

Bee Culture for Profit.

by Nora Reed.

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To any one who intends to manage bees for profit, a knowledge of their structural peculiarities and life history will aid greatly in determining more accurately what conditions are necessary to their greatest welfare.

Such a knowledge, however, will never take the place of an acquaintance with those conditions under which actual practice has shown that bees thrive, but it will form a good basis for an understanding of whatever practice has found best in the management of these industrious and profitable insects. It may also show in what ways practice may be improved.

In its life history we trace the bee from the Branch Arthropoda, Class Hexapoda, to the great Order Hymenoptera, or membranous winged insects. This includes the family Apidae, or bee family, of which there are several marked types or genera, such as *Apis*, the hive bee; *Bombus*, the bumble bee; *Xylocopa*, the carpenter bee; *Megachile*, the leaf cutter, and many others. All of these are very interesting to study, and each fulfills a purpose in the economy of Nature; but in this paper only the first genus,

Apis, or the hive bee; can be considered. There is another genus, *Melipona*, the stingless honey bee of the American tropics, which has often been brought up with the expectation of realizing important practical results from it! So far this has proved a failure, their honey yield is small, not well ripened, and not easily harvested in good shape, as the honey cells are of dark wax, and arranged in irregular clumps, like those of our bumble bees.

Of the genus *Apis*, the only representative in this country is *Mellifica*, although several others are natives of Asia and of Africa. Among the former is the *Apis indica*, the common bee of Southern Asia, these are kept in very limited numbers and with but small degree of profit, in earthen jars and sections of hollow trees in portions of the British and Dutch East Indies. Colonies of these bees are easily handled if smoke be used, and, though they are more excitable than our common hive bees, this peculiarity does not lead them to sting more, but seems to proceed from fear. The sting is also less severe than that of our bees.

Under the rude methods thus far employed in the management of this bee, no great yields of honey have been obtained. They might possibly do better if imported into this country, but it is very likely they might not withstand the severe winters of the North, unless furnished with extra protection.

The bee, Apis florea, also a native of East India, is the smallest known species of the genus. It builds in the open air, attaching a single comb to a twig of a shrub or small tree. This comb is not much larger than a man's hand, and is exceedingly delicate, there being on each side 100 worker cells to a square inch of surface. Colonies of these bees accumulate so little surplus honey as to give no hope that their cultivation would be profitable.

The Apis dorsata, or Giant East Indian honey bee, is also a native of the far East, both on the continent of Asia and the adjacent Islands. There are several varieties of these bees. All build large combs of very pure wax, often five to six feet in length and three to four feet in width, which they attach to overhanging ledges of rocks or to large limbs of forest or jungle trees. For a long time very little was

known about this bee, but in 1880-81 Frank S. Benton visited India for the purpose of obtaining colonies of the *Apis dorsata*. (Plate I Fig. 1, 2.)

These bees were obtained from the jungles, the combs being cut from their original positions and thus many truths of their real habits were learned. He found that they could be domesticated, were not unmanageable and that they were good gatherers. They might with profit be brought to the United States. They would doubtless be able to get honey from flowers whose nectaries are located out of reach of ordinary bees, notably those of red clover, now visited chiefly by bumble bees and which the East Indian bee might pollinate and cause to produce seed more abundantly. This of itself would make this bee extremely useful in many localities; and even if no further utilisable, they might prove an important factor in the production in the Southern States of large quantities of excellent beeswax, now such an expensive article. The results of introducing these various bees cannot be fully estimated without an intimate acquaintance with the nature and habits of the bees to be introduced. It is a subject that should receive

careful consideration, because of the possible benefits to apiculture and the wider beneficial effects on agriculture.

The common hive or honey bee Apis mellifica.

Besides the common brown or German bee imported from Europe to this country some time in the Seventeenth Century and now widely spread from the Atlantic to the Pacific, several other races have been brought here. The Italians in 1860, and later the Egyptians, Cyprian, Syrian, Palestine, Carniolan and the Tunisian. Probably the only races existing pure in the United States are the brown or German bee, the Italian, and in a few apiaries, the Carniolan. These have proven to be the best. The Syrians and Palestines have been condemned as inferior in temper, and wintering qualities to the races of bees already here.

The Tunisians, for similar reasons and also because they are great collectors of propolis, never became popular.

