# MODERN BEE CULTURE.

## No. I.

## INMATES OF THE HIVE.

So work the honey bees,—
Creatures that, by a rule in Nature, teach
The art of order to a peopled kingdom.
—*Shakespeare.*

If a hive is examined any time during the breeding season, it will be found to contain three kinds of bees. 1st, one bee of a peculiar shape, commonly known as the Queen Bee; 2nd, a number of large bees called drones; 3rd, a great number of a smaller kind called workers. The queen is a most important personage, for without her, or the means of raising one, the colony would speedily dwindle down and die out, or be attacked by insects and killed for the sake of their stores. After being deprived of their queen they lose all disposition to defend themselves or their home. As she is the only perfectly developed female in the hive, all the eggs are laid by her, and is consquently the mother of the whole colony, so that it will be readily understood how the loss of her would affect the hive, inasmuch as there would be no bees hatching out to take the place of those dying from old age. As it is all important to know how to supply them with the means of raising a queen when required, I will now state what should be done, which can be easily accomplished with my moveable frame hives, and then we will follow the bees through the process of queen rearing. One of the most wonderful things in the natural history of the bee is that the egg that would in the ordinary way produce a worker can, by peculiar treatment, be made to produce a queen. You will see by the above that it is only necessary to give them a comb containing worker eggs, and, so far, our work is done. Now for the bees. They will at once commence building royal cells, generally three or four. These are commonly constructed on the edges of

the comb; but, under the present circumstances, would be built over the cells containing the eggs, by making about three worker cells into one. When finished they resemble a small pea nut, or acorn, and project from the surface of the comb. By taking up three worker cells they would likely have three eggs in the royal cell; in that case two would be removed. This egg will hatch into a minute larvæ, or worm, when three days old; it is then supplied with a quantity of milky food, termed royal jelly, to distinguish it from that given to the other bees, from which it differs very much. It now grows very rapidly, and on the eighth day the cell is sealed, or capped over; in eight days more, or sixteen from the time the egg was laid, the queen will hatch out a perfect insect. If instead of eggs, worker larvæ six days old is given, they will rear a queen, and in this case she will hatch in ten days after the larvæ was given them. The above, to those who know very little of the natural history of the bee, may seem very strange, and some, I believe, think it not credible, but it is nevertheless true. A gentleman well known, and residing on the Thames, who is using one of my hives, had positive proof of the same only a few weeks back. His colony was queenless, and dwindling away I told him what to do under the circumstances, and supplied him with a frame of comb containing eggs and brood from my apiary (which was an easy matter, all my hives and frames being made to one gage: every part is interchangeable). This not only gave the bees the means of raising a queen, but strengthened the colony at the same time. I examined the hives a short time ago in his presence, and found the colony in good condition, and a fair proportion of comb with eggs in. The queen bee lives, according to best authories, about 4 years She has her full share of duties, the royal office being no sinecure, when she will lay during the height of the breeding season from 2000 to 3000 eggs a day. She is furnished with a sting, but will rarely, if ever, use it, except against a rival. In order that you may distingush her at any time from the other bees, I will describe her appearance: While she is not near so bulky as a drone; her body is longer, and considerably more tapering, or sugar-loaf in form, than that of a worker. Her wings are much shorter in proportion than those of a drone or worker; the under part of her body is lighter, and the upper part darker than the other bees. Her movements are generally slow and matronly, and, indeed, she looks every inch a queen. When seen she is not easily forgotten.

J. HOPKINS.

The Apiary, Parawai.

*(To be continued.)*

# MODERN BE[illegible] CULTURE.

# No. 2.

# INMATES OF THE HIVE.

Their short proboscis sips
No luscious nectar from the wild thyme's lips,
From the lime's leaf no amber drops they steal,
Nor bear their grooveless thighs the foodful meal;
On other's toils in pamper'd leisure thrive
The lazy fathers of the industrious hive.

The drones, or male bees, are much larger and stouter than either the queen or workers; although their bodies are not so long as that of the queen. They are neither furnished with a sting or a suitable proboscis for gathering honey; no baskets on their legs with which to carry pollen; and no pouches on their abdomens for secreting wax, They are, therefore, physically incapable of doing the ordinary work of the hive. Their office is to impregnate the young queens, and they are usually destroyed at the end of the swarming season; they having become at this date an encumbrance only. The number of drones in a hive under the old box-hive system, where we have little or no control over the combs, oftentimes amount to thousands, and as one is sufficient to impregnate a queen for life, it would seem to be advantageous to the apiarist to limit the breeding of them. This is now being done by those working under the modern system, and will be explained in a future paper. It has puzzled naturalists for ages to account for the apparent excess of drones in most hives. This is what the Rev L. L. Langstroth, one of our best authorities, says on the subject: (It must be understood that the young queens always leave the hive to be impregnated.): "If a farmer persists in what is called 'breeding in and in,' that is, without changing the blood, the ultimate degeneracy of his stock is the consequence. This law extends, as far as we know, to all animal life, man himself not being exempt from its influence. Have we any reason to suppose that the bee is an exception? or that degeneracy would not ensue, unless some provision were made to counteract the tendency to 'in and in breeding?' If fecundation had taken place in the hive, the Queen would have been impregnated by drones from a common parent; and the same result must have taken place in each successive generation, until the whole species would eventually have a run out.' By the present arrangement, the young queens when they leave the hive often find the air swarming with drones, many of which belong to other colonies, and thus by crossing the breed provision is constantly made to prevent deterioration." I take the above to be a very good and common-sense view of the matter. The drone eggs are laid in larger cells than those of the worker, although of the same shape, hexagonal. The drone passes three days in the egg, about a week in the larvæ state, and changes into a perfect insect in the twenty-fourth day after the egg is laid. As the life of the drone is usually cut short by violence it is difficult to ascertain its precise limit. Bevan estimates it not to exceed four months. The worker bees compose the bulk of the population of the hive. An ordinary good swarm will contain from 20,000 to 30,000; and a strong colony in a large hive, during the height of the breeding season, will usually number two or three times as many. The sex of the worker bee has, comparatively speaking, only recently been determined, and, curiously enough, by a young lady—one Mdlle Jurine, who, by her clever dissections and the aid of the microscope, proved beyond a doubt that the worker is an imperfect female, whose ovaries are not sufficiently developed to admit of their laying eggs except under peculiar circumstances, to be explained hereafter. She is smaller than either the queen or drone, and furnished with an exceedingly curious tongue or proboscis for gathering honey, which she conveys to her honey bag or first stomach. This honey bag is surrounded by muscles, which enable her to compress it, and so empty its contents into the cells. Her hind legs are furnished with hollows or baskets, in which to carry pollen or bee bread gathered from the flowers. She is armed with a formidable sting, and will make instant use of it when provoked. It is a most wonderful piece of mechanism. It has two fleshy muscles at the base, which can been by the naked eye; they have the appearance of small levers, and act like pump handles. These levers will work for some time after the bee has left its sting in the flesh, driving it deeper and deeper into the wound. A few days ago I took a sting out of the back of my hand and held it on top of my finger to examine the working of the levers; the point touched my flesh and immediately commenced to penetrate it again. The sting was laying in such a manner that it would go just beneath the surface, and run almost parallel with it. I allowed it to remain, and watched the result: The levers continued to work for about thirty seconds; by this time the sting had been driven into the flesh the full depth, and the point had emerged from the skin, leaving the most of the poison on the outside. It is barbed like an arrow, and therefore cannot be withdrawn by the bee from the human flesh or any tenacious substance. After losing its sting it is generally believed the bee perishes Still, in defence of home it will—

"Deem life itself to vengeance well resign'd;
Die on the wound and leave the sting behind."

The office of the worker bee is to do the general work of the hive, such as gathering honey, pollen, generating wax, carry water, build comb, nurse the young bees, and ventilate and defend the hive. The worker passes three days in the egg, four days in the larvæ state; is then sealed over, and emerges from the cell a perfect insect on the twenty-first day after the egg was laid. From 45 to 50 days is the average length of her life during the heavy working season, those hatched at the latter end of the season living four months or more.

J. Hopkins,
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*(To be continued)*

# MODERN BEE CULTURE.

## NO. 3.

## THE APIARY.

It is necessary that a few important points should be observed in establishing an apiary by those desirous of engaging largely in bee-culture. Although there are few places on the face of the earth, where man can find sustenance, that the bee cannot be kept with profit; still some places are better adapted than others for carrying on bee-culture extensively. Until a few years ago it was thought that only districts specially favoured would give large honey crops, but under the modern system of management it has been proved, by the large yields from all quarters that bee-culture can be profitably carried on almost anywhere. I would therefore say try a hive or two no matter where you may be located. In selecting a spot for the apiary it should if possible be where it will be sheltered from the prevailing winds, close to the dwelling, and in view of the rooms most occupied, or where you will be likely to cast your eye every time you pass out or in. If so situated it will save you a great deal of trouble of watching them through the swarming season. As it is desirable to have the ground dry as quickly as possible after heavy rains, and that no water should stand about, any hollows or low places should be levelled, or filled in, and the ground drained. If it is on a gentle slope it will be all the better. The plot occupied by the apairy should be in grass, mowed frequently and kept free of weeds, for if weeds, and grass, are allowed to grow tall and rank about an apiary, thousands of bees will be lost, by being beaten down in showery weather when coming home loaded, and being unable to rise again through the tangled mass, will perish. As bees ascend with difficulty when heavily ladened, it would be better if the apiary were situated in a valley rather than on a hill, and also near a shallow running stream, for it is astonishing the amount of water they require during the breeding season. The usual method of arranging hives, is either on stands two or three feet high, or in covered sheds. I would not recommend any one to adopt either of these places, they are both bad, as I have proved; the shed not only harbours vermin, but prevents the sun getting to the hives when it is most wanted, in winter. If the hives are as they should be, wind and water tight, the best place is outside on the ground, or rather on a small mound made of fine coal cinders or sand; if either of these are not easily procured, some thin sods will do. By having them on the ground, you can get to work at them better; and if a bee drops short of her hive, as they often do, when coming home heavily laden, she need not rise again, but can walk straight in. The mounts should be about 4 inches high, after being well beaten down with the back of a spade; the top should be no larger than the bottom of the hive, and the sides slanting for rain to run off. Four half bricks or stones should be placed on top for the bottom board of the hive to rest on. This should stand perfectly level across, or from side to side, and have an inch fall to the front. By this the bees have greater facility for cleaning their hive and dragging out their dead. The bricks or stones may be partly buried, so that when the bottom board is placed on them there will be a clear space of two inches underneath the board for the air to circulate and keep it dry. The position of the entrance to the hive is, I think, of very little importance, providing there is a clear flight in front for the bees coming to, or going from, the hive. The hives should not be placed nearer to each other than six feet (the usual space allowed in the American apiaries is seven feet); if placed closer together, the young bees, taking their first flight, are liable to go into the wrong hive, and so get killed, which would be a loss to the apiarist. The best arrangement for hives in large apiaries is hexagonal, or six sided: every six hives is in the shape of a bee's cell, and is the centre of a larger cell and so on. By this plan they are in the best possible position as regards each other, and a given number occupy less ground than they would under any other arrangements. In the summer no place is so congenial to bees as the shade of trees, if not too dense, or their branches so low as to interfere with their flight. I would therefore recommend the planting of fruit trees in the apiary; while forming excellent shade in summer, being deciduous, the hives would get the benefit of any sunshine there might be in winter. Vines trained on trellises on the north side of the hives make first-rate shade, but as they are so infested with blight of late years as to be of little or no use for grapes, I have recommended fruit trees. As a monthly calendar of operations for bee-keepers may be of some service, I will give brief directions applicable to New Zealand with the first paper in each month.

