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# HOW TO KEEP BEES

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ARTHUR C. MILLER



State of Rhode Island and Providence Plantations.

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STATE BOARD OF AGRICULTURE.

JOHN J. DUNN, Secretary.

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## Entomological Department.

A. EDWARD STENE, Entomologist.



Part of a Fifty Colony Apiary at Howard, R. I.—After *Providence Journal*.

## HOW TO KEEP BEES.

ARTHUR C. MILLER.

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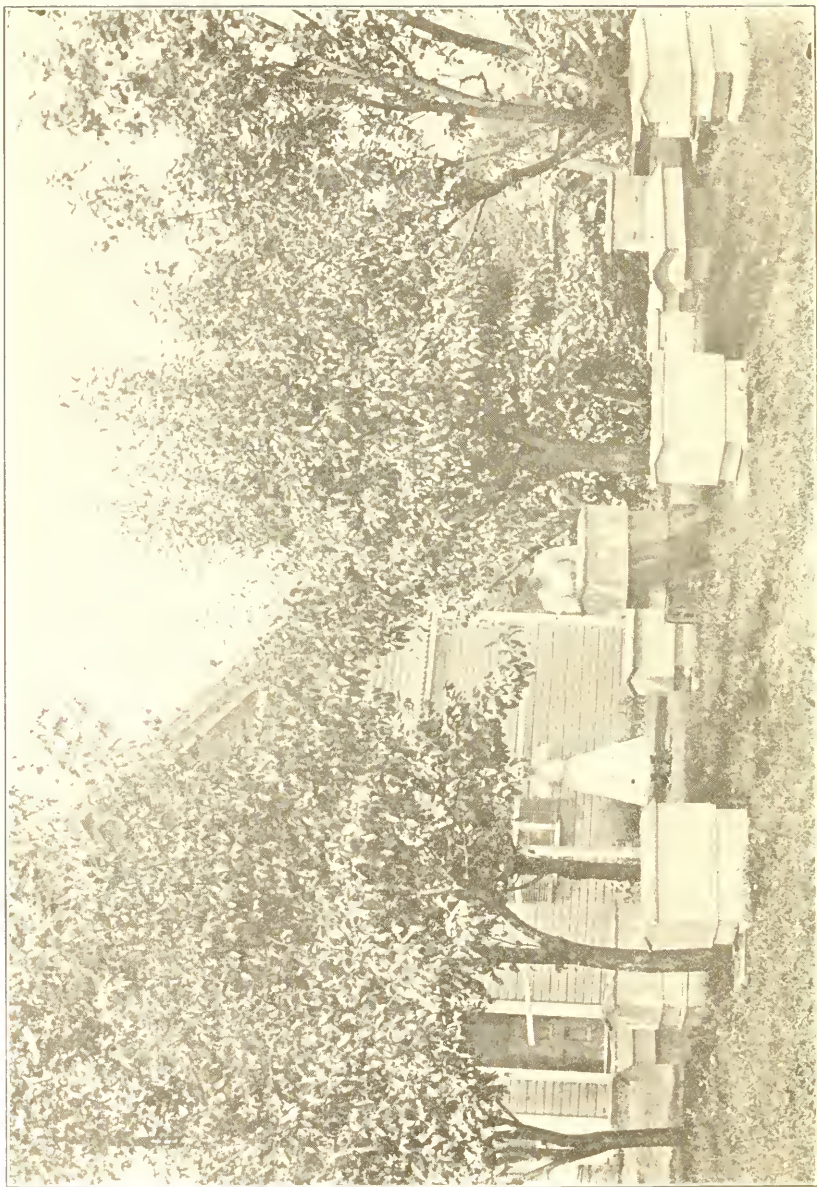
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A woman's apiary near Knightsville, R. I.—After *Providence Journal*.

## PREFACE.

Bee keeping as a pastime or hobby is quite extensively practiced in this as well as in other States. Only occasionally, however, do we find persons who enter into it as their principal business, or even as a money-making side line.

There is a good chance for an enlargement of this industry in Rhode Island. The market for good honey is not overstocked. In fact, we could with great advantage to ourselves supplant with honey some of the sweets now consumed, and it is safe to say that were the advantages of honey as a food well and generally known, and were the supply adequate, the number of bee keepers of both kinds, vocational as well as avocational, could be increased many times over without creating a surplus in the market.

From an economic standpoint also bee keeping should be encouraged. Bees gather and store for human consumption a product which is otherwise wholly wasted, and while so doing they render valuable service to the plants by aiding cross fertilization in return for the nectar secured. In the case of fruit trees, this is of immense advantage to the orchardist.

Bees require but little attention, and the outfit necessary for their care and housing is nominal in cost. While, as Mr. Miller states, our thickly forested areas are not adapted to extensive bee keeping, still there is abundant pasturage for a great many times the number of hives which are now in the State. It is therefore to be hoped that we may have in the near future a considerable increase in this industry, and it is the purpose of the Board of Agriculture to foster it so far as lies within its power.

An excellent apiary inspection law has been passed which will aid in checking the spread of bee diseases and in the dissemination of better knowledge in regard to diseases and methods of eradicating them.

A brief bulletin entitled "Bee Keeping in Rhode Island," which deals with the principal bee diseases and their control, has already been issued. The present bulletin on "How to Keep Bees," aims to give a full account of the practice of bee keeping, and the fact that the author is a bee keeper of long experience, who not only knows the practical side, but has also sought the fullest information through other avenues, assures us that the directions presented can be given the fullest credence and can be studied to advantage by every bee keeper, but particularly by beginners who wish a brief and concise treatise relating to the industry.

The Board of Agriculture is indebted to the A. I. Root Company, Medina, Ohio, for all the cuts used in this bulletin, and to A. H. Gurney, of the *Providence Journal*, for the pictures from which halftones were made, showing apiaries at Howard and Knightsville.

A. E. STENE.

# HOW TO KEEP BEES.

ARTHUR C. MILLER,

INSPECTOR OF APIARIES.

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## INTRODUCTION.

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Rhode Island offers excellent opportunities for profitable bee culture. The soil is diversified, the flora is varied and extensive and the climate is not rigorous. Some of the more densely wooded parts of the State are not adapted to the pursuit as a business, nor even adapted to the support of more than a few colonies here and there. Other parts, particularly those having considerable dairy farming or fruit growing, are well adapted to bee culture on a substantial scale and here and there are locations which compare favorably with the best in the land and will profitably support large apiaries.

In times past bees were to be found on many farms and in many a village yard, but to-day they are far less often met with. The reasons for this condition are many, but probably the most important has been loss or meagre profit due to the lack of information as to the proper care of bees.

To aid in extending bee-keeping in this State and to make it easier and more profitable are the objects of this bulletin.

## PASTURAGE.

Bees may be kept almost anywhere and in almost any sort of a receptacle, but to make them profitable several factors must be considered. The first and most important is the pasturage, for if that is not good, all the skill in the world will avail but little.



The sources of honey in Rhode Island grouped in the order of their appearance are willows, maples, elms and other less numerous trees which furnish the bees with the early supply of pollen and honey so useful and so needful in building up the bee population preparatory to the harvest in which the beekeeper shares.

Next comes the fruit blossoms, peach, plum, cherry, pear, apple, huckleberries and blueberries which, when the spring is favorable, yield good crops of the finest honey. In some places dandelions are an important addition to the fruit bloom, though not always coming at the same time. After the lapse of a week or ten days the main crop of the year comes from the white and alsike clovers. In some parts of the State these are accompanied by a heavy but brief flow of water-white honey from the locust, and are soon followed by chestnut which yields a rich, heavy, but dark honey.