The Cyprians have wonderful honey gathering powers, and are very persevering in their labors, even when the flowers

are secreting honey sparingly. They also winter and defend their hives against robber bees and other enemies better than any other known race. When storing honey, however, the Cyprians fill the cells quite full before sealing, and thus the capping rests against the honey, giving it a "watery" appearance, which is undesirable. This, together with the fact that they are extremely sensitive, though they never provoke an attack, have been the cause of their general rejection by all makers of comb honey.

Even the producers of extracted honey do not seem to have learned how to manipulate them. It would be much easier by selection in breeding to reduce the faults of this race, than to bring any other cultivated race to their equal in the other desirable points.

The Italians were introduced through the agency of the United States agricultural department in 1860. Their good qualities were soon appreciated and they became well established and widely spread. They cap their surplus honey whiter than most other races and are also more gentle. These facts, added to their golden

yellow color, which renders them very attractive caused them to retain their popularity; so much so that many of the more sombre hued races, gentler, better winterers, and better comb-builders, have not received due consideration. The Italians are, however, preferable to the common brown or black bees, for they show greater energy in gathering honey and in defense of their hives against moth havoc and robber bees, while at the same time they are more easily manipulated than the blacks, though they do not winter so well in severe climates.

The Carniolans, the gray bees from the Alpine province of Carniola, Austria, are the gentlest of all races, and are steadily growing in favor. They winter the best of any, their sealed honey is exceedingly white and they gather little propolis. They are quite prolific and may be made to do well in any part of the United States.

By crossing with the Cyprians and by continued selection in breeding, the gentle disposition of the Carniolans and the greater honey gathering powers of the latter might be secured. (See Plate I Figs. 3, 4 & 5.)

The German, common black or brown bees are found commonly throughout our country, both wild and domesticated. Many bee keepers are inclined to think of these bees as having no redeeming qualities, or at least to under-rate them. They have become thoroughly acclimated since their importation over two centuries ago, and besides good wintering and comb building qualities, will, when the flow of honey is good, equal the Italians in gathering.

They are, however, easily discouraged when the flow of honey is suddenly checked, thus tending to reduce profits!

Kind of Bees in a Colony.

At the opening of the season each colony of bees in good condition contains a laying queen and some 30,000 to 40,000 worker bees, or six to eight quarts by measurement. Besides this there should be five or more combs fairly stocked with developing brood with a good supply of honey about it. Drones may also be present. Under normal conditions the queen lays all the eggs that are deposited in the hive, being capable of depositing as many as

4,000 in twenty four hours.

Ordinarily, she mates but once, flying from the hive to meet the drone — the male bee — high in the air, generally when five to nine days old. The queen's life may extend over four or five years, but three years is as long as any queen ought to be kept.

Upon the workers, which are undeveloped females, devolves all the labor of gathering honey, pollen, propolis, and bringing water, secreting wax, building combs, stopping up crevices in the hive, nursing the brood and defending the hive.

The drones, aside from their protective power in contributing warmth to the hive, seem to have no other office beyond that connected with reproduction.

Food and Bee Products.

Pollen and honey form the food of honey bees and their developing brood. Both of these are plant products which are only modified somewhat by the bees, and are then stored in waxen cells if not wanted at once.

Pollen, the fertilizing dust of flowers,

is carried home by the bees in small pellets held in basket like depressions on the hind legs. The hairs covering the whole surface of the bee's body assist in this also. This portion of the bee's anatomy has been described so many times that it is unnecessary here.

Other products of the bee are nectar and honey, propolis, water, silk and wax. A word in regard to the last product, this is not carried into the hive as wax, as many suppose, but it comes into the hive in the shape of honey and is transformed by the workers within their own bodies into wax. The wax plates are on the underside of the abdomen and the wax glands are beneath them. During wax secretion, a high temperature is maintained in the hive, and many workers may be seen to have small scales of wax protruding from between the segments of the abdomen. The molds or plates eight in number when exposed to view are seen to be five sided depressions lined with a transparent membrane. The wax glands themselves are beneath this membrane, and through it the wax comes.

in a liquid form. As the scales harden, they are pushed out by the addition of wax beneath. The bees pluck them out with neat pincers, pass them forward to the mandibles, and mold them into the shape of hexagonal cells, meanwhile warming and moistening them with the secretions of the head glands to render the wax more pliable.

