Advanced Bee-Culture.

BY W. Z. HUTCHINSON.

ADVANCED

BEE-CULTURE

ITS

Methods and Management,

BY

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Flint, Genesee Co., Michigan.

SECOND EDITION

1902

@ 20631

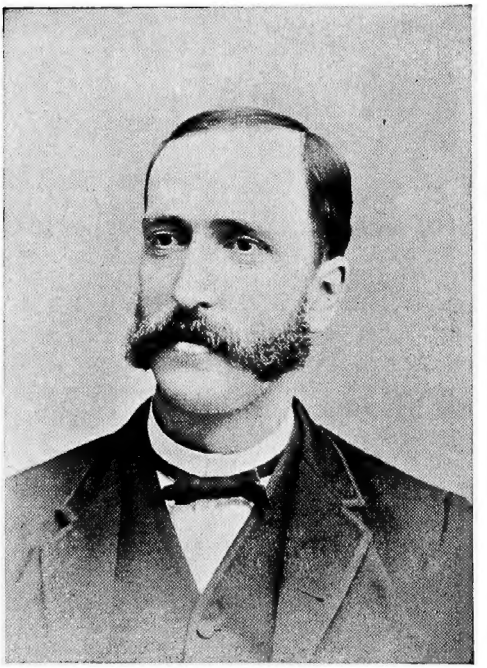
INTRODUCTION.

AS THE RESULT of numerous experiments in the use and non-use of comb foundation, I was led, four years ago, to the writing and publication of a little book entitled "*The Production of Comb Honey.*" The main feature of this book was the giving, in detail, of a method whereby full sheets of foundation might be profitably dispensed with in the brood chamber when hiving swarms. Other important points in the production of comb honey were briefly touched upon. The first edition (3,000) is now sold, and the pleasant task of re-writing and revising is now before me.

When the little book came out, one of the criticisms brought against it was that it was *too small.* "Give us more," was the cry then; and it comes to me yet. Repeatedly have I been urged to write a larger book, giving my experience and views more in detail and upon other points. Flattering as all this may be, I doubt if I should have yielded to these entreaties were it not that, as editor of the BEE-KEEPERS' REVIEW, I have, for nearly four years, had the benefit of reading, and studying over, special discussions, by the most practical men, of the most important questions connected with our pursuit. In other words, a large share of the ideas to be found in the following pages may also be found scattered through the back volumes of the REVIEW. I have classified, arranged and condensed; giving what *I* consider the "cream" of the discussions that have appeared in the REVIEW. The supply of back numbers of the REVIEW will soon be exhausted, and even those who possess them will find it convenient to be able to turn, in a moment, to a fresh, clear and concise, yet comprehensive, resume of the most important apicultural topics of the day. So many more topics are now taken up that the old title would not be appropriate, hence it has been decided to change it to that of ADVANCED BEE-CULTURE; ITS METHODS AND MANAGEMENT.

The above was written about ten years ago, when I got out the first edition of this book, but at present I see nothing to add to it.

W. Z. HUTCHINSON, Flint, Mich.



As ever yours,
W. Z. Hutchinson.

ADVANCED BEE-CULTURE.

Care of Bees in Winter.

IF THEY were properly prepared for winter the preceding autumn, given plenty of good stores, properly protected out of doors, or placed in a cellar or other repository having the proper temperature, and precautions taken against depredations by mice, bees require almost no care in winter.

No bee-keeper worthy of the name will allow his bees to go into winter quarters short of stores. They ought, at least, to have enough to last them until the first warm days of spring, when they may be handled upon their summer stands, and fed if necessary. A very disagreeable job, indeed, is that of handling bees in the cellar, to learn if they are in need of stores. Instead of flying to any great extent, they *crawl*, up the operator's sleeves, up his trouser's legs, from where they have dropped upon the floor, and down his collar and under his coat. They buzz around the light, and, if an ordinary lamp is used, many go down the chimney never to return. Quite a good many drop off on the floor, and are lost. If the bees are wintered upon their summer stands, and there comes a day warm enough for them to fly, it is but little trouble to examine them for the purpose of learning the amount of stores on hand. As a rule, but little honey is used during the winter, but when breeding commences towards spring, stores disappear as by magic.