In many sections sunnies furnish the next crop, and where they are abundant the beekeeper may rightly look for a good crop of a very fair honey.

In some of the more swampy and less settled sections, button bush, clothra (sweet pepper bush) and clematis yield a white and highly flavored honey, that from clematis being of the very highest quality. But the yield from these plants seems to be irregular, in some years being almost absent.

In some of the villages and cities the European Lindens are numerous and yield heavily. The bloom comes toward the end of the clover flow, though the time of flowering of different trees in the same neighborhood varies greatly. Native Linden (Basswood) is now found only in a few places. The season closes with the golden-rods and asters which yield a rich aromatic honey, but which is not acceptable to many persons. The crop from these two sources is not always to be depended upon, being more affected by the weather than some of the others.

Many other flowers contribute to the harvest, but seldom to any great extent.

It is important that the bee-keeper should know well the pasturage



of his bees and govern himself accordingly. If his crop must depend only on one of the groups, he must needs bend every energy to get that, but if he has two or more to depend on he can vary his plans.

Bees range for food about two miles from home, but the best results are secured when the pasturage is within a mile of the apiary. Bear these facts in mind when seeking the location for an apiary and if already located, make a careful inspection of the country round about and determine the sources of supply.

### LOCATION OF THE HIVES.

The hives should be in a somewhat sheltered place, preferably where they get the morning sun and are shaded in the heat of the day. As the prevailing winds in the State are from the west and southwest, it has been found advantageous to face the hives to the southeast or east. If on flat lands or low lands, by all means raise the hives about a foot from the ground. It puts them above a strata of cold fog which in the night often lies about six or eight inches deep in such places.

Having the hives so raised will be found to be helpful in other ways. They are more convenient to work at, are up out of the grass, weeds and dirt, and where sundry vermin will not disturb them.

Any convenient thing will do to set the hives on, but a stand made of spruce fence-rails after the following design has proved satisfactory in many years of service. The writer prefers a stand which will hold two hives and allow about eight inches between them. (See Figure 1.)



FIG. 1.—Hive Stand.

If the legs are creosoted or limed, or lime or waste from electric batteries is put on the ground where they stand, they last a long time. Battery waste will also kill the grass and weeds.

### HIVES.

Any of the hives commonly offered by the manufacturers of bee-keepers supplies will do, but the more simple they are and the fewer the loose parts, the more satisfactory they will prove in the long run. Perhaps the most universal hive now in use is called the "Dove-tailed" hive, named from the manner of its locked corners. (See Figure 2.) The hives known by this name all take the Langstroth frame, which measures  $17\frac{1}{2}$  by  $9\frac{1}{8}$  inches outside measure.

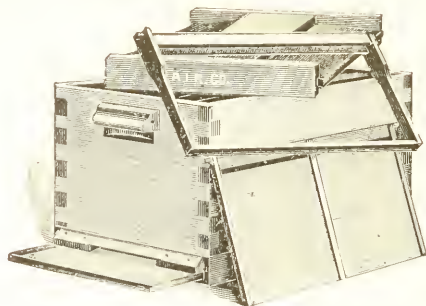


FIG. 2. Dove-tailed Hive.

These hives are commonly furnished in two widths called the eight-frame and the ten-frame. The former has had a great vogue but is now rapidly being discarded for the ten-frame size, and the beginner should be sure to get the latter. The keeper of a few colonies who contemplates increasing should by all means change to the larger size.

The hives having double walls with confined air spaces between or filled with chaff or sawdust are good, but they cost more, are unwieldy, and in many ways less desirable. They are supposed to keep the bees warm in winter and make safer wintering, but as the temperature within the hive and outside of the cluster of bees in winter is practically the same as out of doors, the advantage is im-

aginary rather than real. During the rest of the year, however, such hives are some help to the bees, but in this climate the advantages are not commensurate with the cost and inconvenience. An outer case answers the same purpose and is more convenient. (See Figure 3).

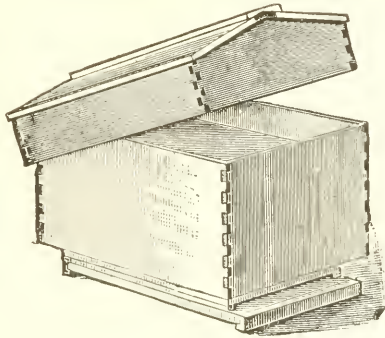


FIG. 3.—Outer Case.

Hives of different sizes and proportions are used and advocated by different persons. They are designed to meet some need of the bee-keeper, or are based on some theory of bee habits, but with one exception it is believed they all call for a lot of attention and manipulation at critical times. The average person will do well to avoid them. There is one type of hive, however, which is designed to minimize labor and give average results. It is known as the "Let Alone" hive. The type was originally exploited by Gen. D. L. Adair, in the late '60's, and was then called the "Long Idea" hive. Some few years ago Mr. Allen Latham of Norwich, Conn., experimented with it, and finally developed the present type which he has called the "Let Alone." It is approximately thirty-six inches long, twenty inches wide, and eighteen inches high. In the Adair hive the entrance was in the middle of the long side, in the Latham hive it extends across one end. Mr. Latham had the advantage of an invention which Adair had not, namely, the so-called queen-excluding metal. Also Mr. Latham is a very careful student of bee habits,

and with the knowledge acquired in many years' work with the bees, was able to accomplish what had not before been done.

In the Adair hive the queen had the run of all the combs (about twenty); in the Latham hive she is confined to the seven at the front, being kept from the others by a sheet of the queen-excluding metal. (See Figure 4).

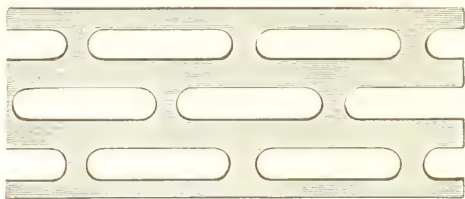


FIG. 4.—Excluder Metal.

These hives are really the tools of a high class specialist and while they will often succeed in the hands of a novice, their continued and uniform success on the minimum of labor plan calls for the knowledge only to be gained by long and careful observation of bees and their ways.

These are special hives which must be made to order. The frames are nearly five inches deeper than the standard Langstroth frame and these frames also have to be made to order. The top bars and end bars of the frames touch the whole length when the frames are in place in the hive, so that the bees can only pass out at the bottom. Beveled cleats are nailed along the lower inside corners of the hive and against these the bottom corners of the frames touch, keeping the bees from going behind the frames and virtually making a box within a box. The tops of the frames are about an inch below the top edge of the hive and Mr. Latham uses a few layers of newspapers and a thin wooden cover on top of the frames. The cover proper has a three inch rim and fits down over the hive. Hive body and cover are covered with heavy waterproof paper, black in color. The entrance which is an inch high, is guarded by a row of fine wire nails driven up through the floor. These are spaced far enough apart to permit the bees to pass freely and yet prevent the ingress of mice.

The bees and queen are started in the frames in the front end of the hive and are thereafter never disturbed unless external appearances indicate something wrong inside. When the bees have the front or brood compartment filled they spread through the excluder metal into the space behind. The frames there have only "starters" of comb foundation as guides for the bees. At the convenience of the beekeeper the honey in these frames is removed and the frames returned.