J. HOPKINS.

The Apiary, Parawai, Thames.

*(To be continued)*

# MODERN BEE CULTURE.

## No. 4.

# MOVABLE-COMB HIVE.

"How oft, when wandering far and erring long,
Might one learn truth and virtue from the BEE."

ALTHOUGH movable-comb hives have been invented, and used by some of the most advanced bee-keepers, a great number of years, it is only of late that the system has been so far perfected as to bring it into general use. The great obstacle to its general adoption hitherto has been the difficulty experienced in inducing the bees to build each comb within a separate frame without diverging to others, and so

fastening two or more together. The difficulty no longer exists since the introduction of wide sheets of comb foundation; by the use of which we can make them build exactly where we like. The methods of accomplishing the above before sheets of comb foundation were used, were so tedious, and uncertain in results, and required so much watching, that it was only those who could spare the time, and make it a hobby, that could expect to become successful. Now, we have merely to suspend a sheet within the frame, give it to the bees, and trouble ourselves no more about it, feeling certain that the result will be satisfactory. Huber made the first step towards the present movable-comb hive, by putting movable slats, or bars, across the top, with pieces of comb attached, to induce the bees to build to them; this they did, but in extending the comb downwards would fasten it to the sides of the hive; so that when required to be taken out it would have to be cut free.

Dzierzon, (pronounced Tscertsone) a Prussian clergyman, and the Rev L. L. Langstroth were the next to follow. These two gentlemen were each working for the same end, at the same time, without one having any knowledge of the labours of the other. It was the latter gentleman who, after experimenting with one of Huber's hives, saw there was something yet wanting to make it perfect, and instead of having the slats or bars across the top, extended them round the hive; hence the movable comb hive. I must not forget to mention the late Mr Woodbury, who did a great deal towards improving the hive, and otherwise introducing a humane system of bee keeping. The Rev. Mr Langstroth having accomplished the main point, next set about experimenting to find the most suitable proportions for his hive, and after trying a large number of different sizes finally adopted the one now in use; as being the most useful and handiest to the apiarist, and most suitable to the bee. In fact one writer goes so far as to say, (it has escaped my memory who) in speaking of its proportions, that it is the best hive that can be used while the bee retains its present instinct. Its dimentions are length from front to back 20¼in, width 16in, depth 10 in, outside measurement; it contains when complete ten brood or seven surplus honey frames. The brood frames are ⅞in, and the surplus honey 2in in width. These extend round the hive, and are suspended by shoulders on the frame, resting on rabbits cut in the body of the hive; and run from front to back. As a proof of the superiority of the Langstroth hive over most others, I may mention that it is now between 20 snd 30 years since it was first introduced into America; during the interval hundreds, I may say thousands of so called improved hives have sprung into existence, they have been tried, found wanting, and have gradually glided into obscurity; while the 'Langstroth' has steadily been gaining ground, and is now almost universally used throughoutt America, and getting largely into use in England and other places.

In regard to the most suitable material for hive making, a light porous wood has been proved to be the best; being a bad conductor of heat, it would be warmer in the winter, and cooler in the summer, and would also absorb moisture. Of New Zealand woods I consider Kahikatea well seasoned to be all that could be desired for the purpose. Great care should be taken that all timber used in hive making is well seasoned, that there may be no shrinking or loose joints. It is necessary that the hive should have two or three coats of paint, white is the best colour, as it does not absorb the heating rays of the sun. Of course it may be made plain or ornamented as suits the taste or means of the apiarist, but the proportions should be strictly adhered to. The hive I have described I use myself; I have simplified it somewhat in order to produce it as cheaply as possible, and after having given it thorough trial I feel convinced there is not a better hive in use at the present time. There is one matter in connection with hives that I consider of great importance, although it may not at first sight appear, that is, that one uniform size of hive should be adopted throughout each district. There are many reasons why this would be best, some of which I will enumerate. If the hives and frames were of the same size, all parts would be interchangeable; consequently if you required a frame of brood to strengthen a weak hive, eggs for Queen rearing, or frame of honey for feeding, you could arrange with a neighbouring bee-keeper for one, as his frame would fit your hive as well as his own. And where comb-honey would be marketed, and there was not a large stock, two or more bee-keepers could arrange to send together; the receptacles being the size, could be packed in the same case, and so save freight. I would particulary caution beginners against getting hives of different sizes in their apiaries, as it will cause them no end of trouble.

MAY.—Hives should now be exmained, and prepared for winter. Small colonies should be united with others and full colonies that are light should be fed with candy. The following is the receipt for making it:—Take say 5lbs of sugar, put into a sauce-pan with a little water, boil it until it is ready to sugar off; you can determine when this point is reached by dipping your finger into a cup of cold water, then into the candy, and back into the water. When it breaks like egg shells from the end of your finger it is just right. Take it off the fire at once, and as soon as it begins to harden, give it a good stirring till it gets quite thick. If your are using frames lay one on a piece of board, and fill it with candy, and as soon as cold hang it in the hive. Otherwise, pour into a shallow dish, which should be greased, when cold put into hive.

J. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE CULTURE.

## No. 5.

## REQUISITES OF A COMPLETE HIVE.

"What well-appointed commonwealths! where each
Adds to the stock of happiness within."

As in the previous paper, I have strongly advocated the 'Langstroth hive' for general use, it may be well to give the Rev. gentleman's idea of the requisites of a complete hive. "1st, A complete hive should give the Apiarist such perfect control of all the combs that they may be easily taken out without cutting them, or enraging the bees. 2nd, It should permit all necessary operations to be performed without hurting or killing a single bee. 3rd, It should afford suitable protection against extremes of heat and cold, sudden changes of temperature, and the injurious effects of dampness. 4th, It should permit every desirable operation to be performed without exciting the anger of the bees. 5th, It should afford suitable facilities for inspecting at all times the condition of the bees. 6th, It should be capable of being readily adjusted to the wants of either large or small colonies. 7th, It should allow the combs to be removed without any jarring. 8th, It should allow every good piece of comb to be given to the bees, instead of melting it into wax. 9th, It should induce the bees to build regular combs. 10th, It should enable the apiarist to remove such combs as are too old. 11th, It ought to furnish all needed security against the ravages of the bee-moth. 12th, It should enable the apiarist by removing the combs, to destroy the worms, if they get the advantage of the bees. 13th, The bottom-board should admit of being easily cleaned; and no part of the hive should be below the level of the place of exit. 14th, It should afford facilities for feeding bees, both in warm and cold weather. 15th, It should admit of the easy transportation of the bees to any distance whatever. 16th, It should afford facilities for enlarging, contracting,

and closing the entrance, to protect the bees against the bee-moth and robber bees; and when the entrance is altered, the bees ought not, as in some hives, to lose valuable time in searching for it. 17th, It should enable the apiarist to transfer the combs, brood, and stores from a common to an improved hive, so that the bees may be easily able to attach them again in their natural positions. 18th. It should permit the safe and easy dislodgement of the bees from the hive. 19th. It should permit the surplus honey to be taken away in the most convenient, beautiful, and saleable forms, and without risk of annoyance from the bees. 20th. It ought to be so constructed that, while well protected from the weather, the sun may be allowed in early spring to encourage breeding by warming up the hive. 21st. It should enable the apiarist to prevent a new swarm from forsaking its hive. 22nd. It should enable the apiarist, if he allows the bees to swarm and wishes to secure surplus honey, to prevent their swarming more than once in a season. 23rd. It should enable the apiarist to multiply his colonies with a certainty and rapidity which is impossible if he depends upon natural swarming. 24th. It should enable the apiarist to supply destitute colonies with the means of obtaining a new queen. 25th. It should enable him to catch the queen for any purpose; especially to remove an old one whose fertility is impaired by age. 26th. It should enable the bee-keeper to entirely dispense with costly sheds, as the hive itself should alike defy heat, cold, and rain. 27th. It should permit the honey, after the gathering season is over, to be concentrated where the bees will most need it. 28th. The hive, while presenting a neat appearance, should admit, if desired, of being made highly ornamental. 29th. It should allow the contents of the hive — bees, combs, and all, to be taken out when it needs any repairs. 30th. A complete hive, while possessing *all* these requisites, should, if possible, combine them in a *cheap* and *simple* form, adapted to the wants of all who wish to cultivate bees.

Few would imagine, in reading this long list of desirables, that any hive can combine them all without being exceedingly complicated and expensive. On the contrary; the cheapness and simplicity with which the moveable-comb hive effects this is its most striking feature, and the one which has cost me more study than all the other points besides. Bees can work, in this hive, with even greater facility than in a simple box, as the frames being left rough by the saw give them an admirable support while building their combs; and they can enter the surplus honey-boxes with more ease than they could mount to an equal height in the upper part of a common box-hive.

Having thus enumerated the tests to which all hives ought to be subjected, I submit them to the candid consideration of those who, having the largest experience in the management of bees, are most conversant with the evils of the present system. If, on *full trial*, they find that the moveable-comb hive can abide these tests, they may be willing to endorse the enthusiastic language of an experienced apiarist who, on examining its practical workings, declared 'that it introduced not simply an *improvement*, but a *complete revolution* in bee-keeping. It will be readily understood by the above in which direction the rev. gentleman conducted his experiments—viz., to produce as perfect, and at the same time as simple, and cheap a hive as possible. And I can only say he has been most successful.

I. Hopkins.

The Apiary, Parawai, Thames.

MODERN BEE CULTURE

# ARTIFICIAL COMB FOUNDATION.

"To work the honey bees,
The singing masons building roofs of gold;
The civil citizen kneading up the honey;
The poor mechanic porters crowding in
Their heavy burdens at his narrow gate."

THE first record we have of artificial comb foundation being used, was about the year 1840, when a German named Kretchmer used strips of tracing linen coated with wax, these were passed between engraved rollers which gave them the imprint of the cells. For some reason or other it does not appear to have come into general use at that time. It was about 1857 when another German named Mehring, invented wooden moulds in which to cast the wax, that they came to be more generally used. Next came metal plates, so long used in England, and small hand rollers. But all these methods gave very imperfect sheets as compared with those now made with the best machines; they were neither regular in thickness or of sufficient strength to be used of a greater depth than one or two inches, owing to their liability to break down under the weight of adhering bees. American ingenuity worked out the present method of making the sheets, which for strength, regularity of cells, convenience in packing for transit, and the readiness with which it is accepted by the bees, leave little to be desired. Attempts have been made to produce comb foundation with a greater depth of cell than at present, but so far all have resulted in failure. Since the introduction of this foundation, within the past few years, many difficult points have been solved; such as how to insure straight combs, how to insure all worker comb, or all drone comb, as the case may be, and how to furnish the bees with the most of the wax they need without being obliged to secrete it by the consumption of honey. The last is a very important item when considering the money value of artificial foundation. Wax is not, as usually supposed, gathered by the bees, but is a natural secretion and may be called their oil, or fat. When gorged with honey or any liquid sweet, if they remain quietly clustered together in warm weather, it is secreted in the shape of small scales, in small pouches in their abdomens. Now it is a well known fact that it takes from 15lbs. to 20lbs. of honey to make 1lb. of wax; that is, the bees have to consume 15lbs. to 20lbs. of honey, to enable them to secrete 1lb. of wax. If we can give them 1lb. of wax in the shape of work already done, we thus save, say the lowest figure, 15lbs. of honey; we shall then have to consider the difference between the price of 1lb. of comb foundation and the value of 15lbs. of honey.

| | s. | d. |
|---|---|---|
| Honey, 15lbs. at 9d per pound .. .. .. | 11 | 3 |
| Comb foundation, 1lb at 3s 6d per lb. .. .. | 3 | 6 |
| Balance in favour of comb foundation .. .. | 7 | 9 |

To say nothing of the advantage of having straight combs, which are invaluable, and the time and labour saved to the bees at the busiest time of the year.