If by any hook or crook the bees *have* gone into winter quarters short of stores, and there are fears that some may be starving, it is better that they be examined, and fed if needed, even though the task is unpleasant. There need be no hesitancy in thus disturbing the bees for fear that it may do them some injury, for, as a rule, it will not. Probably the best method of feeding bees in winter is to give them a frame of honey. Perhaps all the honey is in the hives, what shall be done then? It is well known that all colonies do not consume the same amount of stores. The variation is very great, and by examining all of the colonies, or a large number of them, the bee-keeper can usually find combs of honey that may be spared to furnish needy colonies with stores.

If some colonies *must* be fed, and no honey is available, the best substitute for honey is candy made of granulated sugar. Put in sufficient water to dissolve the sugar, then boil the syrup until it will harden in cooling. To learn when to remove the candy from the fire, take out a spoonful every few minutes and allow it to cool. As soon as it begins to show signs of hardening, draw the vessel con-

taining it to the back of the stove where it will boil slowly. Watch it carefully and try it frequently. As soon as it is sufficiently hard, remove it from the stove and pour into shallow dishes to cool. Be careful not to get it too hard. If it is hard enough to retain its form when placed over a colony of bees, that is sufficient. A thin cake of such candy laid directly upon the frames over the cluster of bees, and then the whole top of the hive covered with a piece of enameled cloth, and two or three thicknesses of old carpet over that, will enable the bees to "hold the fort" as long as the candy lasts. If for any reason it is impossible or undesirable to place candy in this manner upon the tops of the frames, the candy may be "run" directly into empty brood frames, and the frames hung in the hives adjoining the cluster of bees. To fill a frame with candy, lay it upon a smooth board with a piece of paper under the frame, and pour in the candy after waiting until it is as cool as it can be and yet be made to "run." To keep the frame down close to the paper, so that the soft candy will not run out while cooling, tack the frame down with some wire nails driven through it into the board. Have the nails just long enough to hold the frame down nicely, but not long enough to make it difficult of removal. If a full frame of candy is more than a colony needs, a less amount may be given by tacking a cross-bar in the frame, part way up from the bottom, and filling the upper space only with candy.

Henry Alley recommends the use of "Good candy" for feeding bees in winter. This candy is made by mixing pulverized sugar and extracted honey until it is of the consistency of a stiff dough. It is almost impossible to get it too stiff. When first mixed it may be quite hard, but will be found quite soft and plastic in a day or two. To place this candy in a hive, tack thin boards upon one side of an empty brood frame, covering one whole side of the frame. The frame is thus virtually transformed into a shallow tray. Fill it with the soft candy, then cover the other side of the frame with thin boards, except a small space at the top. In the opening thus left, the bees can enter and carry away the food. The frame of food thus prepared is hung in the hive adjoining the cluster, with the opening turned towards the bees.

The above methods of feeding are preferable to feeding syrup, which is more difficult to give and contains so much water. If it must be used, let it be made as thick as possible.

Mice sometimes do some little damage both to colonies wintered indoors and those in the open air. This damage is confined principally to that of gnawing the combs. If bee-keepers would only remember that bees can pass through a space that is less than ¼ of an inch, and that a mouse needs a space nearly twice this, it would seem that there need be no trouble in keeping mice out of hives. Simply contract the entrance until it is only ¼ of an inch the narrowest way, and no mice can enter. This should be done quite early in the fall, as cool, frosty nights often drive the mice into the warm retreat to be found inside a bee-hive. When bees are wintered in the cellar, many bee-keepers practice raising the hives about two inches from the bottom board; others remove the bottom board entirely. This allows plenty of ventilation, but scarcely any escape of heat. All dead bees and rubbish drop down away from the cluster of bees, where they dry up instead of becoming moldy and rotten from contact with the warmth and moisture of the cluster. If a colony *does* die, the combs are left dry and clean, instead of being stuck together with a mass of damp, moldy, rotting bees. All who have tried raising the hives in this manner, are enthusiastic in its praise; but it will be seen that this plan gives the mice, if there are any in the cellar, free access to the hives.

