their operations; and he will find that as a general thing he will have as many bees in his colony on the first of July of the second year as he will at that period in any subsequent year. The philosophy of the matter is simply this: The queen being the mother of the entire family, and producing all the brood, or young bees, the population of the colony is kept up by her; and she being able to produce only about a given number of bees during the season, and their lives being

of so short duration, a large majority of them close their existence before the next spring, at which time the colony is found to contain no more bees than it did the previous spring; and this increase and decrease in numbers will continue yearly while the colony exists, and their numbers will remain just about the same for years.

“Like leaves on trees, the race of bees is found
Now green in youth, now withering on the ground :
Another race the spring or fall supplies—
They droop successive, and successive rise.”

I have known several instances where bees have been put into large palaces, and rooms in buildings, fitted for the purpose, where so much space was given that swarming has been prevented entirely, and the bees permitted to increase for years, to any extent in their power; but in no case have they increased in numbers to exceed that of a good colony just previous to its throwing off a first swarm. I was called upon in the summer of 1851, to transfer a colony into one of my hives from an old *bee-palace* (as they are called in Ohio). The bees had occupied it for fifteen years, during which time they had never thrown off a swarm; and at the time I transferred them, which was the last of June, there were no more bees than in a colony of the preceding year that had not thrown off a swarm that season.

In the month of September, 1851, I transferred a portion of a good strong colony of bees into my observatory hive, leaving the queen with the remainder of the bees in the old hive. This I accomplished by removing the old hive a short distance, and placing the observatory hive where it formerly stood. I had previously taken from another hive a piece of comb containing brood, and placed it in the observatory hive; not for the purpose of trying the experiment of raising a queen from a worker egg, but to experiment in feeding, and observe their operations while destitute of a queen, and also how long they would exist in that situation. I will here state that I had no expectation of their raising a queen from the brood that I had supplied them with, as it was so far advanced in a state of maturity that it afforded them no means of accomplishing that object; yet they had by the next morning laid the foundations of three royal cells, in the portions of the combs containing the youngest brood. On each of these

some half-dozen of bees were busily engaged for some forty-eight hours, when they were abandoned entirely, on account of the advanced state of the brood. I had previously commenced feeding them, and the bees were building combs and storing them with honey, and worked to all appearances as well and systematically as if possessed of a queen; which I was sure was not the case, as I could readily see every bee in the hive, and every cell, in a moment of time. I continued to feed them, and watch their operations closely by day and night, until I was satisfied they had a sufficient supply to last them as long as they would require food, as I could see from day to day that their numbers were diminishing; so that by the first of November, one half of their number at least had become extinct. The remaining bees appeared as active and industrious as those occupying my other hives. They were flying briskly every pleasant day, and appeared eager to improve every opportunity to labor and gather stores as those of other colonies. Their numbers were continually diminishing, and on the first of December there were not more than a pint or pint and a half remaining in the hive; and by the middle of the month not a live bee remained. The cold weather probably had an effect in terminating their existence, as there were not a sufficient quantity of bees to keep up a proper amount of heat.

The foregoing experiment, in connection with others made by Bevan, Huber, Reaumur, and others, goes to convince me that the natural life of the working bee does not reach the term of one year, and that they may very properly be termed an insect of a season.

LONGEVITY OF THE QUEEN.

The life of the queen bee has been ascertained to be of much longer duration than that of the worker. This is a wise provision of the Great Ruler of all events, for if the life of the queen was as brief as that of the working bee, the whole race would be liable to soon become extinct.

The experiments and observations of Huber, Bevan, Dunbar, Golding and Rocca, and of several American apiarists on this point, are sufficient and ample to settle this question. Though no one has ever pretended to be definite as to the exact length of her life, all admit

that she generally sees several generations of her subjects pass away before she quits the stage herself. Huber was of opinion that her life extended in many instances to a period of from four to five years; though he speaks positively only of its extending to two years.

In numerous instances, when she has been marked so as to be identified, she has been traced from swarm to swarm for a period of three or four years.

The life of the drone does not exceed four or five months, if left to die a natural death; but their lives are generally cut off by violence of the workers at a much shorter period than this.

CHAPTER VIII.

THE APIARY.

MUCH more depends upon the location of the apiary than most beekeepers appear to imagine, and even among those who have a preference, there are different opinions on the subject. A majority, however, I am inclined to think, are in favor of a southern aspect; but I think there are no good reasons for such conclusions, other things being equal. I always prefer an eastern aspect, or one bearing a little south of east, as this gives the bees the influence of the sun in the morning, or fore part of the day, when it is beneficial to them, and during the middle of the day it will not be as oppressive as when the hives are fronting the south. Whatever the aspect may be, the hives should never be exposed to the rays of the sun during the middle of the day, excepting in April and May. The apiary should be protected on the north and west by buildings, or trees, or a high fence or shrubbery, to afford the bees a protection from wind and rain, when they are driven home during the season by sudden showers accompanied by high winds. The hives, however, should not stand so near the trees or buildings as to be exposed to their drippings, or so near a fence as to prevent a passage between the hives and fence. It is also desirable that the apiary be located near the residence of the apiarian, where it will be easy of access, and in view, or near, the kitchen garden or yard. It however

should not be near any thoroughfare travelled by horses, as during warm weather, when horses are in a state of perspiration, they are very offensive to the bees. Hens and ducks sometimes are very destructive on bees. I have known them to lie about the apiary, and every bee that came in their reach was sure to fall a victim to them.

INFLUENCE OF THE MORNING SUN BENEFICIAL.

Many bee-keepers do not appear to consider that the morning sun has any beneficial effects upon the labors of the bees. I have in numerous instances seen apiaries located on the *north* and *west* side of buildings and trees, where the sun would not shine upon them until the latter part of the day. This I consider decidedly injurious to the prosperity of the bees, and any one that doubts it let him try the experiment, and set one hive on the east side of a fence or building, and one on the north or west side, and see which will commence their labors first in the morning; the result will be, that the bees in the hive that the sun will shine upon at its rising, will usually commence work at least one hour earlier than those standing in the shade. During the middle of the day, the sun beating in all its power and heat upon the hives not only does them no good, but does them injury, as it is often so oppressive to the bees, as to cause them to nearly suspend their labors in the hive, and cluster outside, and in many instances melts down the combs, and often ruins the family. I want the sun to shine upon my hives in the morning, until about ten o'clock; after that I consider it does them no good. Therefore, if possible, let the bee-house (if it be an open one) stand fronting east, or nearly; *if it bear a little to the south of east* it will be full as well, and let the roof or covering be so constructed as to form a shade for the hives during the middle of the day, or after ten o'clock in the morning.

OUT-DOOR APIARY.

If the apiary be an out-door one, and the hives occupy single stands, they should be protected from storms, and the rays of the sun, by a roof of some kind, about three feet square; this should be supported a few inches above the hive by four posts set in the ground, sufficient to prevent it from being blown down; the rear post should be a few inches shorter than the front ones, so as to give the roof a little pitch

to the west. No shrubbery, weeds, or high grass should be permitted to grow about the hives, as these afford a harbor for spiders and other insects.

I have noticed that some bee-keepers set their hives on the top of posts some four or five feet high, without the least form of shelter over them. In this situation the bees are exposed to all the changes of the weather, during summer and winter; so also are the hives, and the sun and storms will soon crack and warp them, and render them unfit for further use.

It is a very common practice for bee-keepers, in locating an outdoor apiary, to place it by the side of a fence or building, not allowing space to pass between the rear of the hives and fence or building; this I consider bad policy: 1st, because it does not afford as good a circulation of air about the hives as if they stood some two or three feet from the building.

2d. It does not afford as good opportunity to examine the hives as would be if they could be approached from the rear.

3d. Weeds and shrubbery are more likely to be suffered to grow up around the hive in such locations than when in the yard, clear of a fence.

Great care should be taken to secure the hives against being blown over by high winds; different means have been resorted to to prevent this. All hives should be secured in some way, if nothing more than a stone is placed upon the top of them.

When several hives are placed on one bench, either in an open beehouse or out, there should be at least one foot space between the hives, and a division board from four to six inches wide set up edgewise to prevent the bees from mixing up when clustering out. I have known instances, where the hives of late swarms have stood near each other, and the bees have all left one hive and joined their neighbors of their own accord. This I consider no loss when the swarms are weak, but rather an advantage; but with old stock hives it would be different, as they would be very liable to quarrel, especially if the bees should attempt to enter the domicile of their neighbors. Still I have known instances when the bees in adjoining hives have spread out and clustered together for weeks, and appeared to agree as well as if they had been one family.

CHAPTER IX.

HIVES.

THE good or ill success in the culture of the Honey Bee, in my opinion, depends very much upon the size and form of the hive used. But various are the opinions of apiarians on this subject. Hives or boxes of almost every imaginable shape and size have been used, and each had its advocates. Many vague and false theories have been advanced, and each of these has found supporters for a season at least; and it appears, upon looking back upon the history of Bee-Hives for the last twenty years, that the greater the humbug the greater the success with which they have been palmed off upon the unwary and too confiding bee-keepers of our country; and if the question were asked, why have the venders of these worthless beehives met with such universal success in disposing of their worthless impositions, the only true and correct answer must be, because bee-keepers have generally paid so little attention to the subject, that they have not been prepared to judge correctly between a good article and a poor one. Within the last few years I have conversed with hundreds of bee-keepers, who have kept bees (or tried to, as they say) for a period varying from ten to forty years, and I think I may safely state that full one-half of this number know no more about the natural habits and wants of the bee, than if they had never been engaged in the business in any way or shape. Some have kept them in the old common box hive, and have never devoted one moment's thought or study as to their habits or wants. As their "fathers did, so do they;" and whenever they obtained any honey, it has been at the expense of the lives of the bees that gathered it; and they have considered it as indispensable to destroy them to obtain their honey, as it would be to kill a horse to obtain his skin; and I seriously consider the cases just about parallel, and that it is about as good economy to kill a good horse for his skin, or cut down a good fruit tree to obtain its fruit, as to *murder* a good colony of bees to obtain their honey.

Others have been actuated by motives more humane, and have manifested a desire to keep pace with the progress of the age, and

have been anxious to adopt some mode by which, if possible, they might preserve the lives of these industrious and most interesting little creatures, and at the same time procure a much purer article of honey; but being, as before stated, unacquainted with the wants and natural habits of the bee, they have been easily made the dupes of designing men, and in many instances have nearly or quite annihilated their entire stock of bees, and consequently have become discouraged with all patented bee-hives. Not a few, however, have persevered, and, not willing to abandon it, have made the second, and some the third and even the fourth trial, with as many different hives, and with but little better success than at first.

Hence it is not at all surprising that many have become prejudiced against all patented hives; for it is an old *adage* that "a burnt child dreads the fire;" so with those who have not only paid out their money for hives that were of no value, but have in many instances lost their bees besides.

I, however, am of opinion, that much of the bad success in keeping bees in *any* and *every* form of hive, is owing to bad management. For we frequently find a person that has good success, let him use what hives he may, while his neighbor cannot keep them in any form of hive; and we also hear the former crowing or boasting over his success with the old hive, and will point at the latter, who has, from his poor success in the common hive, been constrained to purchase a patent hive, to see if he could not succeed with it better, but owing to mismanagement has failed in this also; and it is all laid to the hive; -and the former will tell him that the old common hive, after all, is far better than any patented hive that was ever invented; that it is more natural to the bee; that bees must swarm in order to prosper, &c. &c.

I for one do not think that because a hive is patented it is either the better or the worse for it; but that its merits or demerits depend upon other considerations. Neither do I think that the old common hive is better adapted to the wants of the bee than any other hive; for certainly they are defective in many respects, as I have previously stated. I admit, and contend, that any hive calculated to change the natural instinct of the bee, is useless. But from experience I have

become satisfied that a hive can be made that will not interfere with their natural instinct, and at the same time far better adapted to their wants at all times, and also much more convenient for the bee-master to manage than any of the common hives now in use.

But, as I have previously stated, the good or ill success attendant on any hive, depends in a good degree on the care and attention paid them while occupied by the bees; for while, with judicious and careful management, bees will in many instances thrive and afford a good supply of honey in almost any form of hive; so in the reverse will they, if occupying the best hive ever invented by man, if neglected or improperly managed, in many instances fail to remunerate their keeper to any reasonable extent, and not unfrequently, for want of a little attention and care, fall victims to moths, robbers, or some other enemy. Hence no person should ever engage in the culture of the bee with hopes of success, unless he expects to bestow some care and attention upon them in summer and fall, and in winter and spring.

As in agricultural and mechanical pursuits, so in the culture of the honey-bee; much that is valuable to the bee-keeper may be learned from the experience of others. And notwithstanding bee-keepers vary so materially on some points, there are others on which a majority agree; and if a person will take the trouble to read and compare the opinions of different authors, and study and observe the operations of his bees, he may soon be able to decide what mode of management to adopt in order to insure success, and make the business both profitable and interesting. But in order to do this, he must have some form of hive different from the old hive, that affords no means of observing their operations or studying their habits and wants.

All admit that too much or too little room is injurious to the welfare of the bees, and that the nearer the hive corresponds in size to the actual wants of the colony, at all times and seasons of the year, the more prosperous they will prove—and for the following reasons, viz. :—

1st. The less unoccupied room there is in a hive, the less danger there will always be from the attacks of moths.

2d. That a large and populous family of bees do actually need more room than a small one.

3d. That a swarm of bees do not require as much room the first season as they do the second and after years.

4th. That a family of bees do require more room during the summer season than in winter.

5th. That a colony of bees, when supplied with ample room for all to labor to advantage, will produce a much larger amount of honey than when crowded so as to compel large numbers of them to leave the interior of the hive, and cluster and idle away their time on the outside.

6th. That a colony of bees will not often continue vigorous and healthy, if permitted to occupy and breed in the same combs for a period of more than three or four years, and that by the removal of the old combs (if done in a suitable manner) the colony may be kept in a healthy state for any number of years.

7th. That all hives should possess some convenient means for taking the surplus honey without disturbing or injuring the bees.

8th. That it is not only desirable, but absolutely necessary, for the successful culture of the honey-bee, that the hive afford some convenient and safe arrangement for feeding, as it often becomes necessary not only to feed late and weak swarms, but that *even strong and populous colonies* often require feeding, during a cold and backward spring, to prevent them from starving.

9th. It is desirable also that a hive afford facilities for observing the operations of the bees, and ascertaining the amount of honey in store, and the strength and condition of the colony at all seasons.

10th. It is a consideration of much importance also, that hives should be so constructed as to render the distance that the bees have to travel to deposit their stores, after entering the hive, as short as possible to all parts, as this will save them much time and labor, and as the honey season is usually short, every facility should be afforded them to improve it to the best possible advantage.

11th. That it is also necessary that the bees, in order to be healthy, must be supplied with a good degree of ventilation.

I say all are ready to admit that the foregoing requisites are both desirable and necessary.

But when we come to consider the form and size of bee-hives, or

the form and size *best adapted* to the natural habits and wants of the bee, we find almost as many different opinions on the subject as there are persons engaged in keeping bees. Some are in favor of large hives, others of small ones. A. has his *large* hive for *large* swarms, and small hives for small ones. B. contends that all should be of the same *size* and *form* under all circumstances. C. prefers the storifying plan. D. the collateral hiving. And an almost endless variety of forms and sizes might be named, and each has its advocates. That persons should disagree in regard to the *peculiar form* that hives should be constructed, is not a matter of surprise; or that there should exist a diversity of opinion, as to the size *best suited* to the actual wants of the honey-bee, so long as different colonies vary so much in the amount of honey they produce, and localities and seasons affect them so materially as they do here in the United States. But that practical bee-keepers, who have paid a good degree of attention to the subject, should *insist* that "every bee-hive in the United States should be of one exact size and shape," under *all circumstances* and *all cases*, and that no "additional room should be given" in any case, is in my opinion taking ground that it will be difficult to defend by sound argument, to say the least.