The sheets as I make them for the "Langstroth hive" are 16½in. by 8½in. (nearly filling the frames); there are ten of those in a hive; they average about 6½ to the pound, so that it takes about 1½lbs. to completely furnish a "Langstroth hive." It is usual to have the ten sheets worked out, and a considerable amount of honey and brood in them in a week or eight days after a swarm is introduced in the early part of the season.

I had last season a large swarm fill a two story hive (20 sheets), and throw off a large swarm in 22 days. This of course would have been impossible under the old system and without the aid of comb foundation. Here is a portion of the diary of a gentleman using comb foundation for the first time, taken from an English journal:—

"Hive No. 42.—Transferred hive August 9th 1878. Three frames brood, ten frames comb foundation.

"August 10th.—All sheets of foundation worked out more or less. One sheet having fallen down, although partly worked out, had to be replaced by a fresh sheet.

"August 13th.—Fresh eggs fill three sheets of foundation entirely. Honey in three also. Four sheets of foundation are not extended, but have honey stored in them.

"August 19th.—Caught queen and clipped her wing. Plenty of fresh eggs and brood. Extracted honey in six frames.

"August 21st.—Honey stored in frames that were exacted.

"August 26th.—Saw queen. I was obliged to extract one frame of honey to give her vacant cells to lay in.

"August 27th.—All going well."

It will be seen by the above that six frames of honey were extracted on the tenth day after the bees were put into the hive; these frames were 13$\frac{3}{4}$in. by Sin., and would hold when full from four to five pounds of heney.

The bees weighed about 5lbs., the weight of an ordinary swarm.

There can be no doubt that the great success of the honey industry in America is mainly owing to the use of artificial comb foundation.

One firm alone make and supply several tons each season. I made over 1000 sheets last season, and have about 300 in use myself; they have given entire satisfaction wherever used. The sheets made by the best machines, when worked out by the bees contain more perfect cells to the square foot than when entirely made by the bees.

In the next paper I will state some more of the advantages of the use of this great modern aid to bee-culture.

No. VII

These with sharp sickle, or with sharper tooth,

Pare each excrescence, and each angle smooth
Till now, in finished pride, two radiant rows
Of snow-white cells one mutual base disclose.

Since comb foundation has been extensively manufactured and used in America and other places, as might have been expected, various cheap substitutes for pure bees-wax have been tried, such as solid paraffin, ceresin, and different compositions, but all, so far, have resulted in failure. Paraffin will make beautiful foundation, and it is readily accepted by the bees; but as soon as the warm weather comes, and with it a high temperature, down falls the beautiful comb, honey, bees, and all, a shapeless mass on the bottom of the hive. Happily as yet bees-wax is found to be the only material suitable. In the attempts that have been made to supply a material other than pure bees-wax for making artificial comb, it has been noted with what wondrous skill nature supplies just what is needed, for the safety and well being of her creatures. For while wax becomes soft and pliable, so as to be readily moulded by the bees, at the ordinary temperature of the hive, yet there is little danger of melting down during the heat of our summers, if not exposed in too thin a hive. Although bees-wax may be softer at a temperature of 90° or 100° than paraffin and other like substances, yet it does not soften in the same ratio as the others at a higher temperature. Not having had sufficient time to grow shade yet in my apiary, my hives have necessarily been fully exposed to the sun. During the hot summer weather I had a thermometer on one of the hives, and when at times it has registered as high as 130° I have tried the inside of the hive, and it has been quite cool in comparison; as a further proof there was not a bee outside

fanning, conclusively showing that all was comfortable within. The hives are made of inch timber painted white, and in hot weather the entrances are enlarged to nearly the full width of the hive by simply pushing the hive forward on the bottom board. One of the greatest advantages we have in using artificial foundation is in having almost complete control over the breeding department. In order to explain this I must tell you that there are two different sized breeding cells in a hive those in which worker bees are bred measure five to the inch (lineal); drones four to the inch. Now, if we give them all worker comb foundation, we shall undoubtedly limit the breeding of drones, for though when pressed for room the queen will sometimes lay drone eggs in worker cells, it is only to a very small extent. If we are using all worker foundation, which I would certainly recommend, it will be an easy matter to leave room for the bees to build sufficient drone comb. My plan is to leave about an inch space at the bottom of each frame. It is a common plan when there are too many drones coming on in a hive, either to cut out the comb and replace it with worker comb, or with a thin-bladed knife, shave off their heads, by skinning the cells in which they are leaving their bodies to be cleared away by the workers. The sheets, when properly made, are about an eighth of an inch thick, including the embryo side walls; it is much stouter than if built by the bees, but if held between the eye and the light, when partially worked out, it will be at once seen that they have thinned it considerably, and utilised the spare wax in extending the cells. Some of the principal advantages of this great aid to bee-culture are the following:—Straight combs are insured within the frames, and wherever desired. The bees are furnished with the greater part of the wax necessary to build their combs, thus saving much exhaustive secretion, and gaining time. A large force of bees that otherwise would have to remain in the hive while the wax was being secreted in their bodies is set free for gathering honey and pollen. In surplus honey receptacles especially the bees may be easily induced to comb-building long before the main flow of honey commences, so that when it does come, there will be abundant accommodation ready for it. The same advantage holds where it is necessary to give the Queen extra room for laying. The Queen can, in a very few hours after the swarm is introduced, commence laying, and thereby keep up the strength of the hive. The bulk of the colony, instead of being occupied building comb during the best portion of the honey season are at once set free. It very often occurs in a short honey season that a new colony will be occupied during the whole of it building comb, and when ready for storing honey, there is little or none to be gathered, thus causing them to be in a starving condition at the approach of winter. When the extractor it used, it will be found that combs built on artificial foundation can be more easily emptied of their honey than natural combs, as they are better able to stand the strain. They are also of great value to those securing late swarms, as a much larger quantity of comb can be thus built before winter. Altogether, we may safely say that the introduction of comb foundation begins a new era in bee-culture; and that rich harvests await those who avail themselves of this and other modern improvements. Extracts from my notes of last season:—

HIVE No. 1.

October 25.—Hived swarm on ten sheets of foundation. Nov. 1.—Nine sheets worked out and nearly full of honey. Nov. 3.—Started queen cell; preparing to swarm. Nov. 16.—Two sheets of top story worked out and full of honey, extracted.

HIVE No. 2.

October 29.—Hived large swarm on ten sheets of foundation. Nov. 1.—Nine sheets partially worked out and stored with honey. Put on another story. Nov. 5.—Lower hive full; five sheets worked out in top story. Nov. 16.—Nine sheets ready for extractor. Nov. 19.—Swarmed.

HIVE No. 3.

October 31.—Hived swarmed on ten sheets of foundation. November 9.—Five sheets fully worked, four partially, eggs, and capped brood. November 16.—All sheets worked out and full of honey, started queen cells, put on top story, &c.

I think the above results are sufficient to show the advantage of using artificial comb foundations. I have taken the first three out of seventeen, so that I have not picked them.

I. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE-CULTURE.

## No. 7.

## ARTIFICIAL COMB FOUNDATION (CONTINUED.)

"These with sharp sickle, or with sharper tooth
Pare each excrescence, and each angle smooth,
Till now in finished pride, two radiant rows
Of snow white cells one mutual base disclose."

SINCE comb foundation has been extensively manufactured and used in America and other places, as might have been expected, various cheap substitutes for pure bees-wax have been tried, such as solid paraffin, ceresin, and different compositions, but all so far have resulted in failure. Paraffin will make beautiful foundation, and it is readily accepted by the bees, but as soon as the warm weather comes, and with it a high temperature, down falls the beautiful comb, honey, bees, and all, a shapeless mass on the bottom of the hive. Happily as yet bees-wax is found to be the only material suitable. In the attempts that have been made to supply a material other than pure bees-wax for making artificial comb, it has been noted with what wondrous skill nature supplies just what is needed for the safety and well-being of her creatures. 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It is a common plan when there are too many drones coming on in a hive, either to cut out the comb and replace it with worker comb, or with a thin bladed knife, shave of their heads, by skinning the cells in which they are leaving their bodies to be cleared away by the workers. The sheets when properly made are about an eighth of an inch thick, including the embryo side walls; it is much stouter than if built by the bees, but if held between the eye and the light when partially worked out, it will be at once seen that they have thinned it considerably, and utilised the spare wax in extending the cells. Some of the principal advantages of this great aid to bee-culture are the following:—Straight combs are insured within the frames, and wherever desired. The bees are furnished with the greater part of the wax necessary to build their combs, thus saving much exhaustive secretion, and gaining time. 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When the extractor is used, it will be found that combs built on artificial foundation can be more easily emptied of their honey than natural combs, as they are better able to stand the strain. They are also of great value to those securing late swarms, as a much larger quantity of comb can be thus built before winter. Altogether we may safely say, that the introduction of comb foundation begins a new era in bee-culture; and that rich harvests await those who avail themselves of this and other modern improvements. Extracts from my notes of last season:—

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I. HOPKINS.
The Apiary, Parawai, Thames.

# MODERN BEE-CULTURE.

## No. 8.

# HONEY EXTRACTOR.

"Here their delicious task, the fervent bees
In swarming millions tend: around, athwart,
Through the soft air the busy nations fly,
Cling to the bud, and with inverted tube,
Suck its pure essence, its celestial soul."