Dr. C. C. Miller heads off the mice by the use of what he calls a reversible bot-

tom board. It is simply a shallow box (minus one end) as wide as the hive and a little longer. In summer the flat side is used uppermost. In winter the box side is turned up, thus furnishing the desired space under the bees. The open end of the box is covered with wire cloth having a mesh coarse enough to allow bees to pass through, but shut out mice. Every bee-keeper does not use such a bottom board, perhaps would not care for it, and then the best plan is to keep the mice out of the cellar. If it is of such a character that they can not be shut out, then they must be trapped or poisoned. For the latter purpose, I have found nothing better than equal parts of flour, white sugar and arsenic, mixed, and placed in shallow dishes in different parts of the cellar.

Unless the cellar is well under ground, where it is well beyond the influence of the outside temperature, it is well to keep watch and not allow the temperature to run too low in protracted cold spells. A lamp stove, burned all night in a cellar, will raise the temperature several degrees. During the fore part of winter a low temperature is not so dangerous as it is towards spring, when brood rearing has commenced. From 35° to 45° will do very well until towards spring, when it should not be allowed to go below 40°, and may with safety go as high as 48° or 50°. In this connection it must be remembered that moisture has an influence upon the effects of temperature. So far as effects are concerned, a moist atmosphere is the equal of a low temperature. If the cellar is moist, either raise the temperature, or remove the moisture. Unslacked lime in the cellar will absorb moisture. Even when the influence of moisture has been considered it will not answer to tie ourselves to a certain temperature. It is the temperature *inside* the hives that affects the welfare of the bees. If the colonies are weak, their hives open, and the brood-nest uncontracted, a higher degree of heat is needed than with strong colonies in close, well protected hives. Putting colonies near the top of the cellar will help matters some, as the air is warmer there. The best guide in regard to this matter of temperature is the behavior of the bees themselves. If they are closely, quietly and compactly clustered, there is but little cause for alarm in regard to the temperature. Quite a number have reported excellent results by warming up the bee repository to summer heat, say once a week or ten days, if the bees become uneasy towards spring. This enables the bees throw off any surplus moisture, and, as the temperature goes down, they quiet down and remain so for several days, when they may be warmed again. So long as the bees remain quiet, I should not disturb them by artificial heat. If the cellar becomes *too warm* in the spring, before it is time to remove the bees, it may be cooled down by carrying in snow or ice, or the windows and doors may be opened at night and closed in the morning.

Years ago many bee-keepers practiced taking their bees from the cellar, if there came a warm day in the winter, and allowing them to fly, returning them again to the cellar, but this practice has been pretty nearly abandoned. If the bees are in a quiet, normal condition, it often rouses them and sets them to breeding in mid-winter, which is far from desirable. If the food, temperature, and other surroundings are what they ought to be, such a flight is not needed. If they are very faulty, such a flight will not save the bees from death.

If bees out of doors are properly protected and have abundaut stores, they need no care in winter, unless it is to see that the entrances are not clogged with ice, snow, or dead bees, when there comes a day warm enough for them to fly. If a rim two inches wide is put under each hive when they are packed in the fall, and an entrance made at the *upper edge* of this rim, the entrance will never be clogged with dead bees.

Securing Workers for the Harvest.

EACH BEE-KEEPER ought to thoroughly understand the honey resources of his own locality. He should know when to *expect* a honey flow. When the time comes, the expected harvest may not come, but the bee-keeper should be in readiness for it. It is possible to have a good honey flow and yet secure no surplus, because there is not a sufficient number of bees to gather it. Bees are valuable when there is honey to gather, at other times they are consumers. Less populous colonies can be more successfully wintered in the cellar than out of doors; while by proper protection and care in the spring, such colonies can be brought up to the requisite strength in time for the honey harvest. If by such management we are enabled to so reduce our colonies in strength during the non-producing time of the year that stores are saved to the amount of from three to five pounds per colony, we are well paid for our trouble.