For it is a fact, admitted by all apiarians, "that some queens are more fertile, and will produce a much larger amount of brood during a season than others, and that even the same queens will produce more bees in some seasons than in others, and consequently the population of the family will vary as the queen is affected by seasons and circumstances, and as a matter of course their wants, as regards amount of room, will vary as their numbers increase or diminish. It is also a fact that some colonies will store double the amount of honey during the season that others will, provided they have room afforded to accommodate them. Now this being the case with each and every colony of bees, does it not appear both proper and necessary that hives should be so constructed as to afford means to increase or diminish the amount of room to accommodate the wants of the family, both at different seasons of the year, and also in different seasons; for as has been mentioned, it will enable the bees to gather more honey, and afford small colonies better protection against the moth, than hives that are so constructed

that you have just such an amount of room, with no suitable means to increase or diminish it, to meet the wants of the bees. It is often the case that bees will not swarm at all, (notwithstanding many appear to think that it is so natural for them to do so,) but will cluster in large quantities on the outside of the hive for weeks in succession, and idle away their time when they would be busily engaged in storing honey, if in hives that would afford them suitable room to store it in.

BEE-HIVES.

It would not only be useless, but impossible for me, in this little treatise, to attempt to give a description of one half of the bee-hives that have been invented during the last twenty years, a number of which were never worth the powder it would take to blow them up; most of which have, however, exploded without the expense of powder.

I have thought, however, that it might not be altogether out of place here to notice some of the many that have been brought into general use, and state my opinions briefly as to their good or bad qualities, according as I view them. It is evident, I think, that many of these hives were never tested by their inventors, or by others, before they were brought before the public; had they been, I think their inventors would not have had the hardihood to humbug the community to the extent they have done. Many of the patented hives, however, have possessed some good qualities; but they generally have been encumbered or surrounded by some useless contrivance, that overbalanced all the advantages they possessed. Others, in endeavoring to remedy one difficulty, have instituted others still worse, if possible. - The object aimed at by most inventors, has been to devise some means for obtaining the honey without destroying the lives of the bees. This, all will admit, is a very desirable object; but I candidly believe that many of the hives that have been invented expressly for this object, have in the end destroyed more bees than they have been the means of saving.

Other hives have been devised expressly to prevent the deprivations of the moth, and have been styled by their inventors "*moth-*

proof;" but like many others, when they were put to the test were found wanting. And I will here state, that I consider it an utter impossibility to construct a hive that will perfectly exclude the moth in every instance, and admit bees into it; for certainly a moth can enter where a bee cannot. And now, reader, whenever you meet with a person that has a moth-proof hive to sell, you just set him down as an unwise man, or a dishonest one: for if he flatters himself that his hive is *moth-proof*, he is badly *bored*, to say the least; and if he has sense enough to teach him that it is *not moth-proof*, he is a dishonest person in endeavoring to dispose of it as such.

I, however, am confident, that some hives afford the bees far better protection against moths, and other enemies, than others, and also better facilities for destroying them after they have gained an entrance into the hive. Hives composed of boxes or sections with bottoms attached firmly, I consider unfit for bees, as they afford the keeper no means to clean the floors of the hives. I believe that every section used for breeding, and composing the main body of the hive, should be open at the bottom, so as to let everything, such as dead bees, filth, moths, and the like, fall free from the combs on to the floor of the hive; and the floor so attached as to admit of its being cleaned off at pleasure, without disturbing the bees.

Several hives have been invented with inclined-plane bottoms, to enable the bees to clear them more readily of moths, dead bees, &c. But I think there has been nothing gained by this in the end, but that it has proved an injury: for in attaching the bottoms in the manner that it has generally been done, leaving an open space the whole width of the hive (and in the double inclined bottoms on two sides), which affords the miller just as good an opportunity to enter as she could desire; for during fall and spring the hives are not usually filled to the bottoms with bees, and during the night the cool damp air will drive the bees from the entrance, and leave it entirely unguarded, when the miller has a free unmolested entrance into the hive, where she may deposit her eggs in the wax about the bottom and joints of the hive; and when disturbed by the bees on the following morning, will leave the hive and secrete herself in some crevice about it, and there remain until evening, when she is ready to pay the hive another

visit. I find that the smaller the aperture for the entrance of the bees, the less liable the moths are to enter, and especially if they are compelled to enter directly in among the bees. Every bee-keeper knows that when a hive is crowded with bees there is but little danger of moths troubling them; but let the colony be reduced in numbers so as to not more than half fill the hive, leaving a large portion of the combs unprotected by the bees, and if the moths do not find their way to them it will be something unusual. I have found also there is no better protection against the moth than full hives. Even if the swarm be small and weak, if it fill the space it occupies, they will defend themselves against moths, especially if the entrance into the hive be small. But put a small swarm into a large hive, and leave it open all around the bottom, and every bee-keeper knows what to expect generally; and if the moths do not take possession of the whole concern in a short time, he is disappointed, and considers himself very fortunate indeed.

As I am frequently asked the question (by persons engaged or interested in keeping bees), whether I ever saw this, that, and the other patent hive of which they have heard, but have never seen, I have thought that it might probably interest some to insert a few cuts showing the form of different hives that are in use in various parts of our country, and accompany each with a few remarks in explanation of them.



WEEKS' VERMONT HIVE.

Mr. Weeks, the inventor of this hive, has paid a good deal of attention to the culture of the honey bee, and has published a small work on the subject. This is a chamber hive, affording room for two boxes for surplus honey, of about twelve pounds each. The reason for having the rear incline, as stated by Mr. Weeks, is to prevent the combs from falling or breaking down, and the inclined bottom, to enable the bees to carry out the moth and dead bees more easily; but as I have stated, it affords the millers too free access into the hive. The bottom is usually attached by wire hooks, leaving an open space on every side of the hive.

This hive has been introduced very extensively in several States,

and has generally given as good satisfaction as most hives, and far better than some that I might name. But like a majority of the hives that are now in use, both patented and those that are not, it is defective in the amount of room it affords the colony, as it is an entire hive, and whether the colony is a strong or weak one, you have so much room, and can give them no more nor no less; hence I consider it far from being what is wanted, in order to secure the greatest profit from the culture of the bee. This is my candid opinion, and I think I shall be able to prove to every unprejudiced mind, that I am correct. It is also defective, like most others, as it affords no convenient means for feeding, or removing the old combs, both of which are very necessary requisites, that every hive should possess, for it often becomes necessary to feed bees to preserve their lives, and there are various reasons why bees will prosper better while occupying new combs than in old ones.

STORIFYING AND SUBTENDED HIVES.

Subtended hives of various forms have been used to a considerable extent in different sections of our country, and many bee-keepers at first were highly pleased with them, but after using them awhile changed their opinion.

The advantages claimed by the inventors of these hives are, that the surplus honey may be taken from them without destroying the bees, and also the old combs may be removed, and the bees permitted to construct new ones in their stead.

Both of these objects are desirable, and various plans have been adopted to accomplish them. But the main objections to these hives, I believe, are, that they afford but a small amount of pure honey fit for market, and the boxes being so large, (containing generally from twenty-five to forty pounds,) are not ready to be removed until late in the season, on account of their containing young bees and brood. There is frequently, also, more or less bee-bread in these large sections, while the small boxes in the chambers of the hive scarcely ever contain a cell of either bee-bread or brood, and they may often be taken filled with pure honey as early as June, and will sell in market for one third more per lb. than that in the large boxes. The bees are

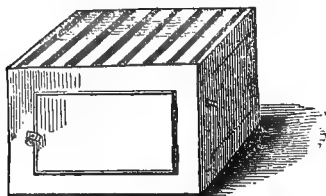
hived in one box, and if it is a swarm of usual size, it is set on the top of another one, and when both are filled another box is added.

The boxes composing this hive are generally eleven or twelve inches square in the clear, and eight or nine inches deep. There are different sizes and forms, however, combining the same principle, but are managed differently by different persons: some super* them, while others nadir† them; the former mode generally produces the purest honey, as the queen is not as liable to ascend into the supers, and deposit eggs there, as she is to descend into the box below. In both cases, however, much depends upon the strength or population of the colony: if it is a weak swarm, she will not be liable to go into either; if a strong one, she will sometimes do so. The communication from one box to the other through the top is often made by boring from three to five auger holes at different points, and sometimes a hole three or four inches square is cut, and a slide fitted to cut off communication at pleasure. The door in the front of each box opens to observe through a pane of glass the operations of the bees, and the amount of honey they have in store. In my opinion, it would be better if this door was in the rear of the hive, as it would then afford the keeper an opportunity to approach it with much less exposure to the bees, but where the hives are placed against a fence or building it could not be done; though this I would never recommend, as it usually affords a harbor for moths, spiders, ants, and other insects, and the apiarian has not as good an opportunity to destroy them as if he could have access on both sides of the hives.

Hives also with supers, capable of containing from twenty to forty pounds of honey, have been used in many parts of the United States with tolerable good success, and I consider them far preferable to the common hive. But the bees will not as readily enter these supers and commence their labors (unless guide-combs are placed in them) as they will smaller boxes, and when they do commence the queen is more liable to ascend and deposit eggs there than in smaller boxes, especially if the colony is a strong and populous one.

* Supering is placing the empty box above the stock.

† Nadiring under the stock.



BEVAN'S CROSS-BAR HIVE.

The above is a representation of Dr. Bevan's cross-bar hive. The object of the bars arranged across the top (as seen in the cut) are to guide the bees in constructing their combs, that they may be more uniform, and afford a greater amount of brood-combs, than when left to their own natural habits. The centre bars are placed at suitable distance for brood-combs, are one half inch thick, and one and an eighth inch wide. The sides of the boxes are rabbeted at the top half their thickness, and half an inch deep to receive the bars. The boxes or hives are eleven and five-eighths inches square, and nine inches deep in the clear, affording space for seven bars. Dr. Bevan says, "that if the distance of the bars from each other be nicely adjusted, there will be interspaces between them of about half an inch. The precise width of the bars should be particularly attended to, and also their distances from each other, as any deviation in this respect would throw the combs wrong, particularly if that deviation gave an access of room. It would be better, therefore, for them to be somewhat within the rule than to exceed it by ever so little, for whenever the bees evince a disposition to depart from the prescribed dimensions, its tendency is generally to make the combs approximate. This has induced me to have my boxes surmounted by bars varying a little in their relative distance; thus, the three centre bars are placed at the distance of only seven-sixteenths of an inch from each other, while the rest gradually recede from that distance, so that the two last interspaces on either side of the box are nine-sixteenths of an inch in width. The same precision must be observed in the length of the bars, as it is of great importance to have them indiscriminately applicable to every box, and in case the joiner should exceed the spe-

cified dimensions of a box, the extra space must be thrown to its sides. At the back of each box a pane of glass should be fixed in a small rabbet, which may be covered with a half-inch door, hung with wire hinges, and fastened by a button. This rabbet should be as shallow as possible, or the bees will be apt to occupy it with a thin comb." After adjusting the bars a top is fitted to the hive with auger holes, or a hole cut three or four inches square, to admit the bees into a super if desired; the top is secured by screws, so as to be removed at pleasure.

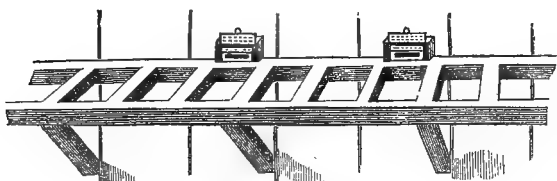
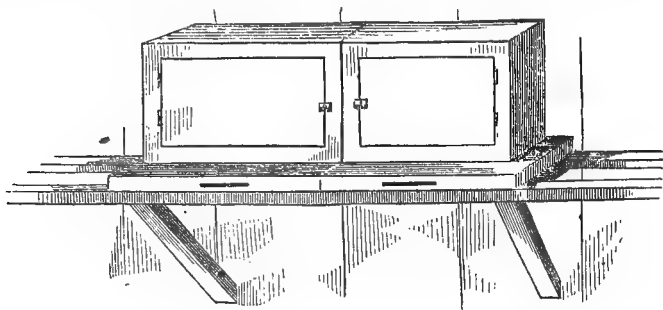
COLLATERAL HIVES.

Collateral Hives have never been used to any great extent in this country. Mr. Nutt, a resident of England, (I think,) and a gentleman that has paid a good deal of attention to bee-keeping, is very much in favor of this system. But Dr. Bevan, Mr. Dunbar, and others, do not consider it the best hive in use by any means.

Jones' Multiplying and Dividing Hive is a little similar to this hive of Mr. Nutt's in its construction, though not like it, as Mr. Nutt's hive has no chamber for small boxes, while Jones' has. The adjoining sides are different also; those of Mr. Nutt's are composed of half-inch boards, with two or three horizontal openings for communications, while those of Jones' hive are composed of cross-bars, some two inches wide, and about the same distance apart, affording a freer communication between the boxes. A large number of Jones' hives were disposed of in the State of Ohio, some five years since, and many beekeepers lost nearly every family of bees they put into them. They followed the directions given by the agent, and divided their stock several times during the season, and before the next spring nearly every bee was dead. By dividing so often, the families were small and weak, and the moths destroyed most of them before winter, and the remainder generally died with hunger during winter.

The hives of Mr. Nutt are not intended for increasing or multiplying the stocks, but to obtain honey. This I do not consider a very profitable way of managing bees, for I believe there is as much to be realized from the increase of families, as there is from the honey they produce, though there are persons so situated that they prefer not to in-

crease their number of hives, but keep a colony or two, just for the pleasure of it, and obtain what honey they consume in their own families.



NUTT'S COLLATERAL HIVE.

The annexed cut is a view of the boxes joined together on the stand, as used generally; they are held together at the rear by butts, and in front by a hook and staple made of wire. The lower cut represents a frame-work for the hives to stand upon, instead of a board.

The boxes are usually ten or eleven inches square in the clear, and eight or nine inches high, with a pane of glass in each, covered by a door, hinged and buttoned, as seen in the engraving.

One of the boxes is kept as the permanent residence of the family, and is not disturbed. The other is removed as often as filled, and an empty one set in the place of it.

Dr. Bevan says, in the first place, the honey obtained by this system is not as pure as that produced by supering; and, secondly, that the harvest of honey they afford is by no means so abundant.

My hive is a combination of the collateral and storifying, or supering, united, and combines all the advantages of both these systems,

while it remedies their defects. It also combines several other important principles—placing the bees completely under the observation and control of the keeper, in all their various operations.

MINER'S EQUILATERAL CROSS-BAR HIVE.

I am frequently asked the question if I have ever seen this hive of which Mr. M. is making so much ado about; and as I think it will probably gratify the curiosity of some, I will endeavor to give a fair and correct description of it, which I think I can do in a very few words.

The hive is *equilateral*, (signifying of equal dimensions on all its sides.) The main body of the hive is twelve inches square in the clear, and is surmounted with a super for obtaining surplus honey.

The *great* advantages Mr. M. claims for this hive over all others are, first, its simplicity; second, the advantages of the *cross-bars*. These cross-bars (as Mr. Bevan terms them in his hive) are to guide the bees in the construction of their combs, that they may be parallel, and more uniform in their thickness, affording a greater amount of brood-combs. Mr. M. contends, that if the bees are left to their own judgment and instinct in their comb-building, they will unwisely construct them in all manner of zig-zag forms and thickness, without regard to the wants of their queen, and the welfare of the family, and the consequence will be that there will be but a small amount of combs constructed suitable for the queen to deposit her eggs in, and she will therefore be curtailed in her laying, and hence, not as many young bees will be produced, as if she were supplied with combs suited to her wants. According to this reasoning, it would appear, that unlike all other productions of the Great Architect, the bee came forth from its Maker imperfect in its instinct and habits, and is dependent on man to guide and direct her in her various operations. But it is evident, I think, from the course she has pursued since her creation to the present time, that she does not necessarily need the wisdom of man to direct and guide her in the constructions of her combs, or in any of the various avocations of the hive.

Mr. M., however, in his Manual, admits, (or says) that "*not all the art and genius of man can teach her one jot or tittle of knowledge.*" "Nor

does she need man's wisdom," and that she "*stands forth perfect in every work.*" And I agree with him, and verily believe that she is fully competent (if put into suitable hives) to go on and construct just such combs as instinct teaches her are best adapted to her wants, (and I think I have heard it said that "*instinct is never at fault.*")

Yet, after all that has been said, I think that if some plan could be adopted (and it can) that would induce the bees to build their combs more uniformly and straight, it would be no injury to the prosperity of the colony, but an advantage, in some respects. But that the whole success of bee-keeping depends upon the bees building their combs "*parallel, and uniform,*" and that they will not do this without having cross-bar hives to do it in, I think is carrying the joke a little too far, for we all know that bees have prospered and done well when taken care of, without these fixtures. I am convinced, however, that the better accommodations the bees are supplied with, the more profitable and prosperous they will prove. But that everything depends upon one little *item*, (and this something new,) I do not believe. Others may form their opinion, and act accordingly.