The Extractor is one of the principal appliances in modern bee-culture; by its aid we are enabled to procure honey in its pure state, without destroying the comb containing it, thus saving the bees much unnecessary labour – which means so much more profit to the Apiarist—as the combs can be given back to them to re fill, and emptied again, and again. The first idea of a honey extractor was taken from a small boy playing with a toy pail in which he had a piece of comb containing honey. After swinging it rapidly round his head, the father of the boy, Von Hruschka, noticed that the honey in the under side of the comb had been thrown out into the pail; taking advantage of this idea he at once set to work and made the first honey extractor or smeilatore as it is called in Italy. It is about twelve years since the first extractor was used; they have been greatly improved during that time. There are several kinds in use at the present time, Abbot's 'Little Wonder' extractor, works somewhat on the principle of the boy's toy pail, but instead of swinging perpendicularly like the pail, the can revolves in a horizontal direction, this requires a deal of manual labour, in fact it is hard work. The best extractors are those that have the can, or cylinder, stationery, with a wire basket inside working on a pivot, into which the frames of combs are put; this is made to revolve at a great speed by gearing wheels, attached to an arm, from the rim of the can; the honey is thrown out of the combs into the can, and is drawn off by a treacle tap or honey gate at the bottom. In these extractors two frames of comb can be emptied at one time. One of the worst features under the old system of bee-culture, and one that has at times, almost made me feel inclined to give up taking honey, is the difficulty of extracting the honey from the combs, so as to have it pure and clean. Some years ago I tried squeezing through a coarse open cloth, this not only spoild the look and flavour of the honey, but caused it to ferment in a short time, and it had to be thrown away. I then tried draining through a piece of mosquito netting made into a bag, of sugar-loaf shape. This also was very unsatisfactory. I next used a large, coarse sieve, over the bottom of which I spread a piece of coarse muslin, and breaking up the comb containing the honey, placed it in the sieve to drain. This was such a slow process, taking days to drain a few pounds, and then perhaps getting only 50 per cent. of the honey from the combs, without squeezing, the difficulty of keeping it out of the way of the bees, and the untidiness of the operation, made it altogether a very unpleasant job. With the aid of movable comb hives and the extractor, all this unpleasantness is got rid of, and we can procure the honey pure and wholesome, and in a saleable form. There are many ways in which the extractor is helpful in the apiary, some of which will be referred to in future papers. It enables us to relieve combs of their honey at any time. Thus we may make room for more brood in the early part of the season, or for stimulative feeding in the autumn. Or, we may extract the combs several times during the honey season. In this way at least double the weight of honey may be obtained. In one of the American bee journals, for February, 1879, there is a credible account of a hive in California, which, by the aid of the extractor, yielded 1000lbs in the season of 1877. A word of caution to those using the extractor:— Never extract from combs until they are sealed over. Unsealed honey is apt to sour or ferment, and as a rule never extract from combs containing unsealed brood. There is generally no necessity to work so close as to extract from brood combs.

Before putting combs into the extractor, that are sealed over, it is necessary to uncap the cells. This is done by taking a thin-bladed dinner-knife, and skimming the tops of the cells. After extracting from one side of the comb turn it round and extract the other. An American bee-keeper, in speaking of the extractor, says, in writing to one of the bee journals:—"I will give what I extracted from three hives, not as a big thing, but to shew that it will pay well at 10 cents per lb.—

| | | | |
|---|---|---|---|
| June | 13, | extracted | 13½ gal |
| do | 20, | do | 14 do |
| do | 27, | do | 16 do |
| July | 6, | do | 18½ do |
| do | 27, | do | 10½ do |
| | | Total, | 72½ gals. |

All from upper stories. It weighed from 11lbs to 11½lbs to the gallon." This gentleman was using the "Langstroth hive."

WORK FOR THE MONTH.—JUNE.

All work, as regards uniting weak colonies, ought to have been completed last month. If, however, this has been neglected, it should be done at once. The directions for feeding light colonies, given for last month, will also apply to this. I omitted to mention in giving the receipt for making candy, that great care must be taken that it is not allowed to burn, as burned sugar is poison to bees. All food ought to be placed *within* the hive, for if placed without it is sure to attract strange bees, and so start robbing. This must be guarded against. The bottom boards of hives should be cleaned occasionally, on fine days, during winter, to destroy the larvæ of the bee-moth. This may be done by gently lifting the hive off and placing it on a temporary board alongside, while the bottom board is being cleaned.

I. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE-CULTURE.

## No. 9.

## REQUISITES OF THE APIARY.

"Not all yon marshalled orbs, that roll so high,
Proclaim more loud a present Deity,
Than the nice symmetry of these small cells,
Where on each angle genuine science dwells."

THERE are few appliances beyond those already enumerated in former papers that it is necessary to have in the apiary, for the successful management of the honey-bee. In this paper I will mention only those that I consider the apiarist cannot dispense with. In addition to those already referred to—hives, comb foundation, extractor—the following are the only appliances I use myself: smoker, mats for covering frames, board for fixing comb foundation in frames, section boxes for comb honey, feeder, and bee-veil (this I use but rarely). These, with the exception of hives, foundation, and extractor, would not cost more than ten shillings, and when once procured, would, with care, last for years.

SMOKER.—Nothing has yet been discovered equal to smoke for quieting bees during manipulation. By this I do not mean that it is necessary to stupefy them before they can be handled; they have only to be slightly alarmed, and nothing does this so readily as a few puffs of pungent smoke. During the season when honey is coming in very fast, hive after hive may be opened, and combs taken out with little risk of being stung. At such times the smoker could be dispensed with, except that is useful for driving the bees out of the way, to prevent any being killed while putting in the frames. There is nothing will vex a careful apiarist more than clumsily killing a bee. After the honey season is over, or when there is very little being gathered, there is more need of a little smoke, as the bees, like ourselves, are more easily provoked when there is nothing coming in than when they are thriving. The best smokers are those that emit a current of cold air and smoke mixed; they are termed cold blast smokers. The advantage of this kind over others, is, that the smoke is cold, instead of hot, when blown upon the bees. The one I have in use is about 6in. square, with the fuel case attached to the bellows, and can be used with one hand while the other is left free for manipulating. It was one of the same make that took the first prize at the great bee and honey show at Kilburn in June, 1879. Rags, or dry, rotten wood make excellent material for fuel.

MATS.—These are for covering the frames, to prevent bees getting up under the cover of the hives. This is a very important matter, and should be attended to, or they will daub all the joints and crevices with propolis, and make it almost impossible to remove the cover without jarring and enraging the bees. And when replacing the cover the bees would be about the joints and get crushed, which would at once show that there was something wrong somewhere. The mats also allow of ventilation without a direct draft. After a time the bees gnaw holes in them, when they must be renewed.

BOARD for fastening comb foundation in frames.—This is a very useful appliance where comb foundation is used. It is made from a piece of board three-eighths of an inch thick, cut slightly smaller than the inside dimensions of the frames, and two small battens are nailed across the back, projecting beyond the ends of the board.

To fasten a sheet of foundation, hold the board in the left hand, place a frame inverted against the battens; the board will then be within the frame, and just reaching the groove in the top bar: lay the sheet on the board and press the edge into the groove. Elevate one end of the board and frame slightly, and with a spoon pour a little melted wax into the groove at the upper end; it will then run down and fasten the sheet securely. Both sides of sheets should be treated in the same manner, but care must be taken to allow the wax to set, and to support the sheet while turning the frame, and also when inverting it to its proper position. It should then be hung up in an empty hive for safety. In cold weather the sheets should be slightly warmed before handling.

Section Boxes.—These are for securing comb-honey, and may be of any size; but those generally used, and found to be the most convenient, are made to contain 1lb and 2lbs of honey. It will not be necessary for me to say more about them now, as I shall refer to them at length in a future paper.

Feeder.—This also is a very useful article in the apiary, as at times it may be necessary to feed a light colony, or to induce brood rearing in early spring. There are many different kinds in use, but the cheapest and handiest for feeding syrup are those made from a solid piece of wood; a piece of 3in. x 2in. one foot long, with three deep grooves in it, with a circular saw set wobbling. If a little very hot wax be put into these feeders and poured out again immediately it will coat them sufficiently to prevent the wood absorbing any of the syrup. These feeders can be used either inside or outside the hive with perfect safety to the bees. While on the subject of feeders I may as well answer a question that has been put to me as to why I recommended candy last month for feeding instead of syrup. If feeding is necessary in cold weather, next to sealed honey candy is best, as syrup contains such a large proportion of water it would not ripen after being stored in the cells, in other words the water would not evaporate; and unripe food is liable to give bees dysentery. While there is so little water in candy that it may be given to bees in cold weather with safety.

Division Boards.—These are thin boards made to fit inside the hive from front to back, and are for contracting the dimensions of the hive to accommodate a small colony, and can be enlarged as the requirements of the colony demand.

Bee-Veil.—This may be made of tarlatine or grenadine to fit over a wide brimmed hat and tucked in the collar of the coat. It gives a timid person, or beginner, a sense of security; but after a while generally gets laid on one side. It is handy to have by you in cases of need. In future papers I shall have occasion to refer to all the above appliances, when the method of using them will be gone into at greater length.

T. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE-CULTURE.

## No. 10.

# HONEY, AND HONEY DEW.

"Nor scorn ye now, fond elves, the foliage sear,
When the light aphides, arm'd with puny spear,
Probe each emulgent vein, till bright below,
Like falling stars, clear drops of nectar glow."

HONEY is a vegetable production, and was known as such to the ancient Jews, one of whose rabbis asks: "Since we may not eat bees, which are *unclean*, why are we allowed to eat honey?" and replies: "Because bees do not *make* honey, but they *gather* it from plants and flowers." There is also a saccharine substance termed honey dew, which is sometimes gathered in large quantities by the bees. It is generally found on the foliage of particular kinds of plants and trees, and is by many believed to be an exudation from their leaves. While others believe it to be discharged from the bodies of small *aphides*, or 'plant lice.' There are some again that think it may be produced in either way; and a few, that it is a natural dew that falls in the night.

In America, at the present time, there is a great difference of opinion as to the manner of its production. A gentleman writing to one of the American bee journals, in February of this year, says: "In December number, you ask me what kind of an oak it was on which I found such an abundance of the honey dew. It was the *Quercus nigra*. In reply to the question, 'Is it really a fact that trees sometimes yield honey from their leaves as well as blossoms?' I say they do. As evidence of this I offer the following:—Virgil stated, prior to the Christian era, "Hard oaks shall distill the dewy honey." Mr Weimoo, of this county, has seen the honey dew on the leaves of the *Quercus macrocarpa* (Bar Oak), and also on the leaves of the beech in Ohio, and in the state of Virginia, on the leaves of other trees and shrubs; but he never saw it till some of the leaves began to don the yellow or purple hue

of autumn. Mr J. Taylor has seen and tasted the honey dew on the leaves of the *Nyssa milliflora* (Gumtree) It was so thick that by pressing the leaf with the fingers it would adhere enough to raise the leaf. These leaves had begun to assume that beautiful rosy tint so common to this species of tree, in the last of summer or beginning of the fall months. We also noticed the bees working on the heads of wheat in the time of harvest. He said to me, 'Six of us went to harvest wheat. When we arrived at the field, we noticed quite a dew on the heads of the wheat; every beard had a small drop on the outer end, and bees were flying and working on some of the heads. On close inspection I found near the grains a tenacious fluid, which was touched and tasted by all of us, and found to be quite sweet. This was not found on all the heads, but on occasional ones." Mrs Dr. Noble, a botanist, has found the honey dew several times on the leaves of the beech in numerous small drops. The writer of this has seen the bees work on the leaves of the *Salix Nigra* (Black willows) long after the flowering season had passed. And many times has he watched the bees as they sipped the dewy nectar from its leaves. He has seen them work on the ripened grain, at or near the time of harvest, and has seen the inspissated nectar on the leaves of the wild cherry and sycamore trees. These instances are enough to establish the fact, that leaves, as well as flowers, furnish honey for the bees.—J. B. Cline, M.D." Here is another letter in the same number, from Professor W. J. Reale, of the Michigan Agricultural College, on the other side of the question, he says:—"The last number of your magazine has an article on this topic (the origin of honey dew). I have seen many classes of "honey dew" on many kinds of plants. Some have been sent me by letter. I have never seen one in which I thought the leaves exuded the sweet. Under a high magnifying power, I could not detect openings where it had escaped, nor were there any glands that could secret the honey. The dew is usually on the upper side of the leaf, while the *Stomata*, or little breathing pores, are on the under side of the leaf. On *carefal observation*, for some days, I believe that in all cases honey dew will be found to be the exudation of small insects, known as plant lice. The lice may not be seen for some time. Some of them move about quite freely and hide under pieces of bark. A case of this kind occurred the past summer on some larch trees near my door.