Rapid breeding late in winter or very early in the spring is undesirable. Nothing so quickly wears out bees as the rearing of brood; and the more unfavorable the conditions the greater the wear. It is better that the bees should remain quiet until warm weather furnishes the most favorable conditions for brood rearing, when the same expenditure of vitality will produce two bees instead of one. If the bees in the cellar are quiet and show no signs of dysentery, don't allow a warm day or two to tempt you to their removal. Leave them in until either honey or pollen may be gathered. Some bee-keepers leave them until considerable later than this, and, if the bees are to receive no extra protection when placed upon their summer stands, this course is advisable. But the bees are not always quiet as spring approaches. The character of their food may have been such as to overload their intestines, and unless they are soon allowed an opportunity of voiding their fæces, death will result, or their vitality will become so impaired that death will soon claim them. Whether the bees are quiet or not, *I* would carry them to their summer stands as soon as there is pollen to be gathered, and then I would protect them by some temporary covering.

Aside from food in abundance, *warmth* is the one thing needed to promote *safe*, early breeding. An ordinary colony will generate sufficient heat to enable the bees to rear as much brood as they can tend, the trouble is that so much of this heat is lost by radiation. Unless there is considerable brood present when the bees are taken from the cellar, protection is not needed very much at first—not until a quantity of brood has been developed. I have learned from repeated experiments that protection allows or enables the bees to develop greater quantities of brood; but I do not consider this the greatest advantage of protection. The point is just here: We often have nice warm weather for three weeks. The alders, elms and maples bloom, possibly the cherries, and all this has encouraged the bees to extend their brood until the combs are well filled. Then comes a cold "snap." The mercury

goes down to freezing, or nearly there, and remains so several days; perhaps the ground is covered by two or three inches of snow—a veritable "squaw winter." More than once have I and my bees passed through such experiences, and to our sorrow. The cold drives the bees into a compact cluster in the center of the hive. Half of the brood, perhaps more, is outside of the cluster, where it perishes. The newly hatched bees, if any there are, are tender, like a newly hatched chicken, and easily succumb to the cold. The old bees have lost their vitality in bringing into existence the hive full of brood, and the cold snap is the "last straw" needed to send them to the bottom of the hive. Weak colonies, in passing through such severe weather unprotected, almost invariably die. Ordinary colonies are rendered practically worthless for the season, and strong colonies are not improved. Such low temperature does not usually come so late in the season, but it is *liable* to come any year; while "cold snaps," even if not so severe, come almost every spring; while the loss that *may* occur from an unusually severe spell of weather late in the spring, will be sufficient to pay for the expense of protecting the bees each spring for several years. Several times, when protecting the bees in the spring after taking them from the cellar, I have left a few of the most populous colonies unprotected. In the early morning, or during cool days, the bees in the unprotected hives would be found closely clustered, while those in the protected hives would be found crawling actively about all over the combs, and a puff of smoke would drive them down an inch or two and expose large quantities of sealed brood. When the honey harvest came, a majority of those protected were actually stronger than those left unprotected. Some have compared this packing of bees in spring to a *stimulant*. It is not a stimulant, as we understand the word. It simply confines the heat of the bees, allowing them to spread out and rear and protect larger quantities of brood. Give them the proper conditions for following their instinct in the direction of brood rearing, and no additional stimulus is needed.

If spring protection is so important that it is advisable to pack the hives after taking them from the cellar, it may be asked, why not practice out door wintering—then winter protection will answer for spring, and the expense of a cellar and of carrying the bees in and out will be avoided? In the first place, the saving of stores in cellar wintering will pay for the expense twice over; and, in the next place, and of far greater importance, it is only by the cellar method that the wintering of bees, in a cold climate, can ever be reduced to a perfect system. By a selection of natural stores, or, better still, by using sugar, we can secure uniformity of food, but it is only in the cellar, or special repository, that uniformity of temperature at a desirable point can be maintained. Possibly our knowledge of wintering bees will yet become so extended as to enable us to keep them breeding in the cellar, during the spring, until all danger of blizzards is past, or so nearly past that no protection will be needed; but as the majority of us *now* winter our bees, they become restless as warm weather comes on, and, as a flight in the open air, and a little freshly gathered pollen, honey and water seem to act like a charm, putting new life into their veins, I believe it is better to put them upon their summer stands as soon as pollen can be gathered in abundance, and, as we almost always have "cold snaps" after this, I would protect them.