The bars to this hive are attached similar to those in Dr. Bevan's, which has already been described. Mr. M., I understand, besmears the under edges of the bars with melted wax, which induces the bees to follow them in constructing their combs. He also uses a plate or sheet of thick paper with portions of it cut out the thickness of the combs, and the distance apart the combs are required. This he lays on the inside of the top the same as a miller brands his barrels, or a merchant boxes of goods, and then with a sponge or brush dipped in melted bees-wax, he puts on the wax where it is desired to have the bees attach their combs.

In cutting the guide-plate, it will be necessary to be very particular to lay off the distances between the combs where they will be needed. The outside space should be left a little broader than the others, unless the hive is of suitable size to have all the spaces equal. The best way is to commence at the middle of the plate to lay off the spaces, and if there is any surplus room throw it at the outside of the hive, for the bees generally build these combs thicker than the centre ones, and use them for storing honey.

The spaces cut out for the combs should be a trifle over three-fourths of an inch, as near four-fifths as possible, and the bars left in the plate which is the space between the combs three-eighths of an inch. These, I believe, are all the peculiarities that this hive possesses. It is got up in an ornamental style, and makes a better appearance than the common hive, though any chamber hive may be ornamented as well as this, and make just as good appearance. Mr. M. thinks that it is superior to any other hive, and better adapted to the wants of the bee, both in size and shape. But bee-keepers do not agree on this any more than on other points. I am confident that some colonies require a larger amount of room than others, and that if it is afforded them, and is easy of access, they will produce more honey than if they were compelled for want of room to cluster on the outside of the hive. This hive I consider defective on this point, the same as every other hive of this form. It affords the bees just such an amount of room whether there be many or few, with no means to increase or diminish it to correspond to their actual wants.

CHAPTER X.

FORMATION OF SWARMS.

THE season of swarming is one of excitement and interest to the apiarian. And the causes that tend to produce this result may be considered various, and much veiled in mystery; for while one cause appears to have a marked effect on one colony in hurrying off a swarm, the same cause does not appear to influence another colony in the least. The crowded state of the hives, together with hot and sultry weather, are generally considered symptoms of swarming. Yet both of these combined often fail to produce the result anticipated; for it is well known that bees will cluster out in large quantities, sometimes for weeks, during the swarming season. and not swarm at

all; while, on the other hand, they will in *some* instances swarm, notwithstanding room be given them far exceeding their wants (though these instances are rare). I am knowing of one particular instance of a colony that occupied a bee-house for twelve years, without swarming, but on the thirteenth threw off a swarm.

Some apiarians consider it natural for bees to swarm, and that any device or arrangement tending to prevent this, is ruinous to the bees; and consequently they condemn all non-swarving hives, without judge or jury. That it is natural for bees to swarm, without regard to causes, I am not prepared to admit. They appear to me to be governed more by instinct and reason, or by *instinctive reason*; for if a swarm be put into a large box or room, affording a large supply of surplus food, we find that, in nineteen cases out of twenty, they will not swarm for years, although every means is afforded them to swarm that there would be if in a hive one foot square. Now they have a very good reason for not swarming, viz., they have all the room necessary, and that is all they desire. But put a swarm into a hive one foot square, and the result will be very unlike the other; for in the latter case, in all probability, the colony will throw off a swarm every season; and the *reason* is a good one: the hive did not afford sufficient room to accommodate the whole population, hence the necessity of a portion of the family emigrating. But as previously stated, there are *extreme* cases, when neither of the above causes, and others combined, are sufficient to produce the result.

Notwithstanding what has already been said on the subject, it is evident, I think, that the prime or moving cause of emigration is, the crowded state of the hive, produced by the wonderful fruitfulness of the queen. There are other causes, however, that are subservient to this, and are made to operate in favor of the desired results. The amount of brood produced by a single queen during a season is almost incredible; for if we examine a stock hive on the first of February, it will be found generally to contain not more than three or four thousand bees (and often less); yet this same hive will, during the month of June, throw off a swarm containing in numbers from twelve thousand to twenty-five thousand, and in some instances to even thirty thousand, and not unfrequently will a second swarm issue

of some eight thousand or ten thousand more, still leaving a population in the hive, on the first of September, of double the number it contained on the first of February.

Now, supposing they throw off but one swarm, and that should contain twenty thousand bees; and the addition to the old stock amounts to four thousand more, making an increase of twenty-four thousand in five months, this would make the average number per day about one hundred and sixty; but as a much less number of eggs are laid in the months of February and March, than in April and May, it would readily appear that the queen must, during these months, produce some two hundred or three hundred eggs daily.

After the queen has finished her principal laying of worker eggs, she increases in size and moves sluggishly, when she commences laying drone eggs in cells prepared for their reception; she generally lays drone eggs for three or four weeks. About the commencement of the third week the workers prepare the *royal cells*, from three to ten in number, in which the queen deposits eggs at intervals of a few days, so as to mature at the time they would be required, in case more than one swarm should issue. These young queens are never permitted to leave their cells, (except in extreme cases of foul weather,) until the first swarm has left, which *in all cases is led off by the old queen*. If, on account of unfavorable weather, swarming is deferred beyond the time anticipated by the bees, the young queens are not permitted to emerge from their cells, but are guarded and held prisoners and fed by the workers until the old queen leaves with a swarm. If, however, the unfavorable weather should continue for several successive days, the young queen in some instances becomes impatient, and will burst from her cell, when she soon falls a victim to her mother's wrath, for there is such a deadly hatred implanted in the mother queen, that she will, if permitted, eagerly devour her own offspring. This, I think, probably is the cause why in some instances hives that are filled with bees to overflowing, do not swarm. Many have entertained doubts as to the certainty of the old queen's *invariably* leaving the parent hive with first swarms. I would say to any one who doubts this, to examine the combs in the hive of a first swarm on the second or third day after it has taken possession of a hive, and they may be assured

that they will invariably find eggs in them, which certainly could not be the case if it was accompanied by a young queen. I have found eggs in the cells on the second day after the swarm entered the hive. Or let the old colony be suffocated immediately after the first swarm leaves the hive, and there can no *matured* queen be found. I have on several occasions taken the bees out of the hive on the second day after a first swarm had left it, and in no case did it possess an old queen, but in every instance from one to five queens in an embryo state. It is not unusual for a first swarm to produce young bees in twenty-two or twenty-three days after being hived. I have myself had ocular demonstration of it in my own hives. In my estimate on the number of bees produced by a single queen during a season, I have put the number higher than some authors, but I think they will be found to be very near the mark in most instances. It is true that different stocks vary materially in the amount of bees produced during a season. Some queens will produce fully double the amount that others will. I have also estimated the numbers in a first swarm larger than Mr. Miner and some others. But the number remaining in the parent hive after swarming, I have put at less. I have made my estimates from observation. I have in a large number of instances driven the old stock from their hive a few days after they had thrown off a swarm, and have always found that there were not more than one third as many bees remaining as had left with the swarm. And I have been able to judge pretty correctly as to their numbers, as in both instances the bees were in my hives, that afforded an opportunity to see what amount there was in each.

Dr. Bevan remarks, that "the laying of drone eggs, which is called the great laying, usually commences at the end of April or the beginning of May; that there seems to be a secret relation between the production of these eggs, and the construction of royal cells; for regularly on the 20th or 21st day, (if at all), royal cells are founded. *About the time when the larvæ hatched from the eggs laid by the queen, in the royal cells, are ready to be transformed to nymphs, (sometimes sooner, sometimes later, depending on circumstances,) this queen generally leaves the hive, conducting a swarm along with her.*"

As has been stated, a first swarm is always led off by the old

queen; and Huber remarks, that this is a wise provision of nature, for, being the strongest, she would never fail to overthrow the younger competitors for the throne, near which "the jealous Semiramis of the hive will bear no rival." Dr. Bevan observes, that the queen having finished her laying of male eggs, and her deposition of female eggs, in the royal cells, prior to leaving the old hive, is ready to commence in the new one with the laying of worker eggs; workers being first needed in order to secure the continuance and prosperity of the newly-founded commonwealth. The bees that remain in the old hive have been supposed to guard with peculiar care the royal cells, in order to prevent the young queens, successively hatched, from leaving them, except at intervals of several days from each departure of a swarm, or at the moment of swarming. The *law of primogeniture* is always strictly observed towards these royal insects, "the first-born, or princess royal, being always selected to assume the sovereignty over the new colony, or if vacant, to occupy the throne in its native home; and so on with respect to the third and fourth, or whatever number may issue. Then after swarms, however, particularly the later ones, are often accompanied by more than one princess, several of them frequently obtaining their liberty at the same time, owing, in all probability, to the guards no longer keeping a strict watch over them, in consequence of the bustle of swarming. In these cases, the victorious in conflict assumes the sovereignty over the new colony."

According to Huber, *the queen ordinarily lays about twelve thousand eggs in two months*; one impregnation serving for the whole complement of eggs, of every description, which she lays during two years at least. Reaumer states the number of eggs laid by a queen in two months at double the number that Huber did. Schirach says that a queen will lay from seventy thousand to one hundred thousand in a season; and it is my opinion that *some* queens do produce that amount of eggs in a favorable season.

The testimony of Huber, Bevan, and several other naturalists and apiarians, goes to prove that if the impregnation of the queen is by any means retarded beyond the twenty-first day of her life, instead of laying worker and drone eggs, as is usually the case, she commences laying drone eggs on the 45th hour, and lays no other during her life-time.

CHAPTER XI.

SYMPTOMS PRIOR TO SWARMING.

CLUSTERING on the outside of the hive is generally considered a symptom of swarming; though, taken singly, it cannot be regarded as a very sure sign that a swarm will issue immediately; this, however, indicates that there are a sufficient quantity of bees to admit of a swarm's issuing; and if attended with other symptoms, may be considered as a pretty sure indication that a swarm will soon be thrown off. On the day, or day before swarming, the bees are generally less active, and are not seen gathering honey and farina, as usual; and those that return from the fields loaded with farina, do not immediately enter the hive, as is their usual practice, but cluster outside with their loads, ready to emigrate at a moment's warning. Large numbers may also be seen sporting in the air, about the hive, during the middle of the day, or from eleven to twelve o'clock; also when drones are seen in the crowd outside of the hive, this may be considered as additional evidence—as a preparation on the part of the bees for emigrating soon. Yet, with all these symptoms combined, bees will not unfrequently cluster in great numbers, for several weeks in succession, and not swarm at all; for if preparation for raising a young sovereign has not been made, no inducement whatever will persuade them to emigrate. I have known of an instance where a colony have gone so far in making preparations for swarming, as to select a tenement in a hollow tree, and labored for several weeks in clearing it out, and finally did not swarm that season; but, on the ensuing spring, about the tenth of May, they again were seen busily engaged in the same tree, making preparations, and in the latter part of the month a swarm was thrown off, when they proceeded directly to the tree, and entered it, notwithstanding water and dirt were thrown on them, and every effort made to prevent them from leaving the apiary.

About the first of May, in the spring of 1851, I sold a gentleman one of my hives, for which I was to receive in pay two stocks of bees, in the old common square hive. The agreement was, that out of his

apiary of twelve hives, I was to have the privilege of selecting one, and he one. He selected, as a matter of course, the weakest and lightest hive in the apiary, which was a swarm of the previous year, and had not filled the hive, (which was not a large one,) but a little more than half full of combs. I selected the heaviest and most populous stock he had, which was only two years old, very heavy, and then overflowing with bees. I brought them home without injury, and placed the hives side by side in my apiary, and by the twentieth of May the strongest colony were clustering out in quantities sufficient to swarm. At this time the little swarm had not near filled their hive with comb or bees, but were doing as well as could be expected. Both continued to increase in numbers; the large colony clustering nearly sufficient to completely cover the hive, and all idle—as the hive on the first of May was filled with combs, and these pretty well stored with honey. On the twenty-second of June, the small swarm had filled their hive, and thrown off a fine swarm, which I saved. Five days after, I drove or transferred the parent stock into one of my hives, at which time they had no matured queen, but three in their cells in an embryo state, which I placed in the new hive, with pieces of the brood-combs adjoining the royal brood; these were hatched in a few days, and the colony immediately commenced their labors, to all appearances as well as a swarm that had been thrown off in the usual way. The old colony, in the other hive, still continued to cluster out in a mass sufficient to fill a half-bushel, or nearly so. I bore with them until the first week in July, when I transferred them into another of my hives, and on examining the old combs, not the least preparation had been made for raising a young queen, as no royal cells had even been commenced. Instances similar to the foregoing have probably fallen under the observation of most every bee-keeper, and it is not a little perplexing to the apiarian to be trifled with in this way, day after day, and week after week, and his bees not swarm after all. In my hives, if the bees do not feel inclined to swarm immediately after they have filled two of the large boxes, I open the communication to the third, so as to let them have sufficient room to labor to advantage. In this way I manage to get much more honey than from the common hive, and without injury to the colony.

SYMPTOMS PRIOR TO A SECOND SWARM.

The most distinctive symptom of a second swarm issuing, is a singular noise made by the queen, called *piping*; this continues generally for two or three days and nights in succession; it may be heard at intervals at the distance of several feet from the hive, if particular attention be paid to notice it; frequently the voices of two or more queens may be heard at the same time, though differing in tone. The following extract is from Dr. Bevan's work, and is from the observations of Mr. Golding. Mr. G. says: "On the 7th of June a first swarm issued from one of his hives; on the 14th *piping* commenced, two days sooner than it is usually heard; but what appeared still more singular, the piping was not in a clear and plaintive, but in a short, hoarse key. Nevertheless, the notes proceeded from a senior princess; this unusual cadence being found to arise from her piping before she had obtained her liberty. After it had continued for two days, she emerged from her cell, when the hoarse notes immediately gave place to the plaintive ones. Soon afterwards another princess hoarsely responded; they piped together for the usual term of three days, the notes of each being marked throughout by the usual distinctive intonation. The first piping was manifestly premature, but it clearly shows the cause of different sounds that usually precede an after-swarm. The queen that is at liberty, when piping, stands, or rather squats, and exhibits a tremulous motion with her body and wings, the latter moving slowly in a horizontal direction; the motion resembles the working of a pair of bellows with their edges held vertically. On the first day the sound which she utters is rather indistinct, on the second it becomes clearer and louder; it is long and plaintive, particularly the starting note, and is repeated five, six, or more times in succession, in a clear, shrill key, but becomes shorter and shorter each time. The note of the imprisoned princess, which generally commences on the second day, is hoarse, dull, and short throughout."

This piping generally commences in seven or nine days (though in some instances a few days later) after the first swarm has left the hive, and often continues for a period of two or three days; if the

weather is favorable, a swarm may be expected on the tenth or eleventh day. It is but very seldom that a swarm does not issue on the third day after the piping commences, and in such cases a swarm may be expected, though the weather should not be very favorable. Unless this voice can be heard about the period before stated, no after-swarms will issue.

The *rationale* of this theory lies simply here: The first swarm generally issues about the time the queen cells are sealed over, which usually occurs on the eighth day after the eggs are deposited in it; in about eight days more the queen is matured, at which time piping generally commences, if a second swarm is to issue, and within three days from that time a second swarm may be expected, and occasionally when a plurality of queens mature at, or about the same time, a third swarm will issue in the course of three days from the second. I find it best to return third swarms to the parent hive; or, in case they have occupied it for three or four years, I hive the new swarm in a suitable hive, and about sunset of the same day, I unite the old stock with the swarm. See chapter on Reunion of Swarms.

CHAPTER XII.

HIVING SWARMS.

THIS branch of bee culture is generally better understood than many other things connected with bee-keeping. Yet, in hiving swarms, hardly two persons can be found that operate exactly alike in all respects. While some adhere to the ancient custom of ringing bells and drumming on pans and kettles, at the time of swarming, to induce the bees to settle, others resort to no such means, and consider it entirely useless: and I am of opinion that it does no good at all. In case a swarm seem determined to go off, throwing water, or dirt, and gravel among them, frequently has a more favorable effect, to induce them to settle, than anything else. I have known of many a swarm

being arrested by this means, by persons at work in corn-fields. But when a swarm has a place of residence selected, prior to leaving the parent hive, (and one with which they are satisfied,) it is very difficult to induce them to abandon their purpose, and be contented to remain in a hive even should they be hived; for they will occasionally leave a hive in such cases, even after remaining in it for two or three days, and constructing combs the size of a person's hand. If, however, good clean hives of suitable dimensions, well ventilated, are provided, and kept well protected from the rays of the sun at the time of hiving, and for several days afterwards, there will be but little danger of swarms leaving after being introduced into such hives.