Professor A. J. Cook and myself, after a while, fully satisfied ourselves that all the honey came from insects, which we did not find for a week or more after the bees found the dew. The same was found on our Norway spruces. Of course there may be cases unlike any I ever saw. Many species of plants are furnished with glands and glandular hairs, which secrete a liquid or viscid substance. It may be that in some cases this secretion drops on the leaves below, and causes "honey dew," but I believe the above statements to be near the truth. In the *American Naturalist* for 1878, the writer illustrates some of the glands on the leaves of snow-ball and fruit of trumpet creeper. Other plants have glands. It is not likely that I know *all* about the subject. Another writer in the same number says, "Several years ago there arose a cloud in the south-west, producing a mist for the space of thirty minutes. The bees carried the same in, sipping it from the grass and leaves as though it were honey, and passing in and out excitedly. A heavy rain then stopped operations. Mr G. G. Large states a similar occurrence in the north part of this county (Pana, Ill). *What was it?*" The editor answers, "I cannot explain it at all, unless that cloud was a cloud of insects of some kind that exuded honey while on the wing." I have never been able to detect anything in the shape of "honey dew" in New Zealand yet; perhaps some of your readers may have. If so, I should like them to give the particulars. I gather from all I have read on the subject that it is most plentiful in the autumn months; although Bevan says "It is most abundant in June and July (of course these months would answer to December and January here) and is chiefly found on the oak, the elm the plane, the sycamore, the lime, and the blackberry; occasionally also on the cherry, currant, and other fruit trees. The oak generally affords the largest quantity." Whatever way it may originate, it is eagerly gathered by the bees, and is produced in such abundance at times that they are able to fill their hives in a very short time. It would appear that the honey from this source, although seldom light-coloured, is generally of good quality. Honey ought not to be taken from the hive for use before it has been sealed over by the bees, for until this is done it is not ripe, and therefore not so wholesome. Any rank or unpleasant taste it may have when first gathered is in most cases entirely gone before the bees seal it over. In some of the Southern States of America all that is unsealed is rejected. In the process of ripening the honey gets much darker and clearer, so that clear, transparent honey is not always the best. Any honey about which there may be a doubt as to its being wholesome should be boiled before being used; this will expel any noxious properties it may have.

I. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE-CULTURE.

## No. 11.

## POLLEN, OR BEE BREAD.

"First the grey willows' glossy pearls they steal,
Or rob the hazel of its golden meal,
While the grey crocus and the violet blue,
Yield to their flexile trunks ambrosial dew."

POLLEN is the dust-like particles of farina, found on the stamens of flowers. It is gathered by the bees, and is indispensable to the nourishment of their young, for without it, or a substitute, brood cannot be raised. It is very rich in nitrogenous substances, which are very necessary for the formation and maintenance of muscular tissue, and therefore needful to the development of the young bee. Previous to Huber's time pollen was supposed to be used in comb building. He, however, proved by experiments that comb could be built by the bees in confinement, by being fed with honey or sugar syrup, without a particle of pollen. He was not long in discovering that pollen was used for the nourishment of the young bees. Confining some to their hive without pollen, he supplied them with larvæ, honey, and eggs. In a short time the young all died. A fresh supply of brood being given them, with plenty of pollen, the development of the larvæ proceeded in the natural way. Until recently pollen was not considered to be part of the food of an adult bee; but at the present time, amongst the most experienced bee keepers, it is believed that nitrogenous food is necessary to supply the enormous waste of muscular tissue that takes place daily in every hard-working bee. The following analysis of pollen is taken from the *Journal of Horticulture*:—

| | |
|---|---|
| Artificial nitro. organic subs. ... | 36·59 |
| Water ... ... ... ... | 12·74 |
| Ash ... ... ... ... | 2·72 |
| Albuminous ... ... ... | 21·75 |
| Sugar ... ... ... ... | 26·20 |
| | 100·00 |

Here we find albumen and nitrogen predominating. The way in which the

pollen is gathered by the bees is very interesting. The worker bee is furnished with a long flexible brush-like tongue, with which, while hovering over the centre of the flowers, she sweeps up the grains of pollen. She then wipes her tongue with her front legs in a peculiar manner, which I will try to describe.

The bee has three pairs of legs. Under what we will term the knees of the first pair are small blades or tongues, attached to the legs above the knee, and extending downwards past the joint. These tongues can be shut, *i.e.*, pressed against the legs or opened at pleasure; right under the knee on the leg is a small semicircular cavity, when the bee is about to transfer the pollen she has gathered to her pollen-baskets, she places her tongue in the cavities of both legs closes the blades and then withdraws it (her tongue), leaving the pollen adhering to the sides of her knees. It is then worked up into a small pellet with her tongue and legs, and placed by the second pair, into the spoon shaped hollows, or baskets, on the third or last pair of legs, and neatly patted down. These baskets are furnished with short stiff hairs which prevent the pollen falling off. After having gathered sufficient to make a load the bee of course makes for her hive. Her next movemeets, are graphically described in the *British Bee Journal* for May 1876, and are as follows:—The pollen-laden bee, upon entering the hive, makes directly for the brood-nest, and where its load is required, it quickly disencumbers itself. Sometimes the nurse-bees are in want of the all-necessary pollen, and nibble it from the legs of the worker without ceremony; but more often the bee goes to a cell devoted to pollen-storing, and hangs by its first pair of legs to another cell immediately above, and (as it were) kicks the balls of pollen into the proper receptacles. Here they are mixed with a little honey and kneaded into a stiff paste, which is then rammed hard against the bottom of the cell for future use, the bee using its head as a battering ram; these operations are repeated until the cell is almost filled with the kneaded dough, when a little clear honey is placed on the top, and it is sealed over and preserved as bee-bread. If a cell full of pollen be cut in two longitudinally its contents will, as a rule, be found of many colours, stratified, the strata of varied thickness standing on edge, as if the bees instead of storing bread had stored pancakes. In cold climates, to induce brood rearing in early spring, before there is a supply of natural pollen, resource is had to a substitute. Artificial pollen, as the substitute is termed, generally consists either of pea flour, wheaten flour, rye flour, or a mixture of finely ground oats and oats. This is placed in a sheltered position in the apiary, with short straws or shavings mixed with it for the bees to light upon, and a piece of honey or a little syrup near to attract the bees and get them started, when there will be no further trouble, save replenishing the material if necessary. Mr J. H. Townley, of Mich., U.S., says—'It will pay to feed meal in spring, as early as the bees will work at it, which is sometimes the first warm day. I use meal made of about two bushels of wheat to one bushel of wheat screenings, and direct the miller to grind it as fine as possible. Last spring (1879) the bees in my home apiary worked all the soiling qualities out of about seven bushels of it.'—*Gleanings in Bee Culture.* In New Zealand, at any rate the northern part, there is very little need of artificial pollen, as natural pollen can be gathered more or less all through the winter and spring months except in severe weather. The willow is to the apiarist one of the most valuable as being one of the very earliest honey and pollen producing trees we have. It is all-important to start brood rearing early, in order to have the hives strong at the commencement of the honey season; for this purpose a little stimulating feeding is necessary and if there has been a continuance of severe weather, artificial pollen may be given with advantage.

WORK FOR THE MONTH.—July.

Little will need to be done this month, beyond keeping hives clear of vermin, against damp, and to see that each colony has a *sufficient supply of food*; more bees are lost for the want of a little judicious attention in this matter, than all other causes together. Timber required for hives next season, should be stacked in a dry airy place to get thoroughly seasoned.

I. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE CULTURE

## No. XII.

## NATURAL SWARMING, AND HIVING SWARMS.

"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."

SWARMING is the act of a great number of bees, headed by their queen, leaving the mother hive to form a new colony. It is in this multiplication of colonies by swarming that an all-wise Providence has guarded the bee against the possibility of its extinction. Want of room is the most general cause of swarming, although not always the cause, as I have known the bees to swarm from a hive before it was half filled with comb. Sometimes it gets to be a sort of mania with them, and they will swarm when least expected. The season that bees usually swarm is in the spring, when the population of the hive is increasing very rapidly, and the combs are fast being filled with brood, honey, and pollen. It is then that the bees make preparations for swarming, by building a number of royal or queen cells. These cells are generally begun about the time drones make their appearance, and, as explained in a former paper, there is an interval of a day or so between the finishing of each, consequently there is a corresponding interval between the maturing of each young queen. Unless delayed by unfavourable weather, the first swarm will leave about the time the first royal cell is sealed over, or nine days before the first queen is hatched. This swarm is invariably led off by the old queen, and may be expected any time between the hours of ten a.m. and two p.m. If the apiarist is inclined to follow up the ancient custom of "tanging," now will be the time to muster all the household with bells, tin-kettles, frying-pans, &c., to ring down the swarm. But if he happens to be of a liberal turn of mind, and cares nothing about ancient usages, and does not wish to disturb the whole neighbourhood, he will sit quietly down till the swarm settles, which they will be pretty sure to do in a few minutes, on one of the nearest shrubs or trees. In speaking of the time-honoured custom of "tanging," a writer in the *London Quarterly Review* says:—"Some fine, warm morning in May or June, the whole atmosphere seems alive with thousands of bees, whirling and buzzing, passing and repassing, wheeling about in rapid circles, like a group of maddened bacchanals. Out runs the good housewife, with the frying-pan and key—the orthodox instruments for *ringing*—and never ceases her rough music till the bees have settled. This custom, as old as the birth of Jupiter, is one of the most pleasing and exciting of the countryman's life; and there is an old coloured print of bee-ringing still occasionally met with on the walls of a country inn, that has charms for us, and makes us think of bright, sunny weather in the dreariest November day. Whether, as Aristotle says, it affects them through pleasure or fear, or whether, indeed, they hear it at all, is still as uncertain as that philosopher left it; but we can wish no better luck to every bee-master that neglects the tradition, than that he may lose every swarm for which he omits to raise this time-honoured custom." There can be no doubt, as Mr. Langstroth says, that "The swarming of bees is one of the most beautiful sights in the whole compass of rural economy." The excitement of the bees at this time seems to be more than shared by those about, especially if they are rather long in settling. It reminds me of the old-fashioned box-hive man (the owner of over 300 hives) and the way he described the excitement in his family at swarming time. Mr. K— also "reckoned" he'd a lively time when they were swarming. When he saw a swarm "bilin" out, he "hollered" for Gus, Phebe, and the "old woman;" the dog and cats edged round too; they were all busy, and "sich a roarin!" Mr. K— said it made him "narvous to think on't." To return to our subject. The swarm having settled, the first thing required will be a hive, and here let me impress upon those keeping, or about to keep bees, the necessity of having a supply of spare hives on hand before the swarming season sets in. It has been too commonly the case, that the swarm has been in the air before the need of a spare hive has been thought of. They should be in readiness not later than the month of September; for though the majority of swarms, under the box-hive system, do not come off until the middle or latter end of November, we should, under improved management, have them off at least a month or six weeks earlier, allowance, of course, to be made for a forward or backward season. The hive intended to receive the swarm should have been placed where it is to remain permanently, care being taken to have the bottom board perfectly *level* from side to side, in order that the frames may hang plumb, and with an inch fall to the front or entrance. As it would be very awkward to take the swarm in the hive, owing to the frames, the usual plan is to shake them into an ordinary box as soon as settled; if they are on a small limb of a tree or shrub, this may be done by holding the box close under the cluster, and giving the limb a smart shake or jar with the hand; if, however, they are on a large limb, that could not easily be shaken, it would be better to brush them in. There are many ways of taking a swarm, under different circumstances, that would present themselves to the apiarist. All that is necessay is to get the queen in the box and the rest will soon follow, and by securing the lower half of the cluster you are pretty sure to have the queen. In some of the American apiaries, where the bees are allowed to swarm naturally, the swarm as soon as taken is carried at once to the hive, and shaken on to a cloth close to the entrance, when the bees apparently walk straight in. After trying this method last season, and it having twice failed with me (the bees rising again instead of going into the hive), I adopted the following plan. I spread a cloth near where the swarm had clustered, shook or brushed the bees into a box, placed the box upside down on the cloth, turned the sides and ends over the box for a minute or two, to keep them together, turned down the cloth and raised one end of the box with a stone or piece of wood, to allow any that were outside to go in. If the queen is in the box, they will before this have set up a loud joyous hum, while a number of bees will be fanning round the edge. If the queen is not in the box, the bees will rise and settle again, when the above process will have to be repeated. After shading them from the rays of the sun, I let them remain till evening. I then carried the box to the hive, shook them on to a cloth, and placed the hive over them, taking care to prop one end up a little so as not to injure any bees. When they have ascended into the hive, which will be in a short time, it may be placed on the bottom board, and the frames if out of order put right.

I. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE CULTURE

# No. XIII.

## NATURAL SWARMING AND HIVING SWARMS.—*Continued.*

"Up mounts the chief, and to the cheated eye
Ten thousand shuttles dart along the sky;
As swift through ether rise the rushing swarms,
Gay dancing to the beam their sun-bright forms."

In the last paper I described the ordinary method of swarming and hiving swarms. As, however, by this plan there is a possibility of losing swarms by their absconding, or sometimes a difficulty in taking them, owing to their having settled in some unhandy place, I will describe a way by which the above evils may be avoided, and one that is in common practice in America. Soon after a young queen has been fertilised one of her wings are clipped; this prevents her flying with the swarm, as she otherwise would do as soon as she came out of the hive, but instead, falls to the ground. The person in attendance picks her up when she makes her appearance (which is usually among the last that leave the hive) and cages her. The cage may be made by rolling a fine piece of wire netting or perforated zinc round the finger, or a small stick, into a tube, and securing the ends. Directly the bees are all out, move the hive away to a new stand, put a new one in its place, and lay the caged queen down near the entrance. The bees will, in a short time, discover that the queen is not with them, and go back to the old stand. When they commence to go in release the queen, and see that she goes in too. In one of the best publications on bee-culture, it says, in regard to this plan:—"If, as we have advised, the queen has her wing clipped, the matter becomes very simple, in fact, so much simplified that, were there no other argument, this would be sufficient to recommend the practice of cutting the queen's wing. Now, if several swarms cluster together, we have not to separate them, they will separate of themselves, and return to their old home. To migrate without the queen means death, and life is sweet even to bees, and is not to be willingly given up, except for home and kindred. Neither has the apiarist to climb trees, to secure his bees from bushy trunks, from off the lattice-work or pickets of his fence, from off the very top of a tall, slender, fragile fruit-tree, or other most inconvenient places. Nor will he even be tempted to pay his money for patent hivers. He knows his bees will return to their old quarters, so he is not disturbed by the fear of loss, or plans to capture the unapproachable. It requires no effort 'to possess his soul in patience.'" There can be no doubt that the above is the most effectual method that can be adopted where we depend upon natural swarming. The apiarist is saved a deal of trouble, and can make sure of securing his swarms; for even if the queen should get lost, or he is not on hand to pick up the queen and change the hives, the bees will be saved, as they are sure to return. The following directions for clipping the queen's wing is taken from "Cook's Manual of the Apiary":—"To clip the queen's wing, take hold of her wings with the left thumb and index finger—never grasp her body, *especially her abdomen*, as this will be very apt to injure her—raise her off the comb, then turn from the bees, place her gently on a board or any convenient object—even the knee will do—she will then stand on her feet, and not trouble by constantly passing her legs up by her wings, where they, too, would be in danger of being cut off. Now, take a small pair of scissors, and with the right hand open them, carefully pass one blade under one of the front wings, shut the blades, and all is over. Some apiarists complain that queen's thus handled often receive a foreign scent, and are destroyed by the bees. I have clipped hundreds and never lost one. I believe that the above method will not be open to this objection. Should the experience of anyone prove to the contrary, the drawing on of a kid glove, or even the fingers of one, might remove the difficulty." To make sure work of hiving, a frame of comb, containing eggs and unsealed larvæ, should be given to them; this not only prevents them leaving again (bees will not leave unsealed brood), but supplies them with the means of raising a queen in case anything should have happened to their own while hiving them. As I have known a number of cases where fine swarms have been lost through not hiving them soon after having settled, and as this was for the want of a little knowledge of the habits of the bee, I will explain why they should be hived directly. The bees, as a rule, have no fixed home when they swarm, and, therefore, settle on some convenient place near at hand, while a number of bees, termed scouts, go off in all directions in search of a suitable place no make a home. When this is found the scouts return, and if the swarm has not been taken from where they clustered they will lead them straight off to their new abode. Or if the scouts have returned too late to make a start that day they will take them off first thing next morning, even if they have been hived in the meantime, when the owner may bid them farewell.

## AFTER SWARMS.

After swarms, as the name indicates, are those that issue from the hive shortly after the first, and are always led by virgin queens. It will be remembered that, in the last paper, I stated that the bees in preparing to swarm, build several queen cells, in which eggs were deposited; consequently there would be several young queens maturing in the hive, it is these queens that head the after swarms. It may be that a very strong colony will send out two or more (I have had as many as four from a hive in five days). Now, as the first swarm, if the weather is favourable, will leave about the time the first queen cell is sealed over, we must expect an after swarm on the ninth *day following. If the bees have decided to send out more* than one, there will be an interval of a day or so between each until they stop. When the last swarm has left, the next queen hatched reigns supreme, and is allowed to go round to the remaining cells and kill her would-be rivals. I say allowed, because the natural instincts of the queens would prompt the first hatched to do it, but if she is required to head a swarm, the bees protect the other queen cells, and will not let her near them. If honey is the principal object of the apiarist, and not increase of colonies, after swarming should not be allowed. It can be stopped by cutting out all queen cells save one, and giving more room by putting on an upper story, directly after the first swarm left. If we do this, we shall very likely have from six to ten, or more queen cells, with young queens in them, that would hatch out under favourable circumstances in a few days; these are just what we require for queen rearing, but this will come under another head.

L. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE CULTURE.

## No. XV.

## ARTIFICIAL SWARMING.

"Swift as the falcon's sweep, the monarch bends
Her flight abrupt; the following host descends.
Round the fine twig, like clustered grapes, they close
In thickening wreaths, and court a short repose."

THE numerous difficulties attending natural swarming have for ages retarded apiculture. These difficulties have caused apiarists to direct their attention to the devising of some more safe and reliable method of increasing their colonies. Although, with movable comb hives, colonies may be multiplied with a certainty and rapidity unknown before these hives were in use, still, there are difficulties that accompany this mode of increase, that it is impossible to remove by any kind of hive. Various automatic swarmers have been invented and brought into use, some have been partially successful, while others have been complete failures; the amount of attention required to adjust them day after day made the "remedy as bad as the disease." It is only of late years, since such great improvements have been made in the hive, that artificial swarming has been extensively practised, and now it is common in large apiaries for the whole of the swarming to be done artificially. Before proceeding to give one of the various plans recommended and practised successfully for making artificial swarms, it may be as well to enumerate some of the difficulties that are associated with natural swarming, so that bee-keepers may decide which is their best way of multiplying colonies. The great number of swarms (estimated at about one-fourth) lost every season is a strong argument against natural swarming—this loss it is almost impossible to prevent. The apiary requires to be closely watched during the swarming season, and the apiarist on hand to hive his swarms. This deters many from keeping bees, especially those whose business takes them from home every day; even if he could always be at home it might sometimes be inconvenient for him to attend to his bees. Although the method of clipping the queen's wing simplifies the matter very much, still, some one must be at hand to shift the hive, &c., or it would be a failure. So that any plan by which the above evils may be avoided, and still increase our colonies if desired, cannot but be an improvement. I will now describe the method I intend to adopt next season, as I like it better than the one I tried last. I will give it in the writer's own words:—"By the process already described (queen rearing) we have secured a goodly number of young queens, which will be in readiness at the needed time. Now, as soon as the honey harvest has well commenced, and the colonies have become pretty populous, transfer one of the nuclei containing a fertile queen to an empty hive—by lifting the three frames out of the one and putting them into the other—remove the same close alongside the colony we wish to divide. This must only be done on warm days, when the bees are active, and better be done while the bees are busy, in the middle of the day. Open the old hive, and remove four combs well loaded with brood, and, of course, containing some honey, from the old colony, bees and all, into the new hive. Also take the remaining frames and shake the bees into the new hive. *Only be sure that the queen still remains in the old hive.* Fill both the hives with frames of comb, or comb foundation, and return the new hive to its former position. The old bees will return to the old colony, while the young ones will remain peaceably with the new queen. The old colony will now contain six frames of brood, honey, &c., the old queen, and plenty of bees, so that they will work on as though nought had transpired, though, perhaps, moved to a little harder effort by the added space and four empty frames. The empty frames may be all placed at one end, or placed between the others, though not so as to divide the brood. The new colony will have seven frames of brood, comb, &c., three from the nucleus and four from the old colony, a young, fertile queen, plenty of bees, and will work with a surprising vigour, often even eclipsing the old colony. If the apiarist has several old colonies it is better to make the new colony from several old colonies as follows:—Take one frame of brood from each of four old colonies, or two from each of two, and carry them, bees and all, and place with the nucleus. *Only be sure no queen is removed.* Fill all the hives with frames of empty comb, or comb foundation, as before. In this way we increase without in the least disturbing any of the colonies, and may add a colony every day or two, or perhaps several, depending upon the size of our apiary, and can thus always, so my experience says, prevent swarming. By taking only brood that is capped, we can safely add one or two frames to each nucleus every week, without adding any bees, as there would be danger of loss by chilling the brood if it were capped. In this way, as we remove no bees, we have to spend no time in looking for the queen, and may build up our nuclei into full colonies, and keep back the swarming impulse with great facility. These are unquestionably the best methods to divide, and so I will not complicate the subject by detailing others. The only objection that can be urged against them, and even this does not apply to the last, is that we must seek out the queen in each hive, or at least be sure that we do not remove her. If we proceed as above described, the bees will seldom prepare to swarm at all, and if they do they will be discovered in the act by such frequent examinations, and the work may be cut short by at once dividing colonies as first explained, and destroying their queen cells, or, if desired, using them for forming new nuclei." I. HOPKINS.