### FRAMES, SUPERS, ETC.

Frames may be placed in two classes, free hanging and self spacing, and the latter again into hanging and standing. Probably the most extensively used and the best for the beginner are the self spacing frames of the Hoffman type illustrated here. (Figure 5a).

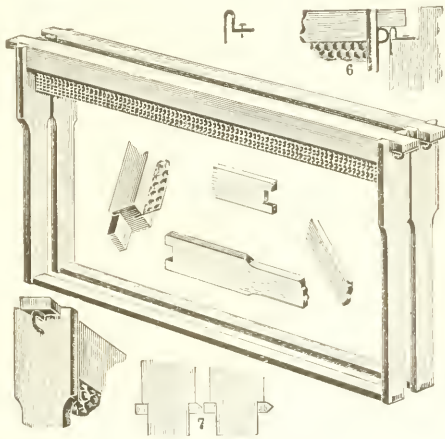


FIG. 5a.—Self-Spacing Frames.

These frames have grooves in the top bar for fixing the comb foundation and holes in the end bars for wires. Fine tinned wire is threaded through these holes, stretched tight and fastened. To these the sheets of foundation are fastened by embedding the wire in the wax. Various devices are sold for the purpose, but any narrow piece of iron with a notch filed in the end will do. The tail

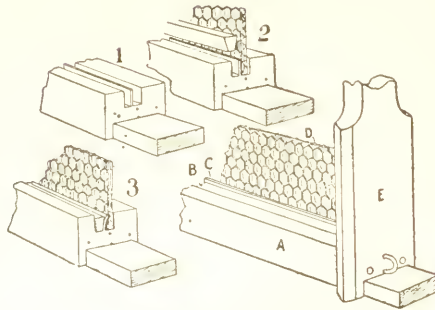


FIG. 5b.—Showing manner of fastening Foundation in Frame.

of an old file is just right. This is kept warm over an oil stove or lamp and is used by drawing the notch along the wire, bearing on just enough to bed the wire without cutting through the sheet of wax. In doing this work the frame is slipped over a board on which the foundation is laid.

It is advisable to wire all brood frames as they may then be handled more readily, and if colonies of bees are shipped any distance, there will be no danger of wired combs breaking down.

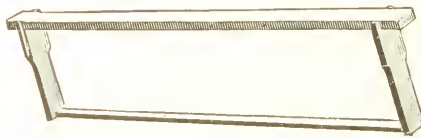


FIG. 6a.—Shallow Extracting Frame.

"Shallow frames" are much like the others except that they are only from  $4\frac{1}{2}$  to  $5\frac{1}{2}$  inches deep. They are used in shallow chambers

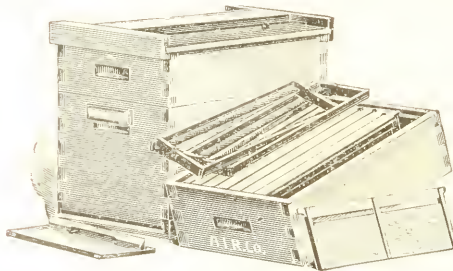


FIG. 6b.—Hive with Shallow Extracting Super.

called supers, and the filled combs are either cut from them or uncapped, and the honey extracted. They are not usually wired. (Figures 6a and 6b).

Arrangements for producing honey in sections are somewhat more complicated. The shallow chamber is much the same as above, but special holders are provided for carrying small boxes or "sections" in which the bees build the combs. Strips of tin or wood separate each row of sections to prevent the bees bulging the surface of the combs. (Figure 7).

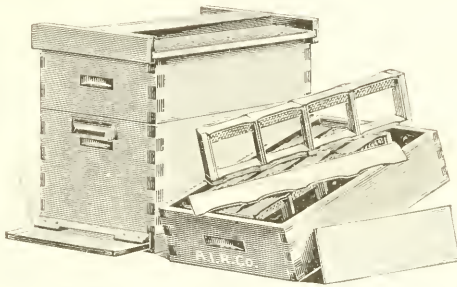


FIG. 7.—Hive with Comb Honey Super.

### HONEY BOARDS.

Honey boards, so-called, are devices for use between the body (brood chamber) of the hive and the surplus compartment (super). The most satisfactory one is made of slats between which are fixed perforated strips of metal or accurately spaced wires to prevent the

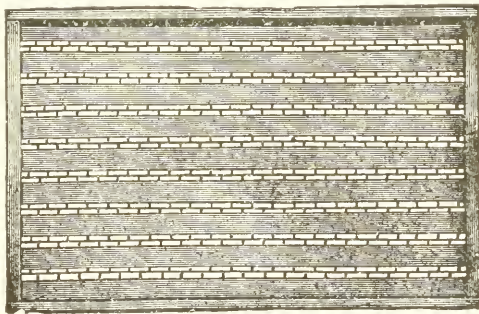


FIG. 8.—Honey Board.



queen passing into the super. There is a rim around the edge so placed as to be flush on one surface and raised on the other, giving a bee space. The bee space side is used uppermost. (Figure 8).

### BEE ESCAPES.

A bee escape is a sort of fly trap device, permitting the passage of the bees in one direction only, and is used in a board placed between the brood chamber and the super to free the super from bees when

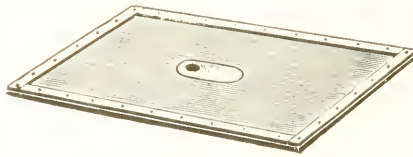


FIG. 9.—Bee Escape in Board.

it is desired to remove the honey. It is a most useful contrivance, but its success depends upon there being no brood in the supers. (Figure 9).

### DRONE AND QUEEN TRAP.

The drone and queen trap is a two compartment box for use at the hive entrance to catch drones and the queen, if a swarm issues. So far as drones are concerned, it is far better to avoid their presence by having combs built from full sheets of foundation. The few drone cells then constructed around the edges will not produce enough drones to do any harm. As a device for catching the queen when a swarm issues, it is successful, unless the queen chances to be abnormally small.

A word of caution regarding the use of the trap will not be amiss. It calls for attention and thought. It must frequently be freed of drones, else ventilation is obstructed and the colony may suffocate if weather conditions are right or shade is lacking. As a queen trap, it must be looked at every day, or the queen may be caught and perish if too long confined or a storm occurs. Many beekeepers have given up their use.

**SMOKER.**

A good smoker is absolutely necessary. Without one it is impossible to readily handle the bees under all the varying conditions to be met with. Get one large enough. One having a barrel three and one-half inches in diameter is a good size, but if many bees are kept, a larger one will be found better. (Figure 10).

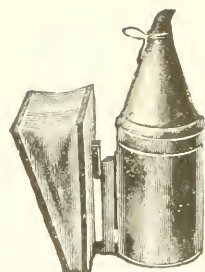


FIG. 10.—Smoker

**FOUNDATION FASTENERS.**

If one is using sections, some sort of a device must be used for fastening the foundation in the sections, and any one of the various machines using a heated metal plate will be found satisfactory. For only a few score sections a little melted wax may be used, but for rapid and extended work buy a fastener.

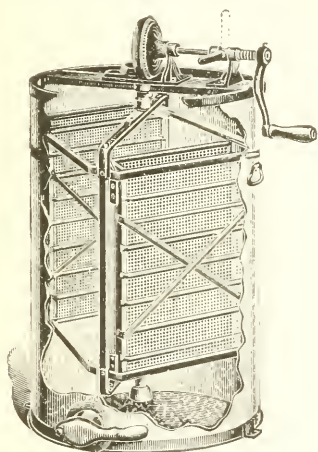


FIG. 11.—Extractor.