PREPARATION OF HIVES FOR THE RECEPTION OF SWARMS.

Various are the opinions of bee-keepers in regard to the best materials to be used in washing or rubbing hives, previous to hiving bees in: some use one thing and others another; but I am satisfied that it makes but a little difference what is used, provided the hive is perfectly clean to commence with. If the hive is an old one that bees have formerly occupied, it should be thoroughly scalded, to destroy the larvæ of moths or other insects. If a new, clean hive, a little salt and cold water, to cool the hive, or a little honey and water, or salt and water, sweetened with either honey, molasses, or sugar; these ingredients may be applied to the hive with a sponge, or, as some prefer, peach leaves, others hickory, others clover, and others bee-balm; the latter is, I am satisfied, preferable to either of the others. I generally use a table for the hive to stand upon, spread a cloth or cover over it, and place two sticks of wood near the centre for the hive to stand upon; these may be two or three inches in diameter; these raise the hive from the cloth and give the bees free access into the hive, and also admit a free circulation of air under the hive, which facilitates the bees entering it, and renders them less liable to leave the hive. Should they be disposed to cluster on the outside the hive, sprinkle them lightly with cold water, and with a dust brush or a fowl's wing, brush them gently down towards the bottom of the hive, and by repeating this operation two or three times they will usually all enter.

CHAPTER XIII.

ARTIFICIAL CLUSTERING SHRUBS OR BUSHES.

ARTIFICIAL clustering shrubs may be found very beneficial by any one who will take the trouble to prepare them, either when small shrubbery and trees are plenty, or in an apiary destitute of them: small pine or cedar shrubs six or 8 feet in height, or boughs of these may be tied to the tops of poles of about the same length; set these up around the apiary at two or three rods apart, or what is still better, take the *seed-ends* of mullen-stalks about a dozen in number, and tie these to the tops of poles as before stated; the poles should be set in the ground so as to be easily taken up after the bees have settled on them; by managing in this manner, the hive may be set in the apiary, before hiving, and the bees may be carried on the pole and laid by the side of the hive, when they will enter it; this saves the trouble of moving the hive after hiving, and consequently no bees will be lost. The mullen tops should be attached to the poles so as to lie nearly horizontally. What there is in the mullen stalks so attracting to the bees I know not, unless it is their rough, uneven surface, which affords the bees security against falling; old dry weather-beaten stalks are as good as any.

CHAPTER XIV.

HIVER.

WHEN an apiary is situated near large trees, a hiver will be found very convenient in many instances, when swarms settle on trees so high as to be out of reach, when standing on a chair or stool. It may be made in either of the following forms, and at trifling expense. 1st. Take two pieces of thin light boards eighteen or twenty inches long,

and ten or twelve inches wide, nail them together similar to a mason's hod (for carrying mortar); several auger holes of about one inch in diameter should be bored in each. A forked shank made of half-inch iron should be fastened to the sides with small screws, the shank extending some eight inches to secure it to a handle. Handles of different length may be made to fit the shank, or the handle may be lengthened by means of ferrule joints to any reasonable length. Another form is made merely by attaching the third piece of board to the former, in the shape of a triangle, leaving both ends open; this may be used to advantage when swarms settle in the forks of trees, or on the body, where they cannot be shaken off. Place the hiver by the side of the swarm so as to touch them, and by agitating them a trifle, they will soon enter it through the auger holes, when they may be taken down and shook out upon a cloth, and a hive placed over them.

Another form of hiver is made of four strips of plastering lath, three or four feet in length, (or strips of board of equal size.) Nail these together at their ends, forming a square framework. Stretch a piece of cloth over the frame, and secure it with tacks. Pieces of cord, three or four feet in length, should then be fastened to each corner of the frame, and the other end of the cords fastened to the end of a pole for a handle. This makes a light convenient platform to shake the bees on to when they chance to settle on limbs of fruit trees, so high as to be out of reach, and such as would injure the tree to sever the limb. The handle, as before stated, may be lengthened to suit circumstances; the bees, after being lodged on the cloth, may be carried and placed on a table, or any other place desired. Care in all cases should be taken to protect the hive from the rays of the sun, and keep the bees as cool as possible.

CHAPTER XV.

DIFFERENT SWARMS UNITING.

In an apiary of a large number of hives, different swarms issuing at the same time will be very likely to unite and settle on the same

branch, and even when a swarm has issued, and the bees have nearly all entered their new habitation, another swarm coming out at that time will often unite with them, and another a half hour after will follow the former, and I have frequently known three or four swarms to congregate in this way, producing nearly a bushel of bees. In large apiaries swarms are very likely to congregate, as I have stated, and hence it is very necessary that everything should be in readiness, and a swarm hived as soon as possible. If the bees are backward about entering their hive, sprinkle them a little with cold water, this will hurry them in. The bees also that are expected to issue, may be dampened a little, which may retard their swarming a few moments until the others are secured. When a swarm has issued and the bees have not all entered the hive, and a second issue commences, the former may be covered with a sheet so as to prevent the latter joining them. If artificial clustering poles are used, as soon as all, or nearly all the bees have settled, they may be carried immediately into a dark room, and a hive placed over them, when they will enter as well as in the light. An extensive apiarian informed me that he adopted this plan. He had constructed a room expressly for the purpose, and as soon as a swarm had settled, he immediately carried it into the room, and placed it by a hive, and when the second had settled he took that there also, and that he had frequently had half a dozen in the room at the same time, but being in the dark they did not fly or mix at all, but would soon enter their hives, when they were removed to their allotted place in the apiary.

CHAPTER XVI.

UNITING SECOND OR WEAK SWARMS.

Two or more swarms may be united without difficulty; and it is generally better to put two, and in some instances, even three late weak swarms together, than in separate hives. The best and most convenient time to accomplish this union is at the time

the swarms issue. If two or three swarms issue on the same day, they may all be put together at that time. If one swarm should be hived before the second comes off, take the second and shake it down by the side of the hive containing the first, and they will immediately join those in the hive. Should a third come off the same day, before the hive is placed on the stand, this may be hived the same as the second. When the second does not come off until a day or two (or more) after the first, the best way will be to hive it in a common square hive, and in the evening following, spread a cloth upon the ground, lay a small stick of wood upon it near the centre: bring the hive containing the first swarm and set it upon the cloth with one side upon the stick of wood, so as to afford the bees a convenient entrance into it, when shaken from the other hive; then place a small piece of board on the cloth, eight or ten inches from the hive, then bring the hive containing the second swarm, and give it a good smart jar upon the board, which will usually dislodge nearly every bee at the first effort. If however, a few bees should still cling to the hive, they may be brushed out with a wing, or even with a twig containing leaves, or the hive may be placed on its side with the bottom near the other hive, when the bees will soon leave it and unite with the others. If it should be desirable to add a third swarm, they may be hived in the same manner. After the bees have all entered the hive, it should be placed in its former position before the bees commence flying the next morning. Smoking the bees a trifle with burning linen or cotton rags, at the time of hiving, I think, is advantageous, as it prevents them from distinguishing the bees of the new swarm from those of their own, and they unite readily without quarrelling. One of the queens will of course be destroyed, though in some instances not until several days or weeks afterwards.

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CHAPTER XVII.

REUNION OF THE PARENT STOCK WITH A SECOND OR THIRD SWARM.

WHEN an old stock hive, that has been occupied by the bees for three or more years, and the combs have become thick and unfit for breeding, throws off a second or third swarm, and thereby becomes weak, they should be reunited to the last issue, as neither will usually be worth anything if permitted to remain separate. This reunion may be accomplished in the following manner. Hive the swarm as usual, and at sunset of the same day, after smoking the old colony slightly with burning cloth, remove it a short distance from its location, and set the hive containing the new swarm where the old one formerly stood; turn the old hive upside down, with the bottom off and drum smartly on its sides, with sticks about the size of flour-barrel hoops; the bees will soon commence leaving, and return to their former alighting place, and enter the hive with the new swarm. If some burning rags are kept around the hive during the operation, the bees will not be as likely to show fight, and will leave the hive more readily.

If it is late in the season, they may require feeding; this should be done during the month of October or November. In uniting the old colony with the swarm, considerable honey is frequently obtained from the old hive, and the bees introduced into a hive with new and healthy combs, and a good colony obtained from the two weak ones, that in all probability would not have survived the winter, had they not been united.

CHAPTER XVIII.

EQUALIZING COLONIES.

IN case one hive contain a superabundance of bees, and the stock in another have become weak, in consequence of throwing off two or more swarms, or any other cause, an equalization may be effected very easily, and benefit the weaker colony very much, while it will not prove the least detrimental to the other. All that is necessary to be done is to change places with the hives; if the bees should be clustering on the outside of the hive of the strong colony, remove it a short distance (say twenty-five or thirty feet) from its former position; set the other hive where it stood, then brush the surplus bees from the former on to a cloth, and set the hive in the place where the other was removed from; the bees that are left on the cloth will immediately return to their former alighting place, and enter with the weak colony; and for several days following many of the bees that sally forth to the fields from the strong colony, will return to the place of their former residence, and unite with the weaker one.

SWARMS CONSIST OF BEES OF ALL AGES.

Many persons (and bee-keepers, too,) are of opinion that swarms are composed entirely of young bees, and that those that remain in the parent hive are bees of the previous year, but this is a mistaken idea; swarms are composed of a mixture of old and young bees, and are led off by the old queen. They appear to issue forth at the time of swarming, without regard to age, leaving also a mixture of all ages in the parent hive. A majority of course, in both families, are young bees, as four-fifths of the whole population is produced every spring.

CHAPTER XIX.

THE CONVERSION OF THE EGG OR LARVA OF A WORKER TO A QUEEN.

THAT the bees do possess the power, when deprived of their queen, of supplying the deficiency by converting the larva of a worker into a queen, is a fact at this day well known by all scientific apiarians at least.

Schirach has the honor of first making this discovery, though in the first instance accidentally, as we might say. He having used smoke pretty freely in some of his experiments, which compelled a quantity of the bees to leave the hive, and among them the queen. Knowing that she had left, and the sad consequences that he supposed would follow if she were not returned, he sought diligently for her, but without success. Next morning he noticed a small cluster of bees near the hive that the queen had left, and among them he discovered the queen; he carried her to the hive, when she was surrounded by the bees in such a manner as satisfied him that she was their sovereign. And he says, "What was my astonishment when, wishing to introduce her among the combs, I saw the bees remaining, had already planned, and almost finished three royal cells. Struck with the activity and sagacity of these creatures to save themselves from impending destruction, I was filled with admiration, and adored the infinite goodness of God in the care taken to perpetuate his works. Having carried away two of the cells, to ascertain whether the bees would continue their operations, I beheld next morning, with the utmost surprise, that they had removed all the food from around the third worm left behind, on purpose to prevent its conversion to a queen."

Similar experiments have since been made by Huber, and a host of other apiarians, and followed by similar results, and the fact is now established with all scientific apiarians beyond the possibility of a doubt.

The process adopted by the bees in producing artificial queens is

the same as that of natural ones; all the difference there is in the operation is, the cells of the natural queens are formed before the eggs are deposited in them; while the eggs, from which the artificial queens are produced, are deposited in common worker cells, being the same kind of egg that is deposited in a royal cell, all that is required to make a queen of the worker egg is a more capacious cell and a different kind of food.

The manner of converting a worker egg or larva into a queen is as follows. As soon as the bees have ascertained that they are destitute of a queen, or in a few hours after, they commence cutting away three or four of the cells adjoining the one containing the larva they have selected for a queen, and construct a royal cell of the contents of the demolished ones. Usually from three to six of these royal cells are commenced in different portions of the combs containing worker eggs or larvæ; the larvæ in these cells are now fed on different food from that fed to the workers, being the same as that fed to natural queens. This food changes the insect from a worker to a queen, producing a more perfect development of the female organs.

CHAPTER XX.

FORMATION OF ARTIFICIAL SWARMS.

ALTHOUGH the art of forming artificial swarms has been known for many years, yet but few apiarians have practised it to any extent. The whole sum and substance, and I may say secret of forming artificial swarms, lies simply in the fact, that the worker bees possess the power of converting a common worker egg (and even the larva, if it is less than four days old) into a queen at pleasure. This is a wise provision of nature, for did they not possess this power, many a colony of bees would become extinct that now survive many years.

Having previously explained the manner in which artificial queens are produced, which affords the basis of forming artificial swarms, I will now proceed to inform the bee-master how he may produce artificial swarms with very good results, provided he has a hive containing a

surplus number of bees, sufficient to constitute a family of medium size. The earlier in the season a swarm is formed the better, provided the colony from which the swarm is taken affords sufficient bees to constitute two colonies. Artificial swarms may, however, be formed as late as the 1st of July, from colonies that have not swarmed during the season, and that have a large surplus number of bees, generally clustering outside the hive. All that is necessary to be done is to prepare a good clean hive, and a piece of brood-comb, from some hive in the apiary, containing worker eggs, or larvæ less than four days old. The piece of comb should be not less than three or four inches square. Prepare some melted bees-wax, and with a sponge or small piece of cloth dipped in the melted wax, besmear the top of the hive near the centre, where the comb is to be attached, then with a sharp knife trim off the edge of the comb that formerly was uppermost, so as to have it fit the top of the hive; have a bar or some plate of iron with a smooth and even surface, heated, and place the edge of the comb against the iron, sufficient to melt it, and then quickly place it in the hive, with the melted edge in contact with the wax. If the melted wax and the comb are put in at the same time, before the wax hardens, so much the better, as it will unite the more firmly. It would be well also to insert one or two sticks through the hive, a short distance below the combs, to support the bees, as there would be less danger of the bees disuniting the comb from the hive, in clustering upon it.

The next thing to be done is to prepare for action. If the bee-keeper has not a regular bee dress, let him put a gauze veil over his face, making it secure against the entrance of bees, around his neck and face, and put on a thick pair of woollen mittens or gloves, tied tight around the wrists. If there are a large quantity of bees clustered on the sides of the hive, smoking them a trifle with burning rags will render them less irritable. The old hive should be taken up gently, and the new one immediately set in its place, and the old one carried a short distance from its former position, and if there should be any bees on the outside of it, let them be brushed off gently upon the ground or on a cloth, and the most of them will immediately return to the new hive. If, however, a majority remain in the old hive, turn

it bottom upwards, and with a small stick in each hand drum upon the sides of the hive, until a portion of the bees leave. The hive should then be placed upon the stand, at least ten or twelve feet from where it formerly stood. Considerable additions will be made to the new hive for several days, as many of the bees that issue forth from the old hive will return to the new. It would not be advisable to form artificial swarms later in the season than the first of July, and not even then, unless the old stock is a very populous one.

CHAPTER XXI.

MASSACRE OF DRONES.

THE usual massacre of drones takes place about the last of July or beginning of August, sometimes earlier and sometimes later, according to seasons and climate, generally not until after the swarming season has past, as they may then be regarded as of no further use to the colony, but, as Dr. Bevan observes, useless consumers of the fruits of others' labors. These massacres continue for several days, and I have many times watched the poor persecuted creatures, and could not but pity them, as they were harassed by the laborers, and were not allowed a moment's rest or a particle of food while in the hive. Some have supposed that their destruction has been effected by the sting of the workers; others that their wings are disabled, and others that it is through continued weariness and hunger; and, I think, from observation, that as many die of the latter as of either of the other causes, probably, a portion from each. Dr. Bevan says that at the time of this general massacre, not only all the drones that have undergone their full transformations, but every embryo, in whatever period of its existence, shares the same fate; the maxim of bees being to attend to the general welfare of the community, and to allow none to eat that are not useful in some way.

CHAPTER XXII.

DRIVING OR DISLODGING BEES.

EVERY bee-keeper should understand this branch of bee culture, as much benefit may be derived from it in many instances, in changing the bees from old hives to new ones. Various ways and means have been resorted to to accomplish the result. Some use water, others tobacco smoke, others fungus (or puff-ball), such as is found in our meadows, in the fall and spring.