The Apiary, Parawai, Thames.

MODERN BEE CULTURE

## No. XVI.

## QUEEN REARING.

"So work the honey-bees,
They have a king, and officers of sorts,
Where some, like Magistrates, correct at home."

THE rearing of queens forms a very important part of the modern system of bee-culture, and those who would make the most of this industry will not neglect this part of it. The necessity of having spare queens on hand to supply the place of those grown old, and, therefore, less prolific, or those that by accident or otherwise get lost or killed, will be readily understood when it is remembered that a young, healthy queen lays from 2000 to 3000 eggs every day during the height of the breeding season, so that every day a colony is queenless, it is losing that number of eggs, that would in due course have hatched into bees. Now, supposing that a colony becomes queenless, and we have not a fertile queen to give them, but they have or are supplied with eggs to raise one, if they start with eggs just hatched into larvæ, *i.e.*, three days old, it will be thirteen days before the queen emerges from the cell, three more before she is fertilised, and most likely another six before she commences to lay, making in all twenty-two days. During these twenty-two days the colony has lost, at the lowest calculation, 44,000 eggs or bees—this number would make a fairly-strong colony—so that before any bees commenced to hatch, which would be another twenty-one days, the colony would be getting very weak. In natural swarming also we prevent a great loss by giving the colony a fertile queen shortly after the swarm has left. As I stated in the paper on swarming, if not prevented by unfavourable weather, the first swarm will leave about nine days before the first queen is hatched, it would be another nine before she commenced to lay, making eighteen days, or a loss of 36,000 eggs. I think in the above I have explained the matter sufficiently to show the advantage of rearing and keeping on hand some spare queens, to say nothing of the importance of being able to select your eggs for queen rearing from any colony showing qualities above the usual standard, and thereby improving your bees. There are several ways that queen cells may be procured for queen rearing, such as depriving a colony of its queen, &c., but the best method is the following, because we get them in the natural way :—Early in the spring, about the beginning of September, select one or more of your best colonies, those that gave the best results last season, and get them strong in advance of the others by slow-feeding, or, if need be, by giving them frames of sealed brood from other colonies, so that they may swarm two or three weeks before the rest are ready. The hives, as they become strong, should be examined at least every second day, to note the date when the queen cells are commenced—there may be from six all the way up to a dozen or more in the one hive. About the seventh day after the queen cells were started the swarm will issue. With this as regards queen rearing we have nothing to do. As a queen is hatched in sixteen days from the time the egg is laid, we must see that the cells are cut out before this time. On the tenth day from the starting of the queen cells we are ready to form our

### NUCLEI.

The word nucleus, as applied to bee-culture, is simply a hive and colony on a small scale, used for the purpose of rearing and keeping queens, the plural of the word is nuclei. The nucleus hives should be of a length and depth to take the frame we use generally in the apiary, but not be wider than to take three frames, 4¾ inches inside measurement.

We are now ready to cut out our spare queen cells. This must be done very carefully, without pinching the cell. If they are not too close together give plenty of room around the base or part attached to the comb. A very sharp, thin-bladed penknife is best for this purpose. Having cut out all the cells save one, and placed the nucleus hives in position, go to a strong colony and gently lift out one or more of the central frames until you find the queen; the frames as you take them out may be hung in an empty hive for convenience. As soon as the queen is found, put her into an empty hive with the comb she is on, and insert a queen cell in each comb containing hatching brood as you take it from the hive, and then place it with the adhering bees into the nucleus hive. Proceed in this way until you have inserted all your cells, taking care that only one cell is given to each nucleus. There will probably be five good nuclei made from a fair colony, and the old queen with her comb will make another. If there is not much hatching brood in the comb in which the cell is inserted, it would be better to put another frame of brood beside it; the other frame or frames may be filled with empty comb or comb foundation. After all the nuclei have received their cells, they should be watched to see that sufficient bees remain. Should too many leave, give them more by shaking a frame loaded with bees on top of the frames of the nucleus. Now, if the above was done when the cells were ten days old, the queens will hatch out in six days, and in seven or eight days more will be laying; they will then be ready to give to queenless colonies, and another cell may be inserted in the nucleus. The above, I have no doubt, will appear a very formidable job, to those working on the box hive system, but it is only a part of the everyday work of the improved plan of bee-culture.

## WORK FOR THE MONTH: AUGUST.

As a rule, there are more bees lost in this and the next month than all the rest of the year together. The most general cause of this is starvation. Colonies that have had a short supply of winter stores are now getting through them, and not being able to collect any, if they are not fed will, of necessity, starve. There is also another cause; towards the end of this month breeding begins to increase, we also have some very cold winds and frost during this and the next month. Now, if the hive, as is usual with box-hives, is neither wind nor water-tight, the brood is liable to be chilled and so cause foul brood, or through excessive dampness, cause dysentery amongst the bees. The above diseases may generally be avoided by keeping the bees in good hives, and never allowing them to be short of good wholesome food.

I. HOPKINS.
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MODERN BEE CULTURE

# No. XVIII.

## TRANSFERRING.

O, nature kind! O, labourer wise!
That roam'st along the summer's ray
Glean'st every bliss thy life supplies,
And meet'st prepared thy wintry day

In bee-culture transferring is generally understood to be shifting bees and combs from a common box to a movable-comb hive. Bee-keepers, who intend to use the improved hive, should have at least two complete movable-comb hives for every box-hive they may have, in readiness for the swarming season; one for the new swarm and the other to transfer the mother colony to. About fourteen or fifteen days after a swarm has issued the old colony would be in fine trim for transferring, as there would be fewer bees in the hive and very little brood. When about to commence operations, see that everything required is on hand before starting. You will need a small saw, a hammer, a chisel, a long thin bladed knife, a board to lay the combs on, a smoker, or in lieu of this a roll of cotton rags, an old table-cloth or sheet folded up, a board a little larger than the frames, a small table or a barrel turned bottom up will do, to operate upon, and lastly some transferring wires. To make these, take some tinned wire—I use No. 16 bird cage wire. Lay a frame on its side, and cut the wire into lengths of an inch or so longer than the outside depth of the frame, *i.e.*, from the top of the top bar to the bottom of the bottom bar. You will probably require thirty of these to a hive. Having cut sufficient, make a bend in the wire a half-inch from each end, it should be bent at a little more than right angles, thus ⌐——————⌐, so that the points of the wire will grip the top and bottom bar of the frame when in use. The best time of the day to transfer is in the morning, when most of the bees are out at work. Everything being in readiness, light your smoker or roll of cotton rags, and blow a little smoke into the entrance of the hive you wish to transfer, then carry the hive away a yard or two, and turn it bottom up. Place an empty box over the hive. Of course if the bottom of the hive is nailed on it will have to be wrenched off before the box is placed upon it. Tie a cloth round the junction of the two boxes, and with two small sticks rap on the hive for above 15 or 20 minutes. In the meantime the hive you are going to transfer to should have been placed exactly where the old hive stood, so that the bees that are out on returning home may have a place to go into. The smoking and rapping on the hive will so alarm the bees that they will fill themselves with honey, and go with their queen into the upper box. As soon as most of the bees are in the upper box, which will be in about 15 minutes, lift it off and place it near where it stood before.

You are now ready to transfer the comb. Lay the small board on the table or barrel, and the sheet nicely folded on the board. Now, take your knife and cut the comb free from the sides of the hive, gently knock the old hive apart, and take out the combs as whole as possible. When you have cut out the first comb lay it on the folded sheet, lay a frame on the comb, and cut the comb to fit the frame. If the comb is larger than the frame, cut it so that by springing the frame open it will just go over it. In this way the frame will grip the comb so securely that it will need no other fastening.

When the combs are smaller than the frames it may require several pieces to fill them; even the smallest pieces of straight-worker comb should be transferred. In this case fill the frame to the best advantage, and put on the wires where required to hold the comb in position. Now raise the board and cloth till the frame is vertical, and put sufficient wires on the other side of the frame to secure the comb. As each comb is transferred hang it in the new hive, keeping that containing the brood in the centre. Proceed as above until all the worker-comb has been fastened into the frames and hung in the new hive. Now raise the new hive with small

blocks of wood an inch or so off the bottom board, and shake the bees out of the box in front of the hive. They will at once enter, and in a few minutes commence to fasten the combs and tidy up their new homes.

Care should be taken that none but nice straight-worker comb is transferred. Any clean drone comb may be kept to use as starters in section boxes. The combs should be put into the frames in the same position as they were built. This can be easily ascertained. By looking at a piece of comb in its natural position, it will be seen that the cells are built at a slight angle, the outer edge being the highest, the better to hold honey, &c. It is in this way that they should be put in the frames. There are other ways of fastening the comb in frames besides using wire—such as winding twine around the frames, or tacking small strips of wood on each side, but it will be found that the wires are by far the best, they are easily put on and easily taken off. In two or three days the bees will have fastened the combs securely, when the wires may be taken off, and the work will proceed as cheerfully in the new home as though the colony had known no other. Bees may be transferred any time during the honey season. If done after the flow of honey has ceased, the combs should be taken into some room to be transferred, in order to prevent robbing. It there is not sufficient comb to fill all the frames, put comb foundation in the remainder.

### WORK FOR THE MONTH—SEPTEMBER.

Towards the latter part of this month breeding in healthy colonies will be going on very rapidly, and they will be consuming a great deal of food, so that it is necessary to see that they are well supplied. Hives should be in readiness by the end of the month, and plans laid for future work.

I. HOPKINS.

The Apiary, Parawai, Thames.

# MODERN BEE CULTURE

# No. XIX —SURPLUS HONEY

"These, train'd to work, the clinging wax suspend,
These to the young, the nation's hope attend,
These stow pure honey, and unwearied swell
With liquid nectar each o'erflowing cell."

THE aim of the improved system of bee culture is to obtain the greatest quantity of honey possible in its pure state without destroying the bees or depriving them of their necessary stores.

It is well known that in an ordinary good season bees will gather and accumulate honey far beyond their actual wants. If a colony that has not been "deprived" the previous season is examined at the commencement of spring, when the need of spare stores has passed, it will be found in most cases that they still have a considerable amount of honey which could well have been spared. This is what is termed surplus honey, and constitutes the principal source of profit in bee keeping. Now, as it is this surplus honey that we require, our aim should be to have it stored in the most convenient place for depriving purposes, and away from the brood nest, so that it may be easily got at, and that we may have combs containing nothing but pure honey. I may here remark that it is almost impossible, without having other disadvantages, to so arrange the hive that the queen would be confined to certain combs to breed in, although we can, by judicious management, generally keep her on the lower storey of the hive. It sometimes happens in a good season, when honey is coming in very fast, that the vacant cells of the brood combs get filled, compelling the queen to go in search of empty combs in which to deposit her eggs. If she succeeds in finding one she will at once commence to lay. Now, this may be in a part of the hive we have arranged for surplus honey, thus to a certain extent spoiling our honeycombs and upsetting our plans. To guard against this it is necessary to see that they have sufficient empty combs apart from the brood nest for storing honey, and to extract from the brood combs if too much honey is being stored in them. The brood nest is situated in the warmest part of the hive—the central combs—and may extend over five or six, or even more, during the height of the breeding season.