The production of wax, of which the comb is built, necessitates the consumption of a large amount of honey, and many attempts are being made to supply artificial comb; but have as yet not been successful. Such an invention would add very materially to the profits of bee keepers.

Development of the Brood.

Under favorable conditions, the eggs are deposited during January. The eggs hatch in three days into minute white larvae to which the workers supply food abundantly.

During the first three days of this larvae life, its food is a secretion from glands located in the heads of the adult workers, a sort of milk. After this, honey is added in the case of workers, and honey and

pollen in the case of drones.

The queen larva, however, is fed with this rich secretion throughout the whole feeding period. Even after assuming the pupa form, the young queen is attached to this food by means of the tip of the abdomen. The following table shows approximately the time occupied in the development of worker, drone, and queen.

	Egg.	Larva.	Pupa	Total.
Queen	Days. 3	Days. $5\frac{1}{2}$	Days. 7	$15\frac{1}{2}$
Worker	3	5	13	21
Drone	3	6	15	24.

Quieting and Manipulating Bees.

Langstroth on the Honey Bee, says, "Let all your motions about your hives be gentle and slow, acquaint yourself fully with the principles of management, and you will find you have little more reason to dread the sting of a bee than the horns of a favorite cow, or the heels of your faithful horse".

To avoid stings altogether is simply a question of time and a free use of smoke. To secure easy, rapid, and safe manipulation

accurately made hives, with the frames if hanging, arranged to rest on folded metal rabbits, and the combs perfectly straight, are essential. This brings us to the subject of hives and implements.

The bee keeper needs but few implements. With even a limited number of hives, a smoker, and if comb honey is what is wanted, a section folder and a foundation holder is all that is really needed, the whole not costing over \$10.00.

If only extracted honey is wanted then an extractor and a couple of uncapping knives should be purchased instead of the section folder and foundation fastener, the cost in this case being about \$15.00.

Fifty or seventy five hives may be conveniently managed with no more outlay than that indicated above.

Hives.

These must be of such a nature as to be best adapted to the climatic conditions of the bee keeper's locality, and at the same time permitting the rapid performance of all operations necessary in securing surplus honey. This very naturally affects

the net profits of an apiary.

Frame hives, managed with intelligence and skill, are essential to the greatest success. The one in most general use in this country and in England is the hive known as the Langstroth, (Plate II Fig. 1.). The outside dimensions most in use are $17\frac{5}{8}$ inches long by $9\frac{1}{8}$ inches deep. Mr. Quimby, a successful bee master, preferred frames 12 inches deep and 18 inches wide, and these are still used by many large honey raisers.

The frames should be nailed firmly and exactly true or the result will be disastrous. If only slightly out of shape, they may swing together at the bottom or touch the sides of the hive; and in either case, will be glued fast, by the bees.

The hive to hold the frames should be the plainest kind of a box, the frames resting on rabbets made in the upper edges. As bees always try to glue the frames fast by means of propolis it is best to have them rest on strips of tin, galvanized iron or band iron. The distance between the ends of the frame and the hive should.

$\frac{3}{8}$ inch, or in times of plenty, the bees will build comb there. If the frames are accurately made, there will be $\frac{1}{4}$ inch space at each end of the frame just below the top bar, and $\frac{3}{8}$ inch space at each end of the bottom bar.

There has been much diversity of opinion of late as to the width of hives, and the number of frames each story is to hold. The original Langstroth hive held ten frames in the lower story and eleven in the upper story.

The Dargenbaker hive, (Plate II. Fig. 2.) is also used by many beekeepers, and is as simple as a movable frame hive can be. It contains ten closed end, self spacing reversible brood frames $1\frac{1}{2}$ inches long by $1\frac{1}{2}$ inches deep, outside measure, forming a smooth, solid, double wall, with non-conducting air spaces between the ends of the frames and hives.

The super is furnished with eight seven to the foot, section frames, 17 inches long, each holding four sections, four inches wide, five inches high, seven inches to a foot thick, with seven plain wood separators

and followers. These air spaces afford an effective and inexpensive bee escape.

Sections.

The size and shape of the sections is of great importance to the producer of comb honey. It is claimed that bees will store and cap more honey in the deep thin combs, where they can mass together than they will in the thick $4\frac{1}{4}$ sections.