I have used all of these means in several instances, but I have had the best success generally when I have used a little smoke of burning linen or cotton rags, in connection with drumming on the hive with rods. In using water it injures the honey, and there is more danger of destroying the bees. The best way to drive with water, (or the way that I have had the best success,) is to prepare a cask with one head out, a little longer than the hive, and large enough to receive it; have sufficient water in readiness to fill the cask, and after blowing a whiff or two of smoke under the hive containing the bees, bore a hole in the top of it and turn it upside down carefully, and set the other hive on the top of it, and immediately wind a cloth around the hives, at the joint where they connect, so as to entirely confine the bees, or there will be trouble in a short time, for if there is left an opening large enough for a bee to escape, he will find it, and so will others. Put a small quantity of water in the cask, and set the hives in it, commence pouring in water slowly; and at the same time drum smartly upon the lower hive with sticks. If the cask is too small to afford room to drum on the hive, it may be done for a few minutes before the hives are set in the cask. Pour in the water slowly, occupying some half hour in filling the cask. When the top hive is taken from the other, it should be set on the stand where the old one was taken from. Set the old hive a short distance from the apiary, and take off one side and remove the combs, brushing off the bees remaining among the combs, upon a cloth, and they will mostly revive and return to the hive on the stand. The best time to per-

form their operation is before sunrise. I will describe my other method, and bee-keepers may choose which they prefer.

In driving, I have in every instance drove the bees into my boxes, and the operation is as follows: First obtain a piece of board large enough to cover the bottom of the old hive, containing the bees you wish to drive; cut a hole in the centre of this, very nearly the size of the inside of one of the boxes: if you have no compass-saw to cut out this opening, split open the board, or take two pieces half the width, put their edges together, mark for the hole, and they may then be sawed with a hand-saw, and afterwards united and secured together by nailing a couple of thin cleets on the upper side, against the side of the box, so as to retain it in its place while driving the bees. Close the communications in the sides of the boxes with the dividers, and drive a small tack against the back edge, to prevent them from moving, so as to let the bees escape; close the opening in the front also with a piece of wood. Set one of the small boxes on the top, then drive a good size nail in the two opposite edges of the board this box stands on, and tie a cord from the nail over the top of the boxes, so as to secure them together firmly. See that the surface of the board the boxes are attached to is even and level, to fit the old hive; provide some rods the size of your finger, or pieces of flour-barrel hoops will answer. And also tools to take off the side of the old hive after the bees are out, and a long knife and pans to receive the combs and honey, as it will be necessary to remove them, unless the new hive can be set where the old one formerly stood. In this case the combs need not be taken from the old hive, but the hive taken to a dark room or cellar, and the remaining bees will leave and join their former companions. Commence the operation by blowing a few whiffs of smoke under the bees in the old hive, then turn it upside down carefully and place the box over it, and stopping every little crevice between the hive and box with rags, so as to secure every bee; and if a cord were put around the whole now, and tied securely, it would probably save trouble, as there is danger of the board being moved and let out the bees. (I always do this, as I find it the most safe way.) Now let a couple of persons, with a rod in each hand, commence striking smartly on the sides of the old hive, commencing near the bottom,

and working up gradually. A cloth should be covered over the boxes to exclude the light. When a majority of the bees have ascended into the upper boxes, (which may be known by removing the cloth,) raise the box a trifle, and blow a little smoke under the bottom, and set it quickly into the hive; at the same time have another person ready with another box, prepared to set over the old hive, and continue the drumming until you find nearly all the bees have ascended into the box, when it may be set into the hive. I prefer to remove the combs immediately from the old hive, so as to obtain a portion of the old combs that contain young brood and eggs, if possible; this I cut in pieces to fit the small boxes on top of the large ones, and after sliding out the glass, I set these pieces in, leaving a space between them, and by cutting small strips and inserting between the combs, they may be retained in that position until the bees attach them with wax. By adopting the above method, I have found that the bees are not liable to leave the hive after driving, as they will immediately ascend to these brood-combs, and nurse and take care of the young brood, and appear much more contented than if robbed of them entirely.

I have driven swarms in May, and taken fifty lbs. of surplus honey from them the same season, and left a good supply for winter use.

A gentleman in Ohio informs me that he drove a swarm from an old hive into one of mine, on the evening of the 18th of May, 1852, and it swarmed twice during the season, and procured sufficient honey to sustain them through the winter.

I have drove bees at different seasons, and I find that the earlier they are drove the better; I would, however, not recommend driving earlier than the first of April, and then they will require feeding until fruit-trees blossom.

As a general thing, bees that are driven the first of May, will swarm as early as those that are not, and often prove more healthy and prosperous, and produce a larger amount of honey.

CHAPTER XXIII.

SPRING MANAGEMENT.

THE prosperity of the bees during summer depends very much upon the attention they receive in the spring. A small amount of labor bestowed upon an apiary at this time will be well rewarded during the season by the production of early swarms, and amount of surplus honey produced. During the month of March, or as soon as the snow has disappeared—and the weather will admit of the bees going abroad, (some seasons earlier, some later, and earlier in a southern than a northern climate,) the hives should be arranged for the season, as it is an injury to the bees to be removed after they have commenced their labors in the spring, and become accustomed to the location of the hive; as by so doing many will be lost. The floors should be cleaned of all filth and insects, and a little fine salt sprinkled under the edges of the hive, and the hives set down upon their floors, and if any additional amount of ventilation has been afforded during winter, it may now be dispensed with, leaving a small aperture either at the rear or bottom of the hive, sufficient to admit a small amount of ventilation, but not large enough for the ingress and egress of the bees. It is during March and April, and in some seasons until the middle of May, that the bees require all the *heat* in the hive that they can possibly generate, to develop and mature the young brood, and the warmer the interior of the hive is kept at this season of the year, the earlier swarms will be thrown off. Each hive should be examined also as to the amount of honey it contains, and those colonies having but a scanty supply of honey should be fed immediately, both to preserve the lives of the bees, and invigorate and encourage them. And even strong and populous colonies that have sufficient honey to sustain them, may be very much benefited by feeding a trifle, as it encourages the queen to commence laying earlier in the season than she otherwise would, for she will never lay to any great extent until some means are provided for the support of the young brood.

The hives should be raised and examined daily, and all filth removed from their floors, and if it is done gently, it will soon cease to disturb the bees, and they will receive it as a favor, rather than otherwise, and will soon become so completely domesticated that they may be handled with perfect safety, and when they throw off a swarm, it will be far less liable to leave, than if formerly neglected. If the hives are well sheltered from north and west winds, and brought within the rays of the sun at this season, this will also conduce to their early swarming.

CHAPTER XXIV.

SUMMER MANAGEMENT.

DURING summer weeds and all vegetation should be kept clear from the hive; spider webs also should be cleared away, and the hives protected from storms. This also is the time for moths, that is, during July and August, and if the apiarian will occasionally at evening pass around his hives with a light he may destroy a great many millers that are lurking about the hives, much more successfully than during the day-time.

These millers are of a light gray color, and about half an inch in length, and rather slim—and are as spry as a weasel; it is utterly useless to attempt to catch or pick up one with the fingers, and the only effectual way to dispatch them is to put on an old mitten, and with the flat of the hand give them a sly and sudden slap; in this way a person after a little practice may succeed in destroying them with tolerable success. They may often be seen during the day-time about the outside of the hive, or in the joints, or between boards. If a dish of sweetened vinegar and water be placed near the hives during the night, a good many may be destroyed by this means, as they will be attracted to it by its flavor and fall into it, and will not be able to arise again. Many suppose that the miller will deposit her eggs in the joints or cracks on the outside the hive, but this is a mistake, unless

there is wax or propolis to deposit them in. The egg requires some nourishment to mature it, and instinct teaches the miller this, and this accounts for her anxiety to gain an entrance into the hive where she can have access to the wax and combs. The best and most effectual protection against the ravages of this insect are strong stocks, and hives that afford a small amount of unoccupied room.

CHAPTER XXV.

FALL MANAGEMENT.

ABOUT the first of September it is necessary to examine all the hives in the apiary, and those containing weak swarms, or such as do not fill their hives, should be set close upon their floors, and the entrance for the bees contracted so as to admit only one or two at a time. This will, in a great measure, prevent their being attacked by robbers. The weight of each hive should be ascertained, and if found to contain less than twenty lbs. of honey, they should be fed until that amount is made up. October is the month for feeding. The hives from this time till spring should be sheltered from the rays of the sun, and kept in as even a temperature as possible.

CHAPTER XXVI.

WINTERING BEES.

MUCH diversity of opinion exists among apiarians in regard to wintering bees, as well as on other points connected with bee culture. Some recommend burying them in the earth, some removing them into barns or other out-buildings, some into cellars, while others let them remain on the stand unprotected and exposed to all the various changes of the weather, during winter warmed and animated by the rays

of the sun by day, and chilled and benumbed by the severe frost of night. That bees will sometimes survive the winter, when properly buried, and consume but a small amount of honey, I will not deny; but in nine cases out of ten it will eventually prove their ruin, as the combs are *very* liable to mould, and in that case they are unfit for use. The same difficulty is liable to attend them when kept in cellars, unless it be a very dry cellar, and the hives well ventilated. If the apiary be an out-door one, the hives may be removed into an out-building, if it be a dry, unoccupied one; care, however, should be taken in supplying them with a suitable degree of ventilation, and protecting them against the attacks of mice. The common square hive may be ventilated in the following manner during winter, and while it secures the bees against vermin and all intruders, it confines them in the hive:—Take four strips of board, (hard wood is best) of such length as will form a hollow square or frame, just the size of the hive at the bottom. These pieces may be from one to one and a half inches wide, and about the same thickness. With a common hand-saw, saw across the pieces from the upper side down to within one-fourth of an inch of the lower side. The nearer together the slats are cut, the better, as it gives more ventilation. Place them under the edges of the hives, with the sawed side up. Hives ventilated in this manner, whether in a building or out, should be well enveloped in hay, straw, or something (some apiarians have adopted the plan of setting boxes over their hives) to entirely exclude the light, and keep the bees in as even temperature as possible. A box a few inches larger than the hives set over them answers a very good purpose, as they will remain much more quiet, and consume far less honey than when left exposed to all the various changes of a northern climate. If one or two holes be made in the top of the hive with a half-inch or three-quarter auger, and a small box set over it, it will be beneficial in affording a means for the vapor to escape, that is produced by the breath of the bees, especially if the colony be a populous one, as large colonies require a much greater amount of ventilation than a small one, on the same principle that mankind do. If we confine ten persons in a room say twelve feet square, it is plain to every one that they would require but one-tenth as much ventilation as one

hundred persons would in the same room. The same would be the case if one thousand persons were confined in a room one hundred feet square; it would be necessary that the room afford a good degree of fresh air, continually passing in at some suitable point, and also a passage for the impure air to escape. But if there were but one hundred persons in the same room, the same amount of ventilation that was absolutely necessary both for the *health* and *comfort* of the former, would be both uncomfortable and injurious to the latter, (that is, in very cold weather.) It is an old adage that "circumstances alter cases," and it is true in many points in the management of bees. There can be no precise theory adopted in *every* case, without regard to circumstances. I would, however, observe here, that in all cases weak families that do not fill the hive, require less ventilation, and to be kept warmer during winter than large and populous ones. Many strong, populous colonies perish every season, just for the want of a thorough ventilation of their hives. Many persons in the fall will set their hives close down upon the bottom, and no means afforded for the air to enter or escape, only where the bees enter. This often becomes closed, or nearly so, when the vapor or dampness arising from the breath of the bees condenses, often to such an extent as to run down in large quantities on the bottom of the hive, when it freezes and closes the entrance in some instances air tight, when the bees soon perish by suffocation: and even if they do not suffocate, they become so damp that they freeze. In conclusion, I would say that it will be safe for every bee-keeper to observe the following rules in wintering his bees:—1st. Keep the hives in a perfectly dry and dark place. 2d. See that they are well ventilated. 3d. That they are protected as much as possible from the extremes of heat and cold, consequently, where the rays of the sun cannot have any effect upon them.

Some bee-keepers are in the habit of setting their hives bottom upward, with a cloth tied over them to keep in the bees, and afford ventilation. Mr. Miner recommends this in his winter management. But this mode of wintering bees I disapprove of, in toto; and it appears to me that, upon a moment's reflection, every bee-keeper must agree with me, for every one knows that more or less bees die every winter in the hive; there are also often large quantities of filth, composed of

particles of combs, and other dirt, that accumulate in the hive during winter, and when the hives are set upside down, all this filth falls down among the combs, and will often mould and sour, and injure the combs very much.

CHAPTER XXVII.

FEEDING BEES.

FEEDING I consider a very important part of bee-management, although it has been almost entirely neglected by a large majority of bee-keepers; many, however, are devoting more attention to the subject than formerly, and when they have been enabled to manage so as to prevent robbing, they have been well repaid for their trouble. There is certainly a most decided advantage to be derived from feeding, in several respects.

1st. It enables the apiarian to winter his late and feeble swarms at a trifling expense, that, if taken up, would yield him but a small amount of honey, but when wintered over, often make as good stock hives as any.

2d. It frequently occurs that strong and populous colonies perish with hunger, during the months of March and April, that one half hour's attention and twenty-five cents worth of feed would have prevented.

3d. Colonies even that have *sufficient* honey to sustain them, are very much benefited by feeding a little during March and April, as it strengthens and encourages them, and as I have already stated, it induces the queen to commence laying earlier than she otherwise would.

4th. Colonies that are fed *early* in spring, will usually throw off swarms full two weeks earlier than those that are not. This I consider of much importance, as two weeks' time during the last of May and first of June, is worth almost as much to a swarm of bees, as all

the rest of the season. It also enables the old stock to produce a much larger amount of surplus honey after swarming, than they otherwise would; the swarms also have time to increase their numbers by breeding, and not only to provide sufficient honey for their own support, but often a surplus of from ten to twenty lbs.

Various plans and devices for feeding bees have been recommended and adopted by different apiarians. Some have recommended a large feeder, (or several of them in a large apiary,) placed near the hives, and all the bees fed at the same time. But I think whoever tries this wholesale feeding will be glad to abandon it, especially if he has any neighboring bees within two miles of his apiary. I know of several who have commenced feeding in this way, (as recommended by Mr. Gilmore, of Maine,) who not only were robbed of so large an amount of their feed, but they were obliged to stop feeding; but after they did stop, had their hives attacked by the bees that had been baited there by the feed; and several colonies ruined by them.

Bees may be fed in the top of chamber hives, sufficient to sustain them, provided especial care is taken to prevent robbing. Before feeding is commenced, the hives should be set down on their floors, and the entrance for the bees closed so as to admit only one or two at a time. If the hive is a chamber-hive the feeder may be placed in the chamber; if the hive has no chamber, two or three inch auger-holes may be bored in the top, and the feeder placed by the side of them, and covered with a small box, and this covered with a piece of old carpet, to prevent other bees scenting the feed. If the hive is not filled down within three inches of the bottom with combs, the feeder may be set there, if but little feeding is desired; but recollect, when feeding from the *bottom* the bees must be confined entirely while feeding, or robbers will be sure to find it.

A feeder with a floating cover, made either of narrow strips of boards, from one-eighth to one-quarter inch thick, and half inch wide, with narrow strips tacked across their ends; or it may be made of one piece slit with a fine saw as near together as every half inch, to within three-quarters of an inch of one end, and a piece tacked across each end to hold the strips in their places. A small wooden pin or nail should be put in each end, one and a half inches high, to afford

facilities to raise it with, when the pan is to be filled with syrup. The pan is made of tin, and about six inches square, and two inches high. The float should nearly fill the pan, leaving no space for the bees to get down between the edges and the pan. I shall give a description of another kind of feeder, when I come to speak of my hives. A composition for feeding that will answer every purpose may be made of the following articles, viz. :—

1st. 2 lbs. West India or Orleans sugar.

3 gills ale.

1 gill Malaga wine.

(If the ale and wine cannot be had, use sap or water.)

1 tea-spoonful fine salt.

Mix together in a tin or copper vessel; set it over a slow fire; stir occasionally until it arrives to a boiling point; set it off, and let it cool, remove the scum, and it is fit for use.

2d. 1 gallon (or 12 lbs.) of West India or any other honey.

4 lbs. West India or Orleans sugar.

1 gal. maple sap or water.

$\frac{1}{2}$ pint ale.

2 table-spoonsful fine salt.

Heat and mix as above.

N. B. The above may be made without the ale by using water.

CHAPTER XXVIII.

WAX MADE FROM HONEY.

MANY bee-keepers are not prepared to believe that the combs are made from honey, or that the honey and combs are both produced from the same materials; but on this point I have not the least doubt, for from my experiments in feeding, both in my observatory hive, and in my combination hive, I am confident that whatever will produce honey will also produce wax.