We will now proceed to work a colony through the honey season from the time of hiving, supposing it to be a fair average one.

Before leaving the newly-hived swarm, it should be seen that the frames are in their proper position, *i.e.*, three-eights of an inch apart, and the mat covered closely down over them. A very good way of gauging the distance is to stand on one side of the hive and take hold of the frame farthest from you, with a forefinger and thumb at each end, move it along the rabbits till your fingers touch the side of the hive, it will then be just right; now move the next till your fingers touch the first frame, and so on with the whole of them; if they are right the ten narrow frames will just fill the hive. Examine the hive every other day, and when the work is well forward, which, in the early part of the season would be in four or five days, remove the cover and mat and put on upper storey, placing the mat and cover on this. The upper storey is usually furnished with seven broad frames. These when placed close together fill the hive; the top and bottom bars being narrower than the sides allows sufficient space for the bees to pass between.

If we intend to work for extracted honey sheets of foundation comb should be fastened in the frames; if for comb honey, section boxes instead. The broad frames just take eight 1lb. section boxes, or four 2lbs. The reason for using broad frames in the upper storey is because bees usually build their honey combs with a greater depth of cell than those used for breeding purposes. To start the bees to work at once in the top storey, get one of the broad frames started in the lower hive, and when putting on the upper box lift it out bees and all and place it in the top storey.

As the combs are filled and sealed remove and extract, taking care to supply them with fresh combs or foundation. If using section boxes, remove those that are filled and sealed over, and put empty ones in their place. Now, if we take honey from the upper storey only, and leave the lower hive for the bees, we are not likely to leave them short of food for winter. After the honey season has passed, remove the upper storey and examine the lower hive, to see that they have sufficient stores. About five frames of honey is enough to last an average colony through the winter.

Where there are a number of colonies kept, it is an excellent plan to have one suspended from a spring balance, or steel-

MODERN BEE CULTURE

No. XX.

## DISEASES IN BEES.

"But (since dread ills both bees and man molest)
If e'er disease the languid hive infest,
A horrid leanness the dread sign displays,
Their vigour wastes away, their hue decays."

THERE are only two diseases to which bees are subject that are worthy of special notice, viz, dysentery and foul brood.

### DYSENTERY.

The presence of this disease may be known by the bottom board within, and around the entrance of the hive being covered with a dirty, yellowish, disagreeable looking excrement which has an intolerably offensive smell. Various opinions have been given as to the cause of this disease, but all are agreed that a cold, damp hive and unwholesome food is sure to produce it. In winter—the time when dysentery generally makes its appearance—moisture may be produced through insufficient ventilation causing the breath of the bees to be condensed within the hive. This moisture accumulates and settles on the combs, diluting and souring the honey, and making it unwholesome as food for the bees. The surest cure for this disease is a spell of warm genial weather, when in most cases it will entirely disappear. I have found that dysentery is most prevalent amongst bees in this country about the month of August and beginning of September, and is sometimes attributed to the honey gathered from peach blossoms.

PREVENTION OF DYSENTERY.—From what has been said above as to the cause of the disease it will be readily understood that to keep bees in a healthy condition it is absolutely necessary to provide them with a clean, tight, comfortable, well ventilated hive. Here I may remark that I consider the mat used for covering the frames to be one of the best features in modern bee-culture; for while assisting greatly in keeping the hive warm, it allows of ventilation through the cover without a direct draft. It is more necessary to have the hive well ventilated in cold weather, when the bees cannot get out, than it is in summer, for the bees will then do it for themselves; although this is a very unprofitable system to have a number of bees farming at the entrance, when they ought to be employed gathering honey. If at any time it is necessary to feed bees in cold weather, avoid giving them watery food, feed with candy, or very thick syrup made from the best sugar.

## FOUL BROOD.

The disease known by the name of "foul brood" is, of all others, the most fatal to bees. Dr. Ozierzon once lost his whole apiary of 500 colonies by it. As, fortunately, I have had no experience of it, I will quote one of the best authorities on the subject. He says:—"The symptoms are as follow: Decline in the prosperity of the colony, because of failure to rear brood. The brood seems to putrefy, becomes 'brown and salvy,' and gives off a stench, which is by no means agreeable, while later the caps of the cells become concave instead of convex, and have a little hole through them. There is no longer any doubt as to the cause of this fearful plague. Like the fell 'Pebrine,' which came so near exterminating the 'silk worm,' and a most lucrative and extensive industry in Europe, it, as conclusively shown by Drs. Presuz and Schönfeld, of Germany, is the result of fungous or vegetable growth. Schönfeld not only infected healthy bee larvæ, but those of other insects, both by a means of the putrescent foul brood, and by taking the spores. Fungoid growths are very minute, and the spores are so infinitesimally small as often to elude the sharp detection of the expert microscopist. Most of the terrible, contagious diseases that human flesh is heir to, like typhus, diphtheria, cholera, small pox, &c., &c., are now thought to be due to microscopic germs, and hence to be spread from home to home, and from hamlet to hamlet, it is only necessary that the spores, the minute seeds, either by contact or by some sustaining power, such as a current of air, be brought to new soil of flesh blood or other tissue—their garden spots—when they at once spring into growth, and thus lick up the very vitality of their victims. The huge mushroom will grow in a night. So, too, these other plants—the disease germs—will develope with marvellous rapidity; and hence the horrors of yellow fever, scarlatina, and cholera. To cure such diseases the

fungi must be killed. To prevent their spread, the spores must be destroyed, or else confined. But as these are so small, so light, and so invisible—easily borne or wafted by the slightest zephyr of summer, this is often a matter of the utmost difficulty. In 'foul brood' these germs feed on the larvæ of the bees, and thus convert life and vigour into death and decay. If we can kill this miniature forest of the hive, and destroy the spores, we shall extirpate the terrible plague." The remedies are reserved for the next paper—to give them here would make this too long.

J. HOPKINS,

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# MODERN BEE CULTURE.

# No. XXI.

## DISEASES OF BEES (Continued).

The dead are carried forth, and sad and slow
The long procession swells the pomp of woe;
Or round the doors they cling with pensile feet,
Or all lie loitering in their dark retreat.

As showing how important a matter it is considered in America to prevent the spread of foul brood whenever it may make its appearance, I quote an Act passed by the Legislative Assembly of Utah during its last session, 1880, for the protection of bee culture. It also tends to show the value put upon the honey industry of the State.

AN ACT FOR THE PROTECTION OF BEE-CULTURE.

"Be it enacted by the Governor and Legislative Assembly of the Territory of Utah,—That it shall be the duty of the County Court of each county to appoint from among the bee-keepers of the county one or more suitable persons as inspectors of bees.

"Sec. 2. Those inspectors shall be appointed biennially—viz., on the first Monday in March of each alternate year, or at the first regular sitting of the Court thereafter, and shall perform the duties of beer inspectors for two years, and until their successors are appointed and qualified. Said inspectors shall qualify by taking and subscribing to an official oath, and giving bonds with sureties to be approved by their respective County Courts; said bonds to be filed with the clerks of said Courts.

"Sec. 3. In determining the fitness of a person to fill the position of inspector, the Court may be guided by the wishes of the majority of the bee-keepers owning or keeping bees in their respective counties, and it shall be deemed lawful for any inspector, if he so desires, to invite one or more persons to assist him in prosecuting his inspection, provided that no charge is made for this voluntary service.

"Sec. 4. On the complaint of any person to the effect that, in his opinion, the disease known as foul brood exists among the bees of any person or persons, whether owners or custodians, it shall be the duty of the inspector residing nearest to where the foul brood is suspected to exist, to immediately inspect the bees believed to be infected, and if said inspector finds that foul brood does exist, he shall there and then instruct said bee-keeper wholly to destroy said bees and hives in which it is found, by immediately burning or burying them

"Sec. 5. If a bee-keeper, by his own inspection, or through any source other than through a duly appointed inspector, dis-

covers foul brood in his apiary, it shall be his duty wholly to destroy the hives affected, as provided for in section four (4) of this Act; failing to do which, he will be held liable to the penalties hereinafter imposed.

"Sec. 6. If the bee-keeper, in whose colony the foul brood is discovered, either by himself or an inspector, does not immediately wholly destroy the said diseased bees and hives, in the manner above provided, on the complaint of an inspector or other competent person before the nearest Justice of the Peace of the precinct in which the said bee keeper keeps his bees, and on sufficient and lawful proof he shall be held liable to a fine not less than five dollars, nor to exceed twenty-five dollars, for the first offence, and for each additional offence he shall be liable to a fine not to exceed fifty dollars.

"Sec. 7. To provide for the prosecution of the duties of bee inspectors under this Act, the County Courts are hereby authorised to appropriate such sums as may be necessary for these purposes out of the revenues of the several counties."

If we can find a substance that will prove fatal to the fungi, and yet not injure the bees, the problem is solved. Our German scientists—those masters in scientific research and discovery, have found this valuable fungicide in salicylic acid, an extract from the same willow that gives us pollen and nectar. This cheap white powder is easily soluble in alcohol, and when mixed with borax in water. Mr. Hilbert, one of the most thoughtful of German bee-keepers, was the first to effect a radical cure of foul brood in his apiary by the use of this substance. He dissolved 50 grains of the acid in 500 grains of pure spirits. One drop of this in a grain of distilled water is the mixture he applied. Mr. C. F. Muth, from whom the above facts as to Herr Hilbert's practice are gathered, suggests a variation in the mixture. Mr. Muth suggests an improvement, and takes advantage of the fact that the acid, which alone is very insoluble in water, is, when mixed with borax, soluble. His recipe is as follows:—128 grains of salicylic acid, 128 grains of soda borax, and 16 ounces distilled water. There is no reason why water without distillation should not do as well. This remedy is applied as follows:—First uncap all the brood, then throw the fluid over the comb in a fine spray. This will not injure the bees, but will prove fatal to the fungi. If the bees are removed to an empty hive and given no comb for three or four days, till they have digested all the honey in their stomachs, and then prevented visiting the affected hive, they are said to be out of danger. It would seem the spores are in the honey, and by taking that the contagion is administered to the young bees. The honey may be purified from these noxious germs by subjecting it to the boiling temperature, which is generally, if not always, fatal to the spores of fungoid life. By immersing the combs in a salicylic acid solution or sprinkling them with the same they would be rendered sterile, and could be used without much fear of spreading contagion. The disease is probably spread by robber bees visiting affected hives, and carrying with them in the honey the fatal germs.

I have found that a paste made of gum, tragacanth and water is very superior, and I much prefer it for either general or special use to gum arabic. Yet it soon sours—which means that it is nourishing these fungoid plants—and thus becomes disagreeable. I have found that a very little salicylic acid will render it sterile, and thus preserve it indefinitely.

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