**HONEY EXTRACTOR.**

For extracted honey an extractor is necessary, and if much work of the kind is to be done, one of the "reversible" type will be found best. (Figure 11).

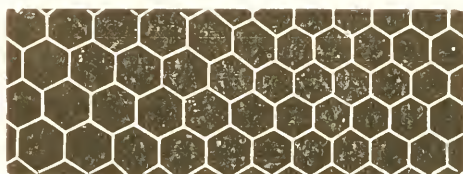
**HIVE TOOLS.**

For prying open hives, separating frames, etc., for scraping off wax and propolis, some sort of a tool is needed. A putty knife if fairly stiff is excellent, or one of the special tools sold for the purpose may be obtained.

### COMB FOUNDATION.

Comb foundation is beeswax made into thin sheets run through embossing rolls which give it the shape of the midrib of honey-comb with an outline of the cell walls. It is made in several thicknesses and of worker size cells, drone comb foundation only being furnished on special order. It is one of the devices which the modern beekeeper cannot afford to do without. Drone comb has about four cells to the linear inch, while worker comb has five. (Figure 12).

In brood frames use the lighter grades of "Brood foundation" and wire the frames.



Drone Cells,      Fig. 12.      Worker Cells.

In sections use the "light super" foundation until skilled in the art. The "extra light" sometimes bothers the novice. Many persons hesitate to use full sheets of foundation in the brood frames, deeming the sixty to seventy cents necessary for each ten frames an extravagance. It is a real economy, and the wise beekeeper will never hesitate to make an expenditure in that line.

### CLOTHING.

A veil for protecting the head from the bees is necessary. It may be purchased ready made or made at home from netting. The part used before the face should be black and preferably of silk tulle. The top may have an elastic cord run around it to slip over the hat crown or it may be sewed to the rim of a hat. Similar veils are made of wire cloth with a "skirt" of cotton cloth attached to the lower edge to tuck under the coat or to tie down. (Figure 13).

Oftentimes the experienced beekeeper works without any veil, but one is always kept at hand in case the bees become irritated or cross.

Short gathered sleeves with elastic band in each end will be found excellent to keep bees from getting inside the coat sleeves. Rubber or leather gloves give confidence to the beginner, but will soon be discarded. Many other devices are offered for sale, but they are not necessary, and should not be purchased by the beginner.



FIG. 13.—Bee Veil.

Light colored clothing of smooth texture, preferably of cotton, will be found better than rough woollens of dark color.

### UNIFORMITY OF APPLIANCES.

Whatever type of hive is used be sure to have all alike, for unless all hives, frames, etc., are interchangeable endless trouble will ensue.

It is not wise to try to make one's own hives. Few persons have the tools or the skill necessary to produce a satisfactory article, and accuracy is essential. The vital principle of all movable comb beehives is the "bee-space," *i. e.*, a space through which bees can pass and yet not so large as to induce them to build combs therein. A space through which they cannot pass they fill with propolis. Factory made hives have this detail carefully worked out.

Catalogues of dealers in beekeepers' supplies furnish full information on the various appliances.

The matter of hives and tools has seemingly perhaps been given undue attention, but unless the outfit is good the beekeeper will find much annoyance and needless labor, and unless he is a veteran, the troubles will make beekeeping so laborious and disagreeable that it is likely to be abandoned in disgust. It is true that honey may be obtained even though the bees are kept in an old box or hollow log, but profitable bee culture demands a suitable equipment.

### MAKING A START.

It is best to buy a good colony of bees in a standard hive, buying from some nearby beekeeper if possible. Also get for the first colony as gentle or easily-handled bees as the seller can furnish. If one's means warrant it, buy two such colonies, using one for study and experiment, and the other for honey, and as a reserve in case of disaster to the first, for frequent overhauling of a colony of bees is not conducive to its success or thrift.

It has sometimes been advised to start by buying bees in a box or any old hive and transfer them to a modern hive "for the experience." It is the sort of experience to dampen the ardor of the most enthusiastic, and an experience which a wise and thrifty veteran avoids as he would a pestilence.

### TIME TO START.

May and June are the most favorable months to make a beginning, but July or August will do, provided the novice does not try to increase the stock by division of the colonies. In buying earlier than May, one is not so sure of obtaining a strong colony, and the desire to examine and overhaul them may be irresistible, and is likely to prove disastrous to the bees. If purchased in September or October, little opportunity is offered for study, and about all that can be done is to see that sufficient food is in the combs for winter use. Winter is a most unwise time to buy bees, and even the skilled veteran avoids purchase then, unless he is thoroughly familiar with conditions as they were in the fall.

### BEEES AND THEIR LIFE HISTORY.

The more complete one's knowledge of the life and habits of the bees the easier and more rapid will be the progress in learning how to keep them and the better the chances for success.

### THE QUEEN.

The "queen," so-called, is merely the mother bee, and there is normally but one in a colony. She lays all the eggs from which the bees of the colony are produced. Upon her vigor and the virtues of her blood and mating depend the thrift of the colony. If she is old or failing, the colony dwindles. If her "blood" is not good her offspring cannot be expected to accomplish the results of offspring from a better bred queen. (See Figure 14).

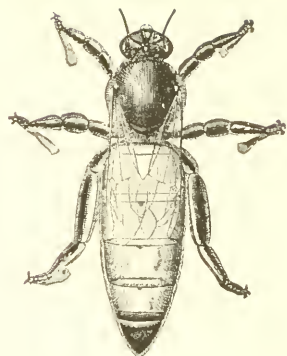


FIG. 14.—Queen.

A queen lives for several years, but as a rule is past her prime and period of greatest usefulness after her second summer. There are exceptions to this, but the rule is a safe one to go by, and all queens should be replaced by young ones after the second summer. Many successful beekeepers re-queen all colonies each year.

### THE WORKERS.



FIG. 15.—Worker.

These are the most numerous members of the colony. They are females, but with the reproductive organs not fully developed and only under some abnormal conditions do any of them lay eggs, such layers being termed "laying workers" and their eggs produce only drones (males).

The workers gather all the honey, pollen and propolis, secrete the wax, build the comb, maintain the heat of the colony, feed the larvae and do all the work of the hive. They are also the ones which do the stinging. (See Figure 15).

### THE DRONES.

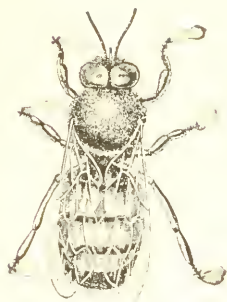


FIG. 16.—Drone.

These are the male bees and normally are produced only at such seasons as bees rear young queens and swarm. They have not the instinct nor are they constructed so they can work. Their sole known function is to perpetuate the race. They are much larger than workers or queen and they have no sting. (See Figures 16).

### BEE BEHAVIOR.

The fundamental law of honey-bee life is co-operation. Though each individual goes about her work of her own volition, the results of her efforts are added to those of the rest of the colony.

The bees cluster in a more or less compact mass for mutual warmth, and when so clustered build their combs and care for their young. Within that cluster the temperature during the active season is close to 98° F. The greater the number of bees the easier it is for them to maintain throughout the hive the necessary temperature. If colonies are not populous, the bees have to cluster more compactly, the queen's room for laying is restricted, and during the harvest time the field force may only be able to get food enough for themselves and the nurses and young.