The following experiment of Huber is to the point: he says, "The existence of the organs before described, and the scales seen under

different gradations, induce us to believe them appropriated for the secretion of wax. But in common with other animal or vegetable secretions, the means by which this is accomplished appears to be carefully veiled in nature.

Our researches by simple observation thus being obstructed, we felt it essential to adopt other methods for ascertaining whether wax is actually a secretion or collection of a particular substance.

Providing it were the former, we had first to verify the opinion of Reaumer, who conjectured that it came from an elaboration of pollen in the stomach, though we did not coincide with him in the opinion that bees then disgorged it by the mouth. Neither were we disposed to adopt his sentiments regarding its origin; for like Hunter, it had struck us that swarms newly settled in empty hives, do not bring home pollen, notwithstanding they construct combs, while the bees of old hives, having no combs to build, gather it abundantly.

We had therefore to learn whether bees, deprived of pollen for a series of time, would make wax, and all that is required is confinement.

On the 24th of May, we lodged a swarm which had just left the parent stock in a straw hive, with as much honey and water as necessary for the consumption of the bees, and closed the entrance so as to prevent all possibility of escape, leaving access for renewal of air.

At first the bees were greatly agitated, but we succeeded in calming them by carrying the hive to a cold dark place where their captivity lasted five days. They were then allowed to take flight in an apartment, the windows of which were carefully shut, and where the hive could be examined conveniently. The bees had consumed their whole provision of honey; but their dwelling, which did not contain an atom of wax when we established them in it, had now acquired five combs of the most beautiful wax, suspended from its arch, of a pure white, and very brittle.

We do not expect so speedy a solution of the problem, but before concluding that the bees had derived the faculty of producing wax from honey, on which they fed, a second experiment, susceptible of no other explanation, was necessary.

The workers, though in captivity, had been able to collect farina;

while they were at liberty, they might have obtained provisions, on the eve, or on the day itself of their imprisonment, and enough might have been in the stomach or on the limbs to enable them to extract the wax from it that we found in the hive. But if it actually came from the farina previously collected, this source was not inexhaustible, and the bees being unable to obtain more would cease to construct combs, and would fall into inaction.

Before proceeding to the second experiment, which was to consist in prolonging their captivity, we took care to remove all the combs they had formed in that proceeding. Buernens made them return to their hive, and confined them again with a new portion of honey.

The experiment was not tedious. From the evening of the subsequent day we observed them working in wax anew, and on examining the hive the third day, we actually found five combs as regular as those they had made during their first imprisonment.

The experiment was continued in such a manner as to satisfy Huber fully, that feeding on honey effected the secretion of wax in their bodies, without the aid of pollen.

CHAPTER XXIX.

ARCHITECTURE OF BEES.

EACH comb in a hive is composed of two ranges of cells backed against each other. These cells, looking at them as a whole, may be said to have one common base, though no one cell is opposed directly to another. This base or partition between the double row of cells is so disposed as to form a pyramidal cavity at the bottom of each. The mouths of the cells thus ranged on each side of a comb, open into two parallel streets. These streets or interstices are sufficiently narrow to avoid waste room, and to preserve a proper warmth; yet, wide enough to allow the passage of two bees back to back. The usual distance between the combs is somewhat more than one-third of an inch. There are apertures also left through the combs to afford a

passage crosswise from comb to comb, whereby much time and travel is saved to the bees. The bees build their cells of a hexagonal form, having six equal sides. There are only three forms in which the bees can possibly build their cells and make them all equal, without the loss of either material or space; viz.: The *equilateral triangle*, the *square*, and the regular *hexagon*. Of these three geometrical figures, the hexagon most completely unites the prime requisites for insect architecture. First, economy of material; second, economy of room; thirdly, the greatest possible capacity, or *internal* space; fourthly, economy of materials and economy of room, produce economy of labor. And lastly, the greatest strength with the least amount of material.

Huber asserts that the "design of every comb is sketched out, and the first rudiments laid by one single bee; that this founder-bee forms a block out of a rough mass of wax, drawn partly from its own resources, but principally from those of other bees, which furnish materials, in quick succession, from the receptacles under their bellies, taking out the plates of wax with their hind feet, and carrying them to their mouths with their fore feet, where the wax is moistened and masticated, till it becomes soft and ductile."

Huber was enabled by means of his observatory hive to bring each bee so completely under his view, that she might be seen to extract with her hind feet one of the plates of wax from under the scales of her body, where they were lodged, and carrying it to her mouth in a vertical position, turn it round so that every part of its border was made to pass in succession under the cutting edge of the jaws. It was thus soon divided into very small fragments; and a frothy liquor was poured upon it from the tongue, so as to form a perfectly plastic mass. This liquor gave the wax a whiteness and opacity which it did not possess originally, and at the same time rendered it tenacious and ductile. The scales of wax thus prepared by the bees, are applied by them to the roof or side of the hive, as the case may be; and thus a block is raised of a semi-lenticular shape, thick at top and tapering towards the edges. When of sufficient size, a cell is sculptured on one side of it by the wax-working bees, who relieve one another in succession, sometimes to the number of twenty, before the cell is com-

pletely fashioned. The cells for the *drones* are considerably larger and heavier than those for the workers, and being generally constructed later, are nearer the edges of the combs. Every cell that was ever built by the honey bee, either for workers or drones, has been of the same form, and no improvement can possibly be made in its construction. The depth of the store-cells, however, varies very materially; they may be found from one-fourth to three inches deep.

CHAPTER XXX.

SIGHT.

MANY conjectures are entertained in regard to the sight of bees; and authors have failed to agree on this point as in most others. And that there is something mysterious concerning it, every one who has paid the least attention to the subject must readily admit. For, if we follow the little laborer during its excursions in the fields, in search for honey, we see it proceed from flower to flower with as much precision, as though this organ existed in its utmost perfection. And when it has gathered its little load, it rises in the air, and as true as the needle to the pole, it makes its way straight homewards, as if in full view of the hive. But let the hive be moved only a few inches to the right or left, or let the entrance be partially closed or turned around only one inch or two, from the place it formerly occupied, the bee appears not to notice this in the least, but flies with unerring precision to that point on the alighting board, formerly occupied by the door of the hive, and after several fruitless attempts to find the entrance, it rises again into the air, as it would appear, for the purpose of removing at such distance from the hive as is best suited to the focus of its visual organ.

Dr. Bevan observes, "The eyesight of bees, notwithstanding the wonderful mechanism of their eyes, seems less perfect than their other senses; on some occasions it scarcely serves them to distinguish

the entrance of their hives, when they come home loaded with provisions." Wildman thought they saw better when flying than when on foot. But says Dr. Bevan, "I believe upon examination, that this opinion of Wildman will not be found quite correct; that the mere act of flying does not enable them to see objects better, but when on the wing, they are at a greater distance from these objects; the eyes of these insects being so constructed as to enable them to see best at a moderate distance." Dr. Durham, in speaking of the eye of the bee and other insects, says, "that the cornea and optic nerves being at one and the same distance, are fitted only to see distantial objects, but not such as are very nigh." "This visual orb, this seemingly simple speck, though really complicated piece of mechanism," says Durham, "will be found upon examination to form a curious lattice-work, of several thousand hexagonal lenses, each having a separate optic nerve, ministering to it, and therefore to be considered as a distinct eye."

Dr. Bevan, in speaking of these lenses, says, "The hemispherical arrangement of them enables the bee to see accurately in every direction, and without any interval of time or trouble." I think, however, that this assertion of the Dr.'s will not upon examination be found quite correct, for I have many times been amused while watching the operations of the sentinel, stationed around the entrance of the hive, to see the bees, when a fly, or miller, or any other intruder, alights near them; with their wings raised, they will turn first one way, and then the other, as if to ascertain the location of the enemy, and then dart in that direction, but instead of going directly towards it, although it may not be more than one inch from the bee, it will frequently miss the object by one half that distance, when it will again turn and rush at it with no better success than before, which proves to my mind that their sense of vision is quite imperfect, to say the least.

I have known of two or three instances where second swarms have left their own hive, of their own accord, after occupying it for a week or more, and constructing combs and storing considerable honey. In each case above mentioned, the hives were standing on the same bench, and not more than from eight to twelve inches apart;

and raised upon blocks a half inch thick, or more ; which gave the bees an opportunity to pass under the lower edges of the hives, from one to the other. And after they had united, and were laboring harmoniously together, instead of all the bees alighting in front of the occupied hive, the bees that formerly occupied the forsaken hive still continued to alight in front of and enter the latter ; but instead of ascending it they would turn and pass out, and across to the other hive, and deposit their loads, after which they would pass out in front in company with the former occupants of the hive. From these circumstances it appears to me that their sense of seeing is very imperfect. If not, why did they continue to pass through their former habitation in this circuitous route, when it would have given them a much less distance to travel to have entered in front of the hive, in company with the first occupants of the hive.

CHAPTER XXXI.

POLLEN OR BEE-BREAD.

BEE-BREAD is the yellow or reddish substance collected by the bees, and carried into the hive on their thighs ; it is the powdered particles discharged by the anthers of flowers, in warm, dry weather. It varies in color, from a pale yellow to a pale red.

This substance was formerly supposed (and is by some at the present time) to be the prime constituent of wax, and gathered by the bees for the purpose of comb-building. But the experiments of Huber and Hunter, and even of others, have proved that wax, or the combs, is a secretion from the bodies of the working bees, and that the principal purpose for which they collect pollen, is to nourish or feed the embryo-bees. Dr. Bevan observes that "Huber was the first who suggested this idea, and it well accords with what we observe among other parts of the animal kingdom : birds, for instance, feed their young with different food from what they take themselves. Mr. Hunter examined the stomachs of the maggot-bees and found farina in all, but

not a particle of honey in any of them." During the fore part of the day, while the flowers are yet wet with the dew, the bee may be seen on the flowers, busily engaged in brushing off the farina, and conveying it to the baskets or cavities in their thighs, and when a sufficient quantity is collected she returns to the hive, when part of her cargo is instantly devoured by the nursing-bees, as Dr. Bevan says, to be regurgitated for the use of the larva, and another part is stored in cells for future exigencies in the following manner: "The bee, while seeking a fit cell for her freight, makes a noise with her wings, as if to summons her fellow-citizens round her; she then fixes her two middle and her two hind legs upon the edge of the cell which she has selected, and curving her body seizes the farina with her fore legs, and makes it drop into the cell; thus freed from her burden, she is fully prepared to collect again. Another bee immediately packs the pollen and kneads and works it down into the bottom of the cell, probably mixing a little honey with it, judging from the moist state in which she leaves it; an air-tight coating of varnish finishes this storing of pollen."

Bees often store bee-bread in large quantities, far greater than they consume, and it proves an injury, inasmuch as it is of no manner of use, and it occupies the combs that the queen would otherwise use for brood-combs. This is one reason why bees do not prove as prosperous after occupying the same combs for four or five years, for they will yearly store more bee-bread than they consume, and after three or four years they will often have one-third of their combs stored with it, which renders such combs useless.

CHAPTER XXXII.

PROPOLIS.

THIS is a substance with which the bees attach the combs to the roofs and sides of their dwelling, and cement the crevices and joints of their domicile, and strengthen its weak places. It is a resinous sub-

stance, very tenacious, and semi-transparent; is of a dark reddish color, resembling wax. It is gathered by the bees similar to pollen; they transfer it from the first to the second pair of legs, and from them they convey it to the hollow of the thigh. It hardens very soon after being exposed to the atmosphere. Bevan says "that so rapid is this hardening process, that the bees which store it oftentimes find some difficulty in tearing it with their jaws from the thighs of their collectors." In my observatory hive I have often seen the bees in the act of unloading those that had collected it. A bee will enter the hive loaded with this substance, when several bees will approach her and commence pulling the propolis from her thighs in small threads, and after obtaining a small quantity, she will knead and work it over in her mouth for several seconds, when she will proceed to deposit it about the joints of the hive, or at the roof or side where they attach their combs.

It is supposed by some writers that propolis is gathered from the resinous exudations of trees, by others from flowers and other materials. At any rate, there appears to be no scarcity of this substance, in any section or climate where honey may be gathered, for bees are always able to obtain a sufficient supply for all purposes.

CHAPTER XXXIII.

PASTURAGE.

It is of the utmost importance to the success of bee-keeping, that the apiary be located in a neighborhood supplied with good pasturage for bees, and especially where early blossoms abound. Among these may be named the willow, the alder, the hazel, the white (or soft) maple.

"First the gray willow's glossy pearls they steal,
Or rob the hazel of its golden meal,
While the gay crocus and the violet blue
Yield to the flexile trunk ambrosial dew."

Gooseberries, currants, raspberries, peach, nectarine, apple, pear, the locust, also, afford a rich yield of honey. Also, the bass-wood, (or Lyme as it is called in some sections,) affords a good pasture for some two weeks. Mustard, turnips, melons, squashes, &c., yield more or less. But of all the blossoms that tend to supply the honey bee with a bountiful harvest, none compare with the *Dutch* or *white clover*, (*Trifolium repens*,) either in the amount it yields, or the richness or purity of its flavor. Wherever white clover abounds, there bees will be sure to yield a rich harvest of honey, if properly managed.

There are seasons in which the bees gather a large amount of honey from the leaves of forest trees, deposited by *honey-dew*, as it is termed. Honey-dew appears on the upper surface of the leaves of trees, is a tenacious, transparent substance, and as sweet as honey itself. I have seen it upon the leaves of the chestnut and the oak, when the leaves would glisten in the sun, as though they had received a coat of varnish. Various conjectures and speculations have been entertained by different writers, as to the causes that produce this substance, but I am strongly of the opinion that it descends from the heavens, the same as the natural dews of the evening.

CHAPTER XXXIV.

PURCHASING BEES.

In purchasing bees, their value depends upon the strength or population of the colony, its weight, and the number of years they have occupied the hive. A good populous family should have in the fall from twenty to twenty-five lbs. of honey in store, for their winter supply; though they often consume much less; depending upon the season, and their exposure to the sudden changes from heat to cold, during winter. Still I do not consider it safe to commence the winter with less than twenty lbs. The number of years the colony have occupied the hive may be judged, pretty correctly, from the complexion of the combs. If it be a swarm of the previous year, the combs

will be a whitish or straw color. If two years old, a light brown or copper color. If from two to three years old, a darker brown, and if over that, a still darker or nearly black. A colony more than two years old (if in the same old combs) are not considered, generally speaking, worth as much as those younger, merely on account of the age of the brood-combs, as the longer they are used the thicker they become, and the cells smaller, and consequently every generation or brood of bees that are hatched in the same combs must necessarily be *smaller*, and more *punny* and *feeble*. Old combs, also, are more liable to contain moths than new ones. The strength or number of bees may be ascertained by raising the hive, and looking into it, or by a slight rap upon the side of the hive. If it is a populous family the buzz or noise produced by the bees will be loud, and continued for two seconds or more. If it be a weak family it will be quiet, and of short duration.

CHAPTER XXXV.

TRANSPORTING BEES.

THE *proper* time to move or transport bees is after they have ceased their labors in the fall, and before they commence in the spring.

In large hives or boxes there is more danger of the combs breaking down than in small ones. I have found not the least difficulty in transporting bees in my hives. I have carried them when full of honey and bees one hundred and fifty miles, by carriage and railroad, without injuring them at all, as they are well supplied with ventilation, and perfectly secure from escaping from the hive, to harm any one.

In transporting bees in the common hive, if the combs are new, and well stored with honey, it will render them less liable to break down, to set the hive with the bottom up, with a cloth tied or made secure

over it to keep the bees confined, and also to afford them ventilation. A wagon or carriage with springs is much better than a sleigh or sled to carry them in, as the combs are less liable to jar down, though, in cold weather, if there be a good quantity of straw or hay spread under them, and care taken, they may be carried without danger in a sleigh. The bees should first be made secure in the hives, and at the same time sufficiently ventilated to prevent them from smothering.

The hives should never be moved from their location during the season, after they commence their labors in the spring, for in so doing it disturbs the bees very much, and many will not be able to find the hive, if removed to a new place, but will linger around their old location, and finally perish.

CHAPTER XXXVI.

BEES IN LARGE TOWNS OR CITIES.