Mr Doolittle says in *Gleanings*, "My reasons for preferring the deep thin sections are that more in number can be set over a given space than can those of less depth; besides, such a cake of honey is of more symmetrical proportions and pleasing to the eye, it being just sufficient to set on the table for an ordinary family and does not give a scrimped appearance of pattern. Why I prefer them is that they bring two or three cents per pound more in the market." Whatever form of hive is used, a good tight roof or cover is indispensable, well painted so that no drop of water can get in from the top.

Establishing an Apiary.

Spring is the best season for this, especially

for a person unacquainted with the care of bees. It is best for the beginner to obtain his start by purchasing one or two colonies of pure Italian or Carniolan bees in accurately made frame hives.

The apiary should be located where no surface water will collect during heavy storms. The ground should be a gentle slope. In the colder portions of the United States, a southern slope is preferable. A wind break such as a board fence, a hedge, or a row of evergreens on the north and west is advisable.

In warmer places, shade is desirable, but not too much. Tall trees are objectionable when very near an apiary, as swarms are liable to cluster so high as to render their capture difficult and dangerous.

Bee Pasturage.

Bees obtain their food from such a variety of sources that there are few localities where a small apiary could not be made to yield a fair surplus.

In regions where the soil is too light, rocky or wet to admit of profitable cultivation, it is often the case that honey

producing plants abound. Among the best yielders are certain forest trees. In the north, willows, alders, maples, tulip tree, (poplar), dandelion, fruit blossoms, locust, clovers, with alfalfa and melilot, chestnut, basswood, Indian corn, buckwheat, golden rods, Spanish Needle and Asters may be cited as the chief sources of pollen and honey; and of these the tulip tree, locust, white clover, alfalfa melilot, basswood and buckwheat furnish most of the surplus honey. It has not been found profitable to cultivate honey plants simply for the increase in the honey yield.

Wintering Bees.

There are five important points to be considered in the wintering of bees.

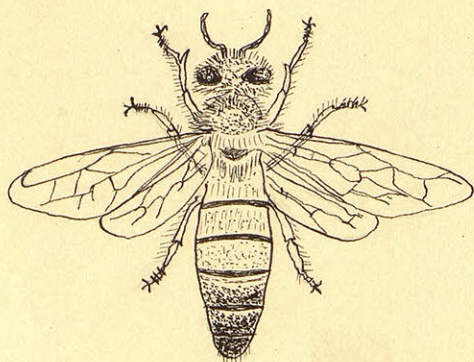
The colony must have a good queen and plenty of bees. It must have good food and plenty of it. The bees must be kept dry and warm.

There should be no manipulation out of season.

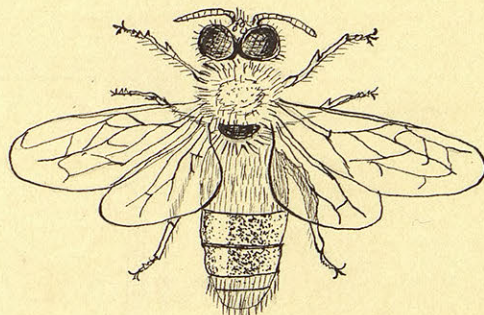
It has been proven that if due precautions are taken and the above rules carefully observed, the apiarist will be secure against any serious losses in wintering out of doors, even in the severest portions of our country.

PLATE I.