In the winter a good colony of bees contains from 3,000 to 6,000 workers. Along about the first of January the queen begins to lay, slowly increasing her laying as the season advances. As the young bees begin to emerge from the comb the queen becomes more active and, if everything is normal, by the time fruit trees bloom, the whole ten combs will contain some brood, most of the combs being well filled. A colony in such condition is ready for the harvest.

If the inquisitive beekeeper frequently opens the hive in the spring, or keeps out combs unduly at that chilly season, abnormal conditions are produced and the colony will not be as strong or may even be destroyed.



## SWARMING.

As the season progresses and the population of the hive increases, preparations for swarming may be made. Queen cells are built, (See Figure 17) and when the young queens are nearly ready to hatch, the swarm emerges, usually on some sunny morning. They pour out like a torrent of living water and rapidly rising into the air, dart and circle about until finally they begin to gather on some limb or other object, and soon they are all clustered in a big irregular mass. If not taken down and hived they will seek some cavity and enter it. Within the

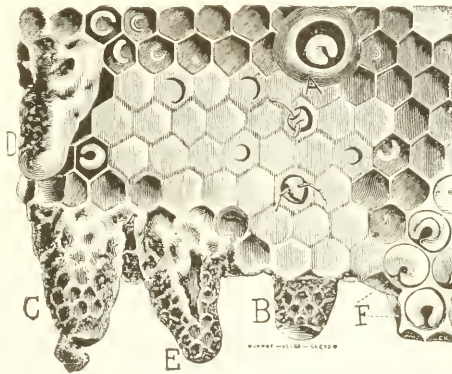


FIG. 17.—Queen Cells.

hive or cavity they again cluster and most of them remain very quiet. Slowly the wax scales push out from between the rings of the abdomen and are taken and worked into comb, which is soon occupied with eggs, pollen and honey.

Bees of most all ages go out with the swarm and the queen joins the throng usually when the swarm is about half out. If the queen fails to go with the swarm they will return to the parent hive.

If only a small part of the bees go out as a swarm, another swarm may follow when the young queens begin to hatch, or it may be delayed until the surviving young queen flies to mate.

Young queens mate about ten days after leaving the cell, though from adverse weather or scarcity of drones, it may be deferred for

two or three weeks. As soon as mated the queen returns to the hive and within a day or two begins laying.

Young queens sometimes mate several times before they begin to lay, but after they commence to lay they never mate again. If a queen fails to mate she will ultimately begin to lay, but her eggs will produce only drones. These may be placed in worker comb, but as soon as the bees cap the brood the raised bullet-like cappings betray the sex of the contained young. Such a queen should be replaced with a good one.

The average time of incubation of the eggs is three days, though it varies with the temperature. From the eggs a minute white grub (larva) is hatched, and this is supplied with and lies in a milky white food prepared in the stomachs of the nurses from pollen and honey. It is fed thus for six days by which time it has grown until it fills the cell and it is then capped over and spins its cocoon and metamorphoses, turning from a grub into a bee as does the caterpillar into a butterfly.

The worker takes twelve days to make the change and the drone fifteen.

The "queen larvæ" receive a more abundant supply of the prepared food and take only seven days to change from grub to perfect bee. It is currently said that larvæ intended for queens receive a different food from that given to the worker larvæ, but there are now good reasons for believing that it is quantity only that is varied, the chemical difference arising after it is put into the cells.

If the queen of a colony is removed intentionally or accidentally, the workers proceed to raise one or several more by enlarging some of the cells containing worker (female) larvæ, and supplying the necessary food. In due time such individuals emerge as perfect queens. If the bees have neither eggs nor young larvæ they cannot raise a queen and unless the beekeeper supplies brood or a queen, the colony will perish. The bees rarely tolerate more than one laying queen in the hive at a time. Perhaps it were more correct to say that the queen rarely permits another queen to remain long, for

man can put in several queens and have each one laying for a time, but sooner or later all but one disappear.

### IMPORTANCE OF GOOD QUEENS.

The success of the colony depends upon the queen, so it behooves the beekeeper to see that each colony has a young and vigorous one.

### INTRODUCING QUEENS.

Introducing a new queen is a matter of much anxiety to the beginner. The first essential is to remove the old queen or if she is missing to be sure that no capped cell or young queen is present. Two methods of introduction are in common use, the "cage method" and the "direct." By the first, the queen is confined in a small cage usually with a few attendants, and the exit of the cage is plugged with a sort of candy made of powdered sugar and honey kneaded together. The cage is placed on top of the frames or between the combs and allowed to remain until the candy has been eaten out and the queen freed.

The "direct method" consists of letting the queen run in free. It is helpful to confine the queen alone and without food for twenty to thirty minutes before running her in, in the meantime keeping her warm. The key to success in this method really lies in getting the bees of the colony to which the queen is to be given into a condition of extreme distress or "fear." The experienced operator does this readily with smoke, and his ear quickly tells the "pitch" of the bees "roaring," which indicates the desired condition. When this is reached the queen is run in either at the entrance or on top of the frames, preferably at the latter place, and the hive quickly closed. She is immediately one of the mass of distressed bees each turning to the other for "help" and when the disturbance subsides she is quite as much at home as they are. A colony infested with laying workers will accept a queen run in in this way when they will not in any other, but unless they have been given a frame of un-

sealed brood shortly before or soon after the queen is introduced, they not infrequently destroy her in a few days or a week, or fail to properly feed the young. As a rule a colony containing laying workers is of too little value to try to save and should be united with some normal colony.

### CLIPPING QUEENS.

For the convenience of the beekeeper at swarming time all queens should have their wings clipped. As the queens use their wings in helping themselves out of cells after laying it is not wise to cut both pairs of wings. It will be found sufficient and best to snip only the tips from the wings of one side. The queen may be able to fly a very little, but not enough to enable her to go far or to rise to some inaccessible limb with the swarm.

### HANDLING BEES.

Bees are more easily handled in the forenoon than later. At such times most of the field bees are out and the young bees in the hive are not as troublesome as the older or field bees. Very young bees, however, do sometimes have a faculty for running wildly over the combs, particularly when the older bees are present only in small numbers. This action often bothers a novice when he is trying to find a queen.

### USING THE SMOKER.

Oftentimes no smoke is necessary in handling bees, but it is a good rule never to open a hive without having a good supply of smoke available. Most anything which will burn will do for fuel in the smoker, but on most farms old burlap bagging which has been lying around in the open until it has begun to decay is available in abundance and makes ideal fuel. New or unrotted burlap does not kindle or burn at all well. Chips, partly decayed wood, cotton waste or rags, or any similar substance, will do. Some beekeepers always begin with a puff of smoke at the entrance, others never use it there, and results seem to favor the latter. After starting the cover loose,

a slight puff of smoke is blown under it, and then it is removed. If the bees show signs of "boiling up" over the tops of the frames, more smoke is blown over them from time to time. Not much smoke is needed, in fact, the beekeeper should study to see how little can be used.

### REMOVING FRAMES.

To remove a frame from the hive push back and remove the "division board" (follower), (Fig. 18), making room to spread the frames so as to give space to take out the desired one. If a little room is not thus secured, the bees are rolled over and over with the bees on the adjacent combs and much irritated, making work difficult and disagreeable for the beekeeper. "Ten-frame" hives

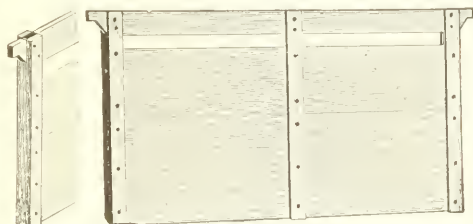


FIG. 18 — Division Board or Follower.

will not take ten frames and allow for such sliding back, so for easiest work nine frames and a division board (follower) are used.