BEES may be kept in most of our large towns, and even in cities, with very good success; much, however, depends upon the surrounding country, as bees usually traverse a circumference of two miles, in search of stores. Fruit-trees, shrubs, and flowers afford a good amount of pasturage in villages, and cities especially, where the *honey locust* has been introduced as a shade tree. In many villages in Ohio it affords a rich pasture for some two weeks, and it comes at a season when it is most beneficial to the bees, viz.: between the blossoming of fruit-trees and the season of white-clover.

One, and the *main objection* to keeping bees in cities, is the trouble and difficulty attendant on swarming; many persons would gladly keep one family of bees, just for amusement, and to obtain honey for their own family use, if swarming could be dispensed with. My hives remedy this difficulty, and not only this, it is better adapted to these locations, as it may be set in buildings, entirely out of the way, and the honey taken without the least exposure to the bees, or disturbance to them. I have sold over fifty of these hives, during the last four

years, in the village of Newark, Licking Co., Ohio, and they have produced a yearly yield of from fifty to one hundred and thirty pounds of honey, of the purest quality, and the demand for them there, where they have been thoroughly tested, is such, that a hive, with a good swarm of bees in it, will readily sell for fifteen dollars. I could have disposed of scores of them at that price last season, had I the bees to accompany the hives.

CHAPTER XXXVII.

HOW THE BEES MAY BE DRIVEN FROM BOXES.

IN boxes destitute of bottoms, there is little difficulty in clearing them from the bees. Where the boxes will admit of it, a little smoke may be blown into it for a few moments previous to taking it from the hive. If the boxes have no bottoms, have a piece of board in readiness, and set the box at once upon it to confine the bees, and it may then be removed with safety to any place desired. I generally perform this operation a little after sunset, at which time the bees are desirous of returning home; and I think they will leave the boxes more readily. After blowing a little smoke into the box I take it a short distance from the hive and turn it bottom up on the ground; the bees will immediately commence crawling upon the upper side of the box and combs, when with a wing I brush them off carefully upon the ground, and move the box a short distance and let others come up, when I brush them off; and by continuing the operation for some twenty minutes, the bees may all be made to leave. Another plan practised by many, is to carry the box into the cellar, or dark place, with a small opening to admit a little light, and the bees will soon leave and make for the light and return to their hive.

If the boxes have no bottoms, bottoms should be fitted immediately. If the honey is intended for market, thin board is best; but if for family use, a bottom made of press paper will answer every purpose.

It should be pasted to the box to exclude the air, ants, &c. Boxes with bottoms having holes bored in them from the passage of the bees, should also have paper pasted over the holes.

CHAPTER XXXVIII.

VENTILATION.

BEES, as well as mankind, in order to be healthy and vigorous, require a pure and healthy atmosphere. And a suitable degree of ventilation, at all seasons of the year, is not only desirable, but *absolutely* necessary, in order to secure the health, comfort, and prosperity of the bees. It will also add much to the amount of honey produced by them, as in a well-populated hive, not sufficiently ventilated, many of the bees, during warm weather, are compelled by the heat in the hive, to leave the interior of it, and cluster and idle away much of their time, when they would be gathering and storing honey if suitable accommodations were afforded. During warm weather, there is no danger of an excess of ventilation, provided in so doing the bees are not too much exposed to the attacks of robbers and moths. Strong and populous families require a greater amount of ventilation than weak ones, at all seasons of the year; and both require less from the last of February to the 1st of May than during the remainder of the year; for during this time the stocks are generally reduced in numbers, and they require all the heat in the hive that they can possibly generate, in order to mature the young brood. Therefore I do not consider it advisable to raise the hives of weak stock only a little at the front side, until they have increased so as to nearly fill the hive; then the rear may also be raised upon small blocks, and the air permitted to pass freely under the hive.

Bees, when oppressed with heat, possess the power of ventilating their domicil; or, in other words, of fanning themselves with their wings. Hundreds of bees may frequently be seen in the operation, on the floor of the hive.

CHAPTER XXXIX.

DISEASE OF BEES AND BROOD.

SOME apiarians have much to say about the diseases of bees, such as dysentery, diarrhoea, and diseased blood; but I have never experienced any difficulty from these diseases; and I am confident, in my own opinion, that if bees are kept in hives properly ventilated, and attended to, that there need be but little fears apprehended from these diseases. In the first place, I believe that the causes that produce these diseases, are a want of ventilation in the hive during winter.

Hives that are not sufficiently ventilated, retain so much of the vapor and dampness that arise from the breath of the bees, that the combs often mould and sour; and in some instances even the honey will ferment and sour. This, with the impure atmosphere in the hive, will not only ruin the combs, but the bees also.

All hives should be so constructed as to admit a free circulation of pure air at the bottom, and at the same time exclude moths and other insects, and have an opening (or openings) at the top, to let the vapor and dampness that arise from the breath of the bees escape from the hive. This opening should be covered with a box, to exclude the light and insects, and to prevent too strong a current of air passing through the hive, at some seasons of the year. Bees that are scantily supplied with honey are more liable to become diseased than those that are well supplied; and it is well to see to it in the fall, that every colony have a sufficient store in to sustain them during winter, and if supplied with pure air, not one colony in a hundred will perish from any cause.

CHAPTER XL.

TOOLS FOR CUTTING COMBS.

It is necessary that every person using the common hive should have tools suitable for cutting out combs. They may be made by any blacksmith, and at a trifling expense.



The accompanying cut represents the form best adapted to the purpose; each should be twelve or fourteen inches long, exclusive of the handle, and the blades sharp, so as to cut the combs without breaking or bruising them. A spatula, or a long thin carving-knife, also, will be found very useful and convenient in pruning or cutting out combs.

PRUNING.

Pruning, as it is termed, is practised by some bee-keepers who use the square or common hive; but it is attended with more or less difficulty, especially by timid persons, and it also disturbs the bees; and if the combs contain honey at the time of pruning, so as to drip, it not unfrequently attracts other bees, and induces them to rob the colony and often destroy them. Some, however, practise it, and are very much in favor of this mode of management, and consider it preferable to any other, and recommend it as the very best method of managing bees in such hives as I have named. Others have tried it to some extent, and have abandoned it altogether for the reasons above stated. Hence we find, that in this branch of bee culture apiarians do not agree any better than on other points connected with it; and the reason is obvious: for while one bee-keeper can handle his bees as he chooses without the least fear of their stings, will turn his hives upside down and cut out the combs, and handle them as though they were so many flies, another person would not perform the operation to save a colony from destruction; therefore a hive that one person may prefer, and that he can manage bees in to his own satisfaction, another person would not use even if he never kept any bees. Any person wishing to prune his hives containing old combs, may do it without much danger from the bees, and even without any danger, if he will only provide himself with a bee dress, such as I have described in another chapter.

The bees should be first fumigated with the smoke of puff-ball, tobacco, or cloth; the puff-ball is the most effectual; and in pruning, it should

not be used too freely, as it will perfectly stupefy the bees so that they will fall down as dead. After applying the smoke for a few moments, or I might say for one moment, turn the hive bottom up, and with the pruning tools cut out about one half of the combs down to the cross-sticks, or about half way of the hive, unless you find that the combs near the centre of the hive contain young brood; in that case, such may be left. The best time to perform this operation is in the spring of the year, say about the 1st of April. On the following spring, the other half may be taken, and by so doing the colony very much benefited.

CHAPTER XLI.

TO EXTRACT HONEY FROM THE COMBS.

As the combs are taken from the hive, those portions containing honey free from brood and bee-bread, and fit for use in the combs, should be cut and separated from the other and kept by itself. And such as have a mixture of honey, bee-bread and young brood, put in a cullender or flannel bag, and put it in a tin pan, and set it in an oven (not sufficiently warm to melt the combs,) and let it remain there for an hour or two, occasionally changing the positions of the combs, so as to let the honey drain from both sides of the combs; they may then be slightly pressed; if, however, there should be no brood in the combs, it will not injure the honey to press the combs as hard as one may choose. A little warm water may then be poured upon the combs, and again pressed, and the syrup thus obtained will answer very well to feed the bees; if it should be too thin, add a little brown sugar, or poor honey, and heat sufficient to scald and incorporate it thoroughly, and when cool remove the scum and it is fit for use.

CHAPTER XLII.

BEEB-WAX.

I FIND that there are many persons that have kept bees for years, that do not rightly understand the method of making wax from the combs.

The way I generally manage is as follows : After the combs have been cut from the hive and the honey separated from them, press them together and put them into a flannel bag, (the smaller the bag the better, if it will contain the desired amount of combs); put the bag into a kettle and a flat stone on the top, to keep it under the water while boiling, fill the kettle with water, and set it over the fire, and let it boil 40 or 50 minutes, take it from the fire, and if the kettle is large enough to afford sufficient room for the wax to rise above the stone, the stone nor bag need not be removed until after the wax has become cold, and been removed ; for if they are taken from the kettle before the wax is, much of it will adhere to the stone and bag, and be roasted.

If the wax is not as pure as desired, wash the bag and put the wax into it the second time, and melt it with water as at first. The wax may then be put in a smaller vessel and melted, and poured into cups or pans, and formed into cakes as desired. The pans should first be rubbed over with a little grease to prevent adhesion.

CHAPTER XLIII.

BEE DRESS.

EVERY bee-keeper that has much to do with bees, should prepare himself with a bee-dress of some description, so as to be prepared for any emergency that may occur.

Some apiarians can handle bees in all ordinary operations without fear of their stings. Still there are occasions that even to such, a bee-dress would be very acceptable. Some persons in hiving swarms throw a veil over their head and face, but this affords only an imperfect security, though it may answer for all ordinary occasions; still, I think that, as the expense is so trifling, every bee-keeper should provide himself with one. It can be made in the following manner, and the cost will not exceed two shillings:—Take one and a half yard of thin, light, three-quarter muslin, and a piece of wire-cloth, (such as is used for meal sieves,) about six inches square; it may be obtained of wire-weavers in most of our large towns and cities, or of hardware dealers. Lay the muslin over the head, with the ends down over the shoulders, with one end of the selvedge in front, and the other back. The back part may be cut and fitted to the head, and a cord run in to gather it around the neck, and the wire-cloth sewed in over the face, first rounding the corners in shape of the face. It should extend down below the mouth, to afford free respiration, and the muslin sewed together below the wire-cloth, sufficient to extend below the vest. It may be worn under a coat, but it is not the best way, as it is usually warm weather when it is worn, and with the head-dress, and a coat over it, a person will be very uncomfortable on account of the heat; besides, the bees will crawl up under one's coat and vest, and when in close quarters will often prick through the shirt, and tickle a person under the ribs. To prevent this and the other difficulty, I have prepared myself with a garment made of the same kind of material as the head-dress, and in the form of a hunting shirt, open before, with buttons close together, to button up tight. I first put on my head dress, and then over this my hunting shirt, buttoned under my pants; and with a pair of thick woollen gloves with stocking legs, sewed to the wrists, to draw up over my sleeves, and my pants tied over my boots, I can defy all the forces they choose to bring against me.

CHAPTER XLIV.

CURE FOR BEE STINGS.

MANY persons suffer great pain from the sting of bees, and are not aware of a palliative to relieve the pain. Tobacco is considered by some as the best remedy, though other articles are frequently used. The manner of applying it is as follows:—Moisten smoking or chewing tobacco until the juice appears of a dark color, and apply it to the part stung, binding it on. If the tobacco becomes dry, moisten it. Ammonia or spirits of hartshorn, saleratus and water, sliced onions, and cold water alone, are all of them used as curatives.

CHAPTER XLV.

SALT AND WATER NECESSARY

SALT is sometimes spread near and around the hive of bees. They partake of it in small quantities, and it is considered beneficial to the health of bees. They are fond of it, and as it is productive of no harm, a supply of it is kept where they can eat it as their wants require.

Water is also necessary to the health of bees, and where running water is not at hand, it is advisable to keep a sufficient quantity in a basin or trough for their use. It is indispensable to the bee in constructing combs, and if there is no standing water near, a shallow tin pan should be placed near the apiary, filled with small stones, about the size of birds' eggs. The vessel should be filled with fresh water every morning. The object of the pebbles is to prevent the bees from drowning, as would be the case without such precaution being used.

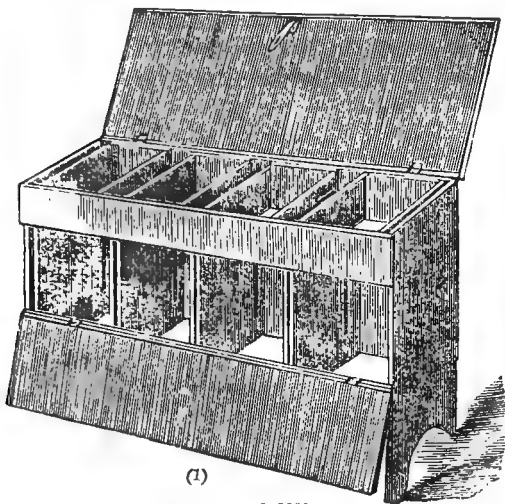
CHAPTER XLVI.

REMARKS.

IN the foregoing pages, I have endeavored to state my views in as brief and explicit a manner as possible. My opinions, as there stated, are the results of practical experience and observation during many years' careful attention to the subject. I am aware that my views and mode of management differ in some respects from other writers on the culture of the Bee; but I have endeavored to give my reasons for forming my opinions, and adopting and recommending the form of hive and mode of culture herein stated, and I leave it with the intelligent and impartial Bee-keepers of the United States to judge of the merits of my labors and the value of my invention. And, judging from the universal satisfaction my hive has given during four seasons past, and the high commendations bestowed upon it by ninety-nine out of every one hundred that have used, or examined it, I can but feel confident that unlike a large majority of the patented hives that have been disposed of during the last fifteen years, it will prove a valuable invention to the Bee-keeper, and divest the subject of much that has formerly been considered mysterious, uncertain and difficult, and enable every person that has a desire to engage in the business, to prosecute it successfully, profitably and pleasantly.

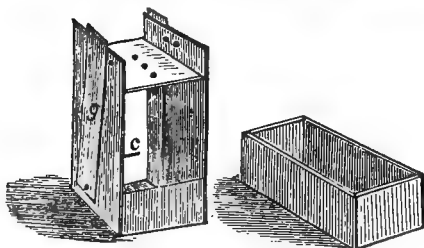
The few remaining pages will be devoted to a description and explanation of my *OPEN COMBINATION BEE-HIVE*, to which I append a few of the numerous testimonials I have received from practical experienced Bee-keepers, who have tested it.

E. W. PHELPS' OHIO COMBINATION BEE-HIVE.



(1)

PATENTED APRIL 6, 1852.



(2)

(3)

THE above cut is a view of the form of my hive, with a case containing four large boxes, with four small ones on the top, for the reception of surplus honey. The usual length I make the case for one family of bees, is three boxes long, as this length is more convenient to handle, and it affords sufficient room for one family of bees. Still the case may be made ten or twelve feet in length, and contain four or five families of bees, if a person chooses; and, especially, if it is to occupy a building, such as a wood-house, granary, or any out-house, in such instances it may be made even the length or width

of the building, and the openings cut through the weather-boarding to correspond with the openings in the boxes, for the ingress and egress of the bees, and the bees may then be set in, and the communication closed between different colonies. Hives got up in this manner, and enclosed in a building, will last an age, and will keep the bees in an even temperature during winter, which will be a benefit to them; and they will consume less honey than when exposed to the various changes of the weather.

Fig. 1 is a view of the rear of the hive, with the lid raised, showing the arrangement of the upper tier of boxes, each with a pane of glass, 6 by 12 inches, covering the entire top of the box. The rear door is also open, showing the arrangement of the main boxes, each with a pane of glass in the back side, 7 by 9 inches, to observe the operations of the bees, and amount of honey in store, &c.

Fig. 2 represents one of the main or large sections, having the communication closed by a dividing shutter that is attached to the side of the box by a screw at its lower end, which forms the pivot upon which it moves to open and close the communication between the boxes. The boxes are all alike, and may be changed to any part of the case without difficulty. An aperture is cut in the front of each box, as seen at *c*, Fig. 2, for the ingress and egress of the bees; a spout, or alighting-board, is attached to the front of the hive of sufficient length to reach through weather-boarding when set in a building.

Fig. 3 represents one of the small boxes; these may be made either with or without bottoms; the top is covered with glass. They will contain, when filled with honey, from eight to ten pounds; the lower boxes about thirty pounds.