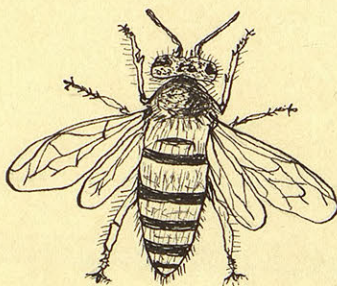
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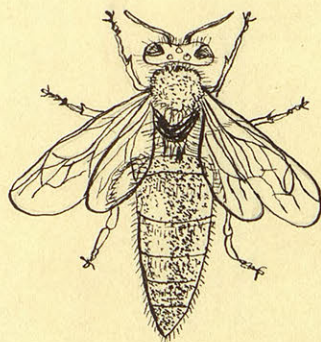
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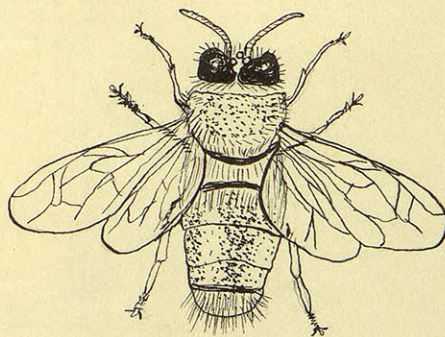
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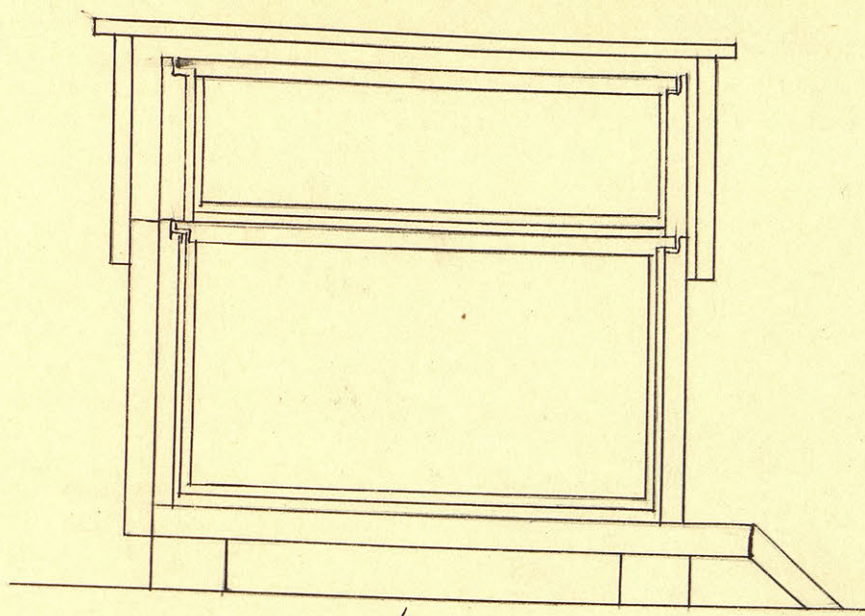


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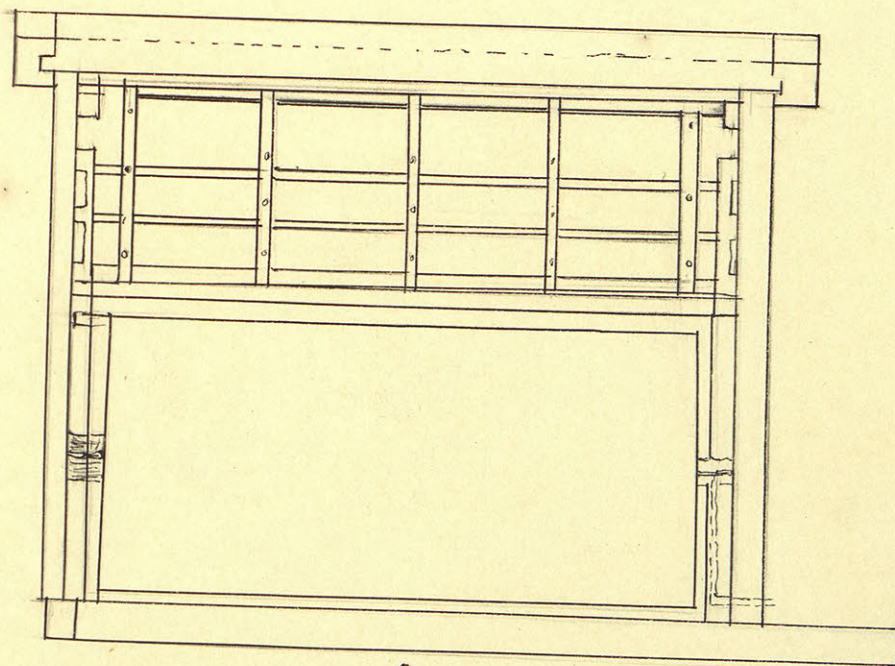


5.

1. Giant honey bee of East India, worker - twice natural size.
2. " " " " " drone - " " "
3. Carniolan variety of *Apis mellifica*, worker - twice natural size.
4. " " " " " , queen - " " "
5. " " " " " , drone - " " "



1.



2.

1. Langstroth hive, cross section showing construction.
2. Danzenbaker hive, " " " "