Handle combs with quiet easy movements. Avoid quick, nervous motions or striking at bees. If stung scrape out the sting with knife or finger nail and blow a little smoke on the spot to hide the odor, as bees are excited by the odor of the bee poison and often follow up the first sting with others when it is not so treated. The veteran, however, gets more or less immune to bee stings, and unless they come thick and fast, pays but little attention to them.

If the bees get much excited and begin to dart at one's veil, burrow into the clothing and generally show signs of "anger," the hive should be closed as quickly as possible and operations deferred until some other day.

### STINGS.

Bee stings are rarely serious unless received in great numbers. The pain is not long continued, and the swelling which (except on seasoned veterans) usually follows rarely remains for more than a couple of days. A little honey smeared over the injured spot will afford as much relief as anything. If you fail to appreciate your appearance after a sting or two on the face try to console yourself with the thought of the amusement it gives those who look at you, then grin—but not when anyone is looking.

### CAUTION.

Avoid handling bees on cold or wet days or on very windy days. Do not go prying into the brood nest of big colonies when they are busy piling up a surplus. Interference at such times is needless and detrimental, besides, a populous colony, for instance, one that is filling the body and several supers, is a difficult thing for anyone but a skilled bee-master to pull to pieces, and he rarely does it if it can be avoided.

In handling combs always keep them "edge up." Do not turn them over "flat ways" or you may find them breaking from the frames.

Keep your colonies strong. This is old advice but good. Unless they are strong they will not give the best results. Vigorous queens will do more towards giving strong colonies than any possible fussing of the beekeeper. For Rhode Island it has been found that best results follow when the colonies are re-queened in August with queens which were reared in late July or early August. Also the colonies are not so populous then as earlier and finding the old queen is easier.

### UNITING BEES.

When honey is being gathered freely the bees of different colonies may be put together without any precaution, but at other times it may be necessary to get them into quite an uproar with smoke before uniting them. The uniting may be done by setting one hive

body directly on another, letting the bees mingle at will; or the combs with bees on them may all be put in one body; or the bees may be shaken from the combs before a hive and allowed to crawl in. Queenless bees unite more readily than those having a queen. If one of the queens is not removed by the beekeeper the bees attend to the matter, at least one queen or the other is soon despatched.

### MOVING COLONIES.

Do not change the location of the hives in the apiary after the bees have begun to fly in the spring, unless one of these two methods is followed: either moving but about a foot each day; or confining the bees to the hive and placing them in a cool cellar for three or four days and then liberating them at night and placing some obstruction, such as a bunch of grass or a bush, before the entrance. This assists in making them "take their location" when starting out the next day. When confined to the hives they should have wire cloth over the top of the hive and over the entrance. If the weather is hot, a sponge or roll of cloth saturated with water should be laid on the wire.

### ROBBING.

When working among the bees take pains not to spill any honey about or leave comb containing honey where the bees can get at it. Sweets so exposed may start robbing and this is particularly likely to occur if little or no food is to be found in the fields. Robbing once well under way is an unpleasant, even a serious matter. The easiest way the writer has found to stop it has been to put an abundance of syrup or honey a few rods from the apiary and get the bees started on it by walking among the hives with a comb of honey until it was well covered with bees and then gently carrying it to the food and leaving it. If enough food is put there to keep the bees busy until dark and the empty receptacles left there for the bees to smell over the next day, the evil is generally stopped without further trouble.



### FEEDING.

The bee *master* rarely has to feed his bees, but sometimes drouth or storm make it necessary to supply the bees with food to keep them alive or for their winter stores. The feeding is preferably done inside the hive. An empty body is placed on top of the brood chamber, and a number of fruit jars filled with syrup and their tops covered with cheese cloth are inverted on the frames and the hive cover put on. The bees will take the food through the cloth. Be sure the cloths are tied on securely. A syrup, half sugar and half water, stirred together until the sugar is dissolved is right. If the feeding is done in the fall when the weather is cool, have the syrup

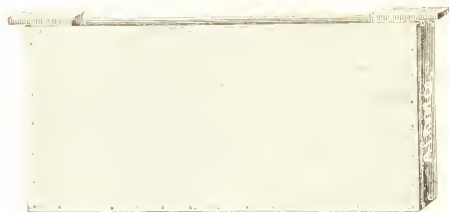


FIG. 19.—Division Board Feeder.

warm, say about 100° to 120°. Feeding is preferably done near nightfall. For "winter stores" a colony needs about thirty pounds of honey or syrup. As the bees consume more or less of the syrup while moving it, it is usually necessary to feed about ten pounds more. Feeding for winter should be finished before the middle of October, preferably before the last of September.

Normally strong colonies re-queened in August will, with an abundance of stores, come out strong in the spring, and no "tinkering" in the way of stimulative feeding in the spring will help them. Various feeders are sold by the supply houses, the most convenient being the division board feeder. (Fig. 19.) The fruit jar will be found to meet most needs, however.

### THE HONEY CROP.

With strong colonies the securing of the honey crop is a relatively simple proposition. It may be tersely stated as putting on the supers and letting the bees alone. Put on the queen-excluding honey board and the "super" on top of that. If the beekeeper is away much or cannot see the bees for a week or more at a time, put on at the start all the super room thought necessary. Do not be afraid to give "too much." If the colony is properly strong it will use the space as it needs it. If it is convenient, give the supers when the first flowers open of the kind from which the surplus is gathered, as at the time of apple bloom, &c. If not convenient to be on hand, then give them earlier.

Do not give supers to colonies which have not bees enough to fully cover the combs of the brood nest. Better unite two such colonies, making one strong one, and give that the supers.

In producing honey in "sections" it is desirable to remove them as soon as the bees have capped the combs in order to retain the whiteness of the cappings. As part of the combs are often finished sometime ahead of the rest, it is sometimes deemed wise to remove the supers, take out the finished sections, refill the supers with the partly filled sections and return them to the bees. The bee escape board is excellent for removing comb honey as the bees leave the combs quietly without cutting the cappings. Put on the escape boards near night and remove the honey in the morning. Usually only one super is removed from a hive at a time. If two or more are to be taken from one hive or if the weather is hot and close, it is often wise to slip nails or chips under the hive cover just enough to let the air circulate, but not enough to let bees pass.

In removing combs for extracting, the escape board may be used and is especially helpful to beginners. If it is not used, the combs are taken from the super or upper story one at a time, and the bees shaken or brushed from them either into the hive or in front of it, and the combs taken indoors. A bunch of asparagus tops or coarse grass

makes an excellent brush. When it gets sticky throw it away and get a fresh one.

### EXTRACTING.

At best, extracting is a sticky and laborious job. It comes when the weather is hot and often when other work is pressing. It may, however, be deferred until some more convenient season, if one has plenty of surplus combs. Also the longer honey remains in the hive the richer and better it becomes. All one has to look out for is to get the crop of light-colored honey off before the dark honey begins to be gathered, and herein the value of knowledge of the honey yields (pasturage) of the locality becomes apparent.