The bottom is attached to the front of the hive by butts, and may be let down at any time without disturbing or moving the boxes, as they stand upon strips nailed to the case at the bottom, against which the bottom shuts and forms a tight joint. The bottom, when closed, is kept in place by a button at each end. There are ventilating openings through the bottom, three inches in diameter, covered on the under side with perforated tin doors, that may be opened and closed at pleasure. The moth-trap, or device for catching and destroying the moths after they get into the hive, cannot be seen in the engraving, as it is placed upon the floor of the hive under the adjoining edges or sides of the boxes. It consists in a strip of board, grooved or rabbeted at the edges, to form a harbor for the moths on the bottom of the hive; this slide, or trap, is covered with a tin case, with openings at its lower edge, corresponding with the grooves in the trap; the case prevents the bees from fastening it to the floor, and admits of its being withdrawn and returned without disturbing the bees. This invention is acknowledged by those who have tested it, to be the most simple, convenient, and effectual device for destroying moths ever invented.

This hive is truly a *Combination Hive*, in every sense of the word. And, although it combines so many advantages, it is perfectly simple in its construction, and bees are managed with less difficulty and better success in it than in any other hive, as all that have used it will testify.

The advantages it possesses over others are:—

1st. Its perfect adaptation (in regard to size) to the actual wants of a colony of bees, at all seasons, let it be a large or small one.

2d. The facilities it affords for obtaining surplus honey, or removing any portion of the old combs, are superior to any other, as the bees may be made to leave either box when desired, before removing it from the hive, without disturbing or injuring them in the least.

3d. It affords the best opportunity for observing the operations of the bees, the amount of honey in store, and the strength of the colony, at all times, without exposure to the bees.

4th. The construction of the hive with the alighting board is such, that it will often save the expense of a building on purpose for bees, as it may be set in any out-building, or in a dwelling, as has often been done by those using it.

5th. It is acknowledged to afford the bees better protection against moths and robbers than any other hive, as the small aperture at which the bees enter is the only means of access for the miller, and this being three inches over the bottom, the bees are not so liable to leave it during evening, as if it was at the bottom of the hive.

6th. It affords a more convenient and effectual means of destroying moths after they get into the hive, than any other.

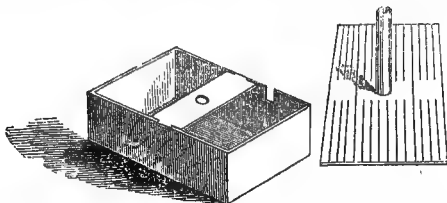
7th. It is also acknowledged to be the best swarming hive known, as the bees may be confined to a suitable amount of room until after they swarm, when more room may be given, and further swarming prevented, and a larger amount of honey obtained than in any other hive.

8th. It may also be used as a non-swarming hive, as ample room may be given, and the surplus honey and old combs removed as often as desired, without disturbing the bees, and a larger amount of honey obtained than in any other hive.

9th. It is acknowledged, by all who have fed bees in it, to be the most convenient hive, for that purpose, known, and the only one that bees can be fed in with any degree of safety against robbers.

10th. It is well arranged for wintering bees successfully, as it is well ventilated, and the boxes containing the bees being enclosed in a case, keeps them in an even temperature during winter, and they consume much less honey than in single hives.

PHELPS' BEE-FEEDER.



THE above cuts represent a feed-box and float, of my own invention, that I have constructed expressly to accompany my Combination Hive, although it may be applied to other hives. It consists of a tin pan, or tray, placed in a wooden box, with a float to fit, and a tin tube passes through the float and is secured to it on the under side. The float may be raised at any time, even if it is covered with bees, by means of the tube, and the syrup poured into the pan through the tube by inserting a funnel in the top of it. The float supports the bees and prevents them from getting into the syrup, and as they consume the syrup it settles down with them. A piece of wood across the top of the box, with a hole for the tube, keeps it in its place, and a pane of glass on each side of this confines the bees, and affords an opportunity to observe their operations while feeding. The feeder is placed in the case by the side of one of the lower sections, while feeding, and the bees do not have a distance of over six inches to travel from the main body of the hive to obtain their feed, and the communication from the hive to the feeder being near the top of the box containing the bees, robbers are not at all liable to find their way to it, as they must enter the small aperture in the front of the hive, and pass nearly through the centre of the colony, to reach it. With this feeder, arranged in this manner, a colony of bees may be fed with as little trouble, by a woman or child, as a brood of chickens.

E. W. PHELPS'

OHIO COMBINATION BEE-HIVE.

THE subscribers are now prepared to sell State, County, or individual rights for the best Bee-Hive in the United States, on the most favorable terms. No other hive has given as good satisfaction as this, after a thorough trial, and it receives the unqualified approbation of ninety-nine out of every hundred that use or examine it, which cannot be said of any other hive in the United States.

Individual rights, \$4; for Hive and individual right, \$8; Hive and right to use the same, and no more, \$6; Feeder and receipt for different kinds of feed for wintering bees, and, also, for obtaining honey for market or table use, \$1. Full specifications for making the hives, and directions and explanations for using, sufficient to enable any person who never kept bees, to manage them without difficulty and successfully, (if he will follow the directions,) accompany the right. Address, post-paid,

E. W. PHELPS & CO., Westfield, Mass.

RECOMMENDATIONS.

[THE following extracts, from letters and certificates of commendation, are a few that I have selected from a large number that I have received from practical bee-keepers who have had my hive in use for a period of from two to four years, and have had an opportunity to test its utility from practical experience; and, therefore, their opinions are entitled to much more confidence than the mere assertions and opinions of persons judging only from a hasty examination of an article in which so many have been deceived in forming their opinions.]

I hereby certify, that I put a swarm of bees in one of E. W. Phelps' Patent Bee-Hives on the 18th day of June, and during the season they filled three of the lower boxes. The next season I took ten boxes of honey that averaged fifteen pounds each, and one large box, which I should think would weigh from forty-five to fifty pounds. On a fair calculation, I feel sure in saying that I took, in all, 180 pounds of honey, and during the month of June, my family being sick, and the bees being in the chamber above, I neglected to take the honey from them, and they swarmed twice. This spring I sold the Patent Hive and bees for \$15, and the two new swarms for \$5 each, making a profit in less than two years of 180 pounds of honey, at 12 1-2 cents per pound, which is \$21.60, and \$17 in cash, together making \$38.60.

Newark, O., April 15, 1849.

JOHN J. PUTMAN.

I have been using one of the above Bee-Hives for two years past, and believe them to be decidedly the best hive that has come within my notice.

T. W. WILSON.

We, the undersigned, certify that we are using E. W. Phelps' Patent Bee-Hive, and that we think it superior to any other known to us. During last season we tried the experiment of dividing a colony, and it succeeded to our satisfaction; both swarms did well, and we consider it altogether the best hive that has come within our notice.

F. F. LAMB,

Newark, O., March 10, 1852.

L. MERCHANT.

Mr. C. Springer, member of the O. S. B. of Agriculture, and President of the Muskingum Co. Agricultural Society, in a communication to the State Board, says:—"It is my decided opinion that Mr. Phelps' Hive is the best adapted to the habits of the bee, and the convenience of the apiarian, of anything of the kind that has come within my notice.

1st. I have never examined so convenient a moth trap. 2d. It has a good arrangement for taking the surplus honey, without which a swarm is comparatively useless. 3d. The arrangement for removing the old combs, so essential to keep a colony in health and vigor, is of the best kind. 4th. Its adaptation to the strength and size of a colony has much merit. My swarm on the Affleck plan are at this time unusually troubled with moths, while I find none at all in the Phelps hive. For these reasons I should certainly think Mr. P. entitled to Letters Patent, for his ingenuity and skill. I have had several interviews with the gentleman, and believe him to have studied the habits of the honey-bee with more accuracy than any man with whom I have conversed on the subject.

"C. SPRINGER, Meadow Farm, Muskingum Co., O."

We, the undersigned, citizens of Licking County, Ohio, hereby certify that we have been using E. W. Phelps' Patent Bee-Hive, and that we have satisfactorily tested its great utility. We conceive it decidedly superior to any other invention for the keeping of bees, the protection of them from moths and other common enemies, and for the facility of procuring of honey without injury to the swarm. The manner of arranging the dividing shutters is an advantageous improvement over anything of the kind we have ever seen, and in fine, we deem the whole invention, from our practical experience, and from what we know of the habits of bees, a very useful invention, and well deserving of the immunities of a patent.

H. N. PARKS,
HENRY FERRY,
JAMES STONE,
SAM'L BOWERS,

A. SHERWOOD,
JOHN BRUMBACK,
WM. SHIELDS,
PETER HOLLER,

THOS. BLANCHARD,
JAMES WELLS,
V. ALSDORF,
GEO. ENGLE.

P. N. O'BANNON,
WM. ALSDORF,
I. DILLE,

I hereby certify, that I am using E. W. Phelps' Patent Combination Bee-Hive, and, from practical experience, I am satisfied that it is the best adapted to the nature and habits of the bees, and, also, the most convenient for the bee-keeper, of anything of the kind that I have become acquainted with, and I have kept bees for over twenty-five years, and have used Dugdale's, and two or three other patents, but consider Phelps' Hive far superior to either, or all of them, in every respect.

JAMES WELLS.

Union, Licking Co., O., Sept. 20, 1850.

I hereby certify, that I have kept bees for several years, and have paid considerable attention to the subject, and that I am now using E. W. Phelps' Patent Hive, and that it has fully answered my expectations. I think it the best adapted to the wants of the bees, and the most convenient hive I have ever known.

OLIVER A. MOORE.

Montgomery, Jan. 1, 1853.

To whom it may concern: I hereby certify, that, for some time past, I have felt much interested in the culture of the honey-bee, and being desirous of adopting the best method of managing them, after much investigation, I was led to believe Mr. Gilmore's plan just the thing needed, and, consequently, I purchased a right of Mr. Headly, (Mr. G's agent,) and, last spring, I commenced feeding on Mr. Gilmore's plan, and was soon obliged to abandon it, on account of my bees being robbed by others. Some time in the latter part of June last I had an opportunity of seeing Mr. E. W. Phelps' hive, and considering it far superior to Gilmore's plan, or any other of which I have become acquainted, I purchased a hive of Mr. Phelps. But the season being so far advanced, I was unable to get a swarm into it, (as the swarming season was nearly past when I obtained the hive.) And being anxious to get a colony into the Phelps hive, I drove one into it about the middle of last October, and with a few days feeding, they made honey enough to keep them until about the middle of January. Since that time I have been feeding them in my house, and they are now (Feb. 28th) doing well. I have not only saved my bees, but got them into the hive in which I wanted them, and obtained about sixty pounds of honey from the old hive.

I have no hesitation in saying that I consider the Phelps Hive the best hive I have ever seen; the most convenient and simple in its construction, and the best adapted to the habits and wants of the bee, and the least trouble to the bee-keeper, of any other hive extant.

WM. VAN VRANKEN.

Schenectady, N. Y., Feb. 28, 1853.

I hereby certify that I am using E. W. Phelps' Patent Bee-hive, and consider it, decidedly, the best hive I have become acquainted with, and I have kept bees for seven years, and paid considerable attention to the subject. It affords the bees the best protection against the moth, robbers, and other enemies of any hive I have ever used, as I have not experienced the least difficulty from these causes in these hives, and it is, undoubtedly, the best hive for feeding bees known, as I have tried it to my own satisfaction. I put a swarm into one of these hives in July last—it was a weak swarm, and the season being very dry, there were but a very few blossoms for bees to obtain honey from—consequently they gathered but a small amount, not half enough to sustain them through the winter. I prepared some feed according to the directions accompanying the hive, and commenced feeding them about the 20th of August, and fed them for four or five days, and I found they were making combs and storing them with honey beyond my expectations, while the bees in my other hives were consuming theirs daily; and, in order to know to what extent each were progressing, I weighed the hive that I was feeding and two others of the same kind that contained stronger families and had sufficient honey to sustain them. I then prepared \$1.20 worth of feed and fed the small swarm, which occupied about a week's time; I then weighed the hives again, and found that the swarm that I had fed had increased in weight 11½ pounds, while the others had decreased 3½ pounds each, making 15 pounds in favor of feeding. I continued feeding until I had fed them about \$3 worth of feed, and have since taken from them two boxes of good honey of ten pounds each, which is worth more than the cost of all the feed I gave them, and I have also saved the bees, which would not have survived the winter had they not been fed. I am also acquainted with several bee-keepers in this vicinity who are using this hive, all of which are highly pleased with them.

EDWIN PHELPS.

Westfield, Mass., March 25, 1853.

[The following certificate is the second I have received from the Rev. C. Springer; he has now three of my common hives in use and one of mahogany, in the form of a washstand, in his sitting-room, with bees in it.]

This is to certify, to whom it may concern, that I have had in use Phelps' Patent Bee-Hive for three seasons past, and that my bees have *done well therein*. It is simply the

common hive placed in a chest, and surrounded by a number of contrivances by far the best adapted to the habits of the bee and the wants of the apiarian of anything that has come under my notice.

C. SPRINGER.

Meadow Farm, Muskingum Co., O., Oct. 28, 1852.

[The following is an extract from a letter I received from Isaac Griffin, of Quaker Springs, Saratoga County, N. Y. He first purchased a hive, and, after using it, he bought the right for Saratoga County; since then he has purchased the right for four counties more.]

“RESPECTED FRIEND, E. W. PHELPS:—Last week I took my hive to our County Fair, and was awarded a premium of \$1.50. I have made some progress in selling rights, and have met with much better success than I anticipated; so, now, I can say that I would like to purchase part, or all, of the following counties.” [Naming five counties, four of which I since sold him.] “Thy friend, respectfully,

ISAAC GRIFFIN.

“Quaker Springs, Saratoga Co., N. Y., 9th month, 21st, 1852.”

[I am credibly informed, that in less than one week’s time he disposed of \$325 worth of rights in Saratoga county, and was offered \$100, cash in hand, for four towns more. The following is from the same, since purchasing four counties above mentioned:]

ESTEEMED FRIEND, E. W. PHELPS:—I have just returned from a twelve days’ tour in Columbiana and Rensselaer counties, as I think with very good success. I have appointed several responsible agents that are to pay me \$2 for every right disposed of. In addition to the above, I have realized \$20 for individual rights. I will observe that I have shown my model hive to a *great many* persons, and there has not yet an individual told me that they *ever saw* a hive that combined so many *advantages* as this, and the general sentiment has been that it stands *unrivaled*. Thine, respectfully,

ISAAC GRIFFIN.

Quaker Springs, 12th month, 13th, 1852.

MR. E. W. PHELPS—*Dear Sir*:—I have now had bees in your hive two seasons, and it has *more than* answered my *highest expectations*. I consider it decidedly the best invention for keeping bees that has come within my observation, and I have kept bees for a number of years, and have paid a good deal of attention to the subject—have examined hives of various forms and patents—but, in my opinion, none will compare with yours, when put into practical use; for, the longer I use yours, the better satisfied I become of its great utility. I consider it just what the bee-keepers of our country have long needed. The arrangement of your boxes, (or sections,) with the pane of glass in the back side, and the dividing shutters attached to cut off the communication, places the colony under the inspection and control of the apiarian without the slightest exposure to the bees. The arrangement of the bottom, also, with the moth-traps, placed within the hive, is the most simple and effectual device for preventing the ravages of the moth, and the most convenient and effectual means to destroy them after they have entered the hive, that I have ever known. And in fine, take the hive in all its parts, I consider it far superior to anything of the kind known to me. It is my intention now to dispense with all my other hives, and use none but yours. Your arrangement for feeding bees is the best and most convenient that I have seen; this, I am confident, will make the bee business far more sure and profitable than it has ever been heretofore.

There might have been a good many of your hives sold in this vicinity if you had sent them here. I will further state, that I have been awarded the first premium, by our society, on honey taken from your hive for two seasons past.

Respectfully, yours,

Bluerock Township, Muskingum Co., O., Sept. 25, 1852.

CALEB H. HALL.

[PHELPS’ COMBINATION BEE-HIVE was awarded the first premium and diploma, at the Ohio State Fair, September, 1851, over Kelsey’s, Dugdale’s, Case & Landreth’s, Wheeler’s, Gilmore’s, and, I think, Reynolds and Colton’s. Also, a diploma for the *best hive*, at the Indiana State Fair, and a premium, at the N. Y. State Fair, September, 1852, and premiums and diplomas, at every county fair where exhibited, for four years past, when the regulations of the societies would admit of giving them to articles from foreign counties.]