After the combs are safely indoors they may be left in some warm and dry room shut up from bees and ants until it is convenient to extract, or the honey may be extracted at once and the emptied combs returned to the bees. Give such combs at as near night fall as possible. Combs fresh from the extractor create great excitement among the bees, and if given in the day time are liable to cause trouble.

### UNCAPPING.

Uncapping the combs is done with a keen stiff-bladed knife, a butcher's knife with a twelve-inch blade is excellent. A pan or tub is used to catch the cappings. The frame rests on a strip of wood placed across the tub and while the frame is held by one hand, the other slices off the capping with a downward sawing stroke. Deep cutting does no harm as the bees quickly repair the combs.

If the honey is very thick or not very warm it may throw out very slowly. If so, throw it partly from one side, then all from the other, and then finish the first side. This procedure avoids crushing the combs into the wire baskets of the extractor.

For a limited amount of honey an extractor is not necessary. If the combs are newly built and are filled above a queen-excluding honey board, they will be free from young bees and contain little or no pollen, hence may be cut from the frames, crushed in a bag of

strainer cloth and hung in some warm place to drain. This treatment may be given the cappings to obtain the honey mixed with them. After the honey has drained out, the comb is emptied into any convenient receptacle—except one of black iron or rusty tin—and melted and strained.

### SWARMS AND THEIR TREATMENT.

With all man's care and precautions bees seem prone to swarm just when it is least desired, which is when they are most busily at work gathering honey, and this seems particularly so when they are storing in sections. Shade, large entrances, an airy location, plenty of room for queen as well as for storage, all tend to deter swarming, but some always seem bound to swarm. About half the colonies in an apiary usually swarm under the systems mostly in vogue.

When the bees do swarm, if the queen was clipped she will be found on the grass or ground not far from the hive. She should be picked up and caged with a few of her workers. The hive should be set to the rear and another containing only frames with narrow starters of foundation put in its place. By this time the bees, not having a queen with them, will be coming back. Lay the caged queen at the entrance while transferring the honey board and supers, with all the contained bees from the old to the new hive. Next shake all the bees from about half of the combs of the brood chamber of the old hive in front of the new one. In doing this have a wide board, hive cover or box placed level with the hive entrance to shake the bees on. When the majority of the bees are in, liberate the queen at the hive entrance and see that she goes in, using a puff of smoke if need be. Usually the bees will settle down to work again, and having no combs for storage below, will put all the honey above. Generally this is an excellent plan, but sometimes it does not work, the bees trying to swarm again. If this occurs, re-cage the queen, and place the cage in the hive for a few days. If the beekeeper is not on hand to see the swarm, the bees, on missing the queen, will return to the hive. A few may find the queen in the grass and gather about her and thus

indicate her whereabouts to the beekeeper. If she is not given back to the bees, or if the beekeeper is away and the queen perishes, the bees, after a day more or less of uneasiness, settle down to work again. If they have plenty of ventilation and storage room they rarely swarm with the young queen which succeeds the first swarming.

If the queen is not clipped and the swarm clusters where it can be reached, it is usually easiest to shake it into a basket or box, cover it with a cloth, carry it to the stand it came from, and when the new hive is ready, pour out the bees in front of and against the hive just as if they were so many beans. Keep empty hives which are awaiting swarms in some cool place or shaded. Bees do not readily enter hot hives.

### FORCED SWARMING.

When a colony seems to be preparing to swarm, indicated by great population, starting of queen cells, bees hanging in masses on front of hive or about the entrance, it is the practice of some beekeepers to shake the bees from the combs, giving the bees a new hive on the old stand as in natural swarming, transferring to it the supers with the contained bees and giving the old brood chamber with its combs to some other colony to care for. Some vary this method by leaving about half the combs unshaken and placing the old hive at one side of the new. In a week it is changed to the other side of the new hive, and a week later back again; this is to throw the force of young field bees into the "swarm."

Another variation is to give the brood from which the "swarm" was shaken, to some weak colony, a week or so later de-queen it, and the next day shake most of the bees into or before the swarm. In forced swarming it is well to make the "swarm" enter the new hive through a queen-excluding honey board temporarily placed under the hive body or through an "entrance guard" of excluder metal or through a drone trap. This shuts out all the drones. The queen is put inside the hive. It is wise to leave the guard or "excluder board" in place for a few days, for "forced swarms" some-

times get uneasy and "swarm out." As soon as they have settled down to work again the guard should be removed. The drones are kept out so as to avoid one disturbing element (as they are such when confined) and also to keep them from choking the entrance in their efforts to get out while the guard is on.

Forced swarming is profitably followed when treating colonies afflicted with any of the contagious diseases, *except* that the combs taken away are not later shaken before the "swarm" for if they were, re-infection would be certain.

### REARING QUEENS.

Every beekeeper should raise his own queens and not depend upon the commercial queen breeders for anything but a new queen for breeding purposes.

The easiest way to secure a few young queens is to divide the combs of a colony that has swarmed into lots of twos or threes, seeing that each lot has one or more queen cells. Place these combs in empty hives, reduce the entrance so but one or two bees can pass, and place the hives away from the large colonies, if convenient. In due time the young queens will hatch and mate and may then be used as desired.

Another simple way is to take a comb, preferably not a very old one, put it in the middle of the colony from the queen of which it is desired to raise new queens and five days later remove it. It will be found to be filled with eggs and very small larvæ. With a knife slice off a couple of inches or more from the lower part of the comb. This is to give the bees a better opportunity to build cells and also they will be built in a more convenient place for the beekeeper.

Place this comb with its adhering bees, but without the queen, in an empty hive and on each side of it place a comb containing honey and pollen. Also give water in a division-board feeder or by a sponge. Now shake into this hive all the bees from two frames taken from the center of the same or of another good colony, being sure not to get the queen. Close the hive entrance with wire cloth and put

the hive in the cellar or some moderately cool place for twenty-four hours, then set it out of doors, remove the wire and reduce the entrance. The liberation is preferably done near nightfall.

Four days after the first cell is sealed, form small colonies (nuclei) of a frame or two of brood and bees, confine them as the cell building colony was treated, liberate them the next evening and give each little colony a sealed cell. To do this easily, cut the cell from the comb together with a piece of the comb, say an inch square, and slightly separating two combs of the small colony (nucleus) place the cell part way down between them and push the combs together enough to hold it.

Two factors are important in raising queens, food and warmth. The first is secured by having an abundance of young bees (nurses), and the second by the abundance of bees, reduced entrance, and if needs be, as during a cold storm, covering the hive with tarred paper or some similar method.

The best queens are generally raised in warm weather and during a good honey flow. If they are to be raised when little honey is to be found in the fields, feeding will be necessary. It must be constant until the cells are sealed. Use only sugar syrup for such feeding. Honey so used is liable to induce robbing.

### RACES OF BEES.

If the bees one has are good workers and handle fairly well, it is wise to go slow in changing them. Most bees in Rhode Island are Blacks or Italians, or a mixture of the two. Some of the less common races have been introduced, but have soon become merged with the others. The Italian bee is probably the best all-round bee we have. The different strains vary in color or work in slight degree. If it is desired to change one's stock, buy a few queens, getting one or two each from different breeders. Try them out for a year and then breed from the best. The "leather-colored" Italians are to be preferred to the "yellow" or "golden" type.



### INCREASE.

If increase is not desired, the brood and remaining bees left by a swarm are united with some other colony after removing its queen or after destroying the queen cells in the hive the swarm left. If increase is desired, the old hive, now much reduced in numbers and without a queen, is placed on a new stand and looked at in about a fortnight to three weeks to see if the young queen is laying. With a good young queen it will soon become strong.

### ARTIFICIAL INCREASE.

Colonies of bees may be divided into two or more parts, the old queen left with the part on the old stand and a new queen given to the other part. The hives are filled out with combs or frames containing full sheets of foundation and the bees allowed to build up. This form of increase is excellent, but needs to be done with caution. It is best done during a good honey flow, but done then it puts an end to hope of surplus from the colonies treated. Indiscriminate division is unwise, and if a colony is divided into many parts, each may be too small to thrive, and the whole colony be lost.

Another excellent way to increase, but a little more laborious is to take a frame of brood with adhering bees from each of five or six colonies, put them together in one hive, fill out the empty space with combs or frames of foundation, and introduce a queen. If seven or eight frames of brood are taken this method may be used as late as the middle of September, but as a rule it is not wise to divide colonies after the middle of August. An expert may safely do it later but the beginner had better not try it.

### MARKETING HONEY.

There are a few rules which should never be forgotten and should always be followed if one wishes to succeed in the honey business:

First: Never sell or give away any unripe or ill-flavored honey.

Second: Always have the packages clean and free from stickiness. If in bottles, jars or cans, be sure they do not leak.

Third: If producing considerable quantities of honey and selling to stores or shipping it away have each case of comb honey all of one kind, and all sections as near as possible equally filled and capped. Have the honey of each lot in bottles of the same kind.

Sell first to your neighbors, next to the stores in your nearest town, and by the time your crops are too large for them to handle you will have learned where and how to sell large quantities. If you start supplying a store, try and reserve enough honey of the kind you start with to carry that customer through to the next season. Nothing so upsets the honey trade as a change in the flavor of honey. Many beekeepers are now practicing "blending" or mixing their various sorts of extracted honey so as to have it all of one general flavor. This is excellent practice, but requires experience for its greatest success. Strong flavored or very dark honeys must be scrupulously left out of such blends.

The best that can be done with comb honey is to see that in each case all of the sections are of the same crop and endeavor to supply only one kind to one customer for the season.

When customers comment on the differences in flavor it is necessary to explain that the flavors of honey from different sorts of flowers vary as do the odors.

Extracted honey will granulate or crystallize in time, hence it is not wise to bottle at one time more than the customer is likely to dispose of before it begins to granulate.

In melting granulated honey heat it slowly and as soon as it softens stir it from time to time that it may heat uniformly. Be careful not to over-heat it or the flavor will be injured or spoiled, and the honey darkened. About 130° F. is as high as it is safe to heat it.

### PREPARATIONS FOR WINTERING.

These should begin in August with the re-queening of the colonies. If there is a dearth of nectar and the prospects of an immediate flow are

slight, it is good policy to stimulate the production of brood. Probably the very best way to do this both for economy of labor and material and for the excellence of the results is to hang in each brood chamber one of the "division board" feeders (Fig. 19), filled with soft "Coffee A" sugar. Do *not* add any water to it. This system was devised by Mr. Samuel Simmins, an eminent British beekeeper, and is one of the best things he ever gave to the public. The bees feed on the sugar just fast enough to keep the queen laying well. They do not store any of the liquified sugar in the combs.

By the time the first frost cuts short the flowers, the colonies will be found to have a large population of young and vigorous bees. If the "fall flowers" did not yield enough to fill the combs well with honey the bees must be fed at once. Syrup of granulated sugar and water is the proper thing to use. Do *not* use "Brown" sugar. Make the syrup half sugar and half water, or if you have delayed too long, until the days as well as nights are cool, make it two-thirds sugar and one-third water. Feed enough so that the bees have not less than thirty pounds of stores. A Langstroth comb when filled contains about six pounds of honey, and in estimating supplies remember that brood combs contain much pollen and if hive and contents are weighed and from the gross weight the weight of a dry hive and set of combs are deducted, remember that old leathery or pollen-filled combs weigh very much more than new ones and that the bees weigh from three to six pounds or even more in a very strong colony. Better give more than you think they need, and then some more.

Bees do not use much food in winter (sometimes as low as two pounds), but when they get right down to brood rearing in the spring, stores vanish like snow in the summer's sun. When all colonies are supplied with food, see that all covers are water tight, that the hives are level, or tilt slightly toward the entrance, fix the covers so they cannot blow off and then let them strictly alone until late spring. If mice are numerous it is a good plan to put across each hive entrance a piece of wire cloth with meshes large enough for bees to pass, but too small to admit mice.

If single ply tarred paper or any other waterproof black paper is laid over each hive, folded down around the sides as one would do up a bundle and secured by strips of lath tacked along the lower edge, excellent protection is afforded both from moisture and from wind. Never close the entrance. It may be reduced in size, even down to a square inch, but the experience of years has shown that colonies with entrances wide open (*i. e.* 14 by 1 inch) are not only just as strong in the spring as those with reduced entrances, but often stronger.

*Attend carefully to this fall work* No amount of fussing and feeding in the spring will make amends for neglect in the fall.

### CELLAR WINTERING.

It is quite unnecessary to put bees in the cellar in this climate, in fact they are much better off out of doors. Some persons put them under sheds, packing all about with leaves or similar material. This is unwise as the hives get damp and the bees do not get the benefit of the sun and air. Leave them where they stood all summer, merely erecting some sort of a wind break if in an exposed place.

### ENEMIES.

Bees have few real enemies here. Skunks sometimes disturb them when the hives sit close to the ground. Ants not infrequently annoy them and occasionally become a real nuisance. They are readily destroyed by pouring gasoline into their nests, or the legs of the hive stands may be placed in tin can covers and a little crude oil or kerosene poured into each. Birds rarely disturb them. The king bird or bee martin catches a few, but as these birds do so much good in devouring various noxious insects, we can well afford to give them a bee now and then. To a person engaged in commercial queen rearing a pair of king birds may become a decided pest, for they seem prone to catch the young queens. If shot at a few times with blank charges they rarely fail to change their hunting ground.

"Wax moths" are often accused of killing out the bees. The bees

whose hive becomes infested with the larvæ of these moths will be found to be depleted in numbers through loss of the queen, disease, or some unfavorable circumstance. The strong colonies will quickly dislodge any they can reach. Weak colonies, however, seem discouraged and give up the struggle against them until ere long the combs are reduced to a mass of webs and dirt. When discovered in this condition, scraping the hive clean and burning all the refuse is all that can be done. The chief preventive to their inroads is to keep the colonies strong, by having a vigorous queen in each one.

Combs not in use should be stored in some dry room and inspected occasionally. If the "wax worms" appear, the combs should be fumigated with burning sulphur and returned to the room.

### DISEASES.

There are two contagious diseases of bees now recognized, both of which attack the brood or bees in the larval stage, and are known respectively as American Foul Brood and European Foul Brood, the latter being sometimes called Black Brood. The so-called Pickled Brood is seldom met with and does not seem to be infectious. The term "foul" as applied to brood disease was given on account of the odor emanating from the dead brood. The larvæ die in the cells and turn brown or black. The colony becomes depleted in numbers and unless treatment is prompt and thorough the disease will spread through and destroy the whole apiary.

In case of trouble or suspected disease, beekeepers are requested to write to the Entomological Department, State Board of Agriculture, State House, Providence, R. I., and the Apiary Inspector will render such aid as may be necessary.







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