Spring protection need not be an elaborate affair. Any old boards nailed together in the form of a box will hold the packing in place. A box without top or bottom, 2 x 3 feet in size, by 18 inches deep, made of cheap, thin lumber, can be set over the hives to keep the packing in place. The lower edge of its front end should rest upon the outer edge of a little bridge placed in front of the entrance and resting upon the bottom board of the

hive. The best of the lumber should be picked out for making roofs; and, as the front end of the packing box is raised several inches, the water will run off at the back end. Dry sawdust makes excellent packing; probably the best that is easily obtainable. It seems to be peculiarly adapted to absorbing and retaining the heat given off by the bees, and that received by the sun, and gradually giving it off in times of need. It becomes, in short, a sort of caloric balance wheel. With this method of packing, all the extras needed are the little bridges, the packing material and the rims; and, if the latter are only slightly nailed, they can be knocked apart and piled up snugly out of the way when not in use; or, by laying the two boards that are used for the *sides* of the rim side by side, and uniting them by tacking a strip of wood across, they may be used as a shade-board. The roof may be used as a shade-board. To pack bees with this arrangement, the sawdust is brought into the yard in barrels upon a wheelbarrow. A rim is set over a hive, then a barrel raised up and sawdust poured over the hive until it is well covered. Perhaps a bushel or more of sawdust is used for each hive. The cover is then put in place, and a stone laid on to keep the wind from blowing it off. The work can be done more rapidly than one would suppose. When the time comes for removing the packing (which is not very much before it is time to put on the supers), the cover is taken off, the rim raised right straight up from over the hive and carried away, then the sawdust is shoveled up into a barrel with a scoop shovel.

Mr. Heddon now protects his bees in spring, after taking them from the cellar, by putting each colony into a box made of thin lumber, and filling the space between the hive and box with sawdust. The box has a bottom, is two inches larger each way than the outside of the hive, is painted dark red that it may absorb the heat of the sun, and the cover has a rim that shuts down over the outside of the box like a chest cover. When the hives are taken from the boxes, the sawdust is left in the boxes, and they are stored in a rain-proof building until wanted another spring. Mr. Heddon prefers packing not more than two inches thick, asserting that more benefit is thus secured from the warmth of the sun than when the packing is thicker.

Quite a number of bee-keepers have used and recommended double-wall hives with no packing between the walls. Protecting bees in the spring, in a similar manner, by simply setting a box over the hive has been recommended. Simply an enclosed space cannot be so effective as though the space were filled with some material like chaff or sawdust. If there is no packing, the air next the hive is warmed and rises; that next the outside wall is cooled and falls. In this way a circulation is brought about by means of which the hive is robbed of its heat. Packing puts an end to this circulation. Mr. Root, of Ohio, is experimenting with a thin outer shell for use in winter in the South, or in the spring at the North. It is made of material only $\frac{3}{8}$ of an inch thick and dove-tailed, lock-jointed, at the corners. He leaves only $\frac{3}{4}$ of an inch between the hive and outer case. He also recommends, when necessary, wrapping a long, wide, flat, thin cushion, filled with chaff, around the hive before the outer case is slipped down over the hive. I consider the space for packing too small.

Bees may be protected to some extent by putting packing of some kind at the sides of the brood-nest, *inside* the hives, and putting chaff cushions over the brood nest, or filling supers with chaff or sawdust and placing them over the hives; but none of these devices are so effectual as completely surrounding the hive with packing.

Years ago, what was called stimulative feeding was frequently practiced in the spring, but it has been largely abandoned. It *is* stimulation in the true sense of the word, and often encourages brood

rearing too early in the season. If the bees are protected as I have recommended, the danger is greatly lessened, but I can think of only one condition when it would be advisable, and that is if the honey flow should receive a check before the main harvest begins. Brood rearing should not begin until it can be carried on uninterruptedly, and once begun, it should receive no check. After brood rearing is well under way, a stoppage in the honey flow will put upon it a decided check. Drones will be killed, and the cells from which brood hatches will be left empty. When the main honey flow comes, there will be an insufficient number of workers, and an empty brood nest to fill. The bees will fill it with honey, and that is *about all they will do.* To have bees go into the sections and do work that amounts to something, the brood nest should be nearly one solid mass of brood when the harvest opens. To more perfectly accomplish this, some bee-keepers change about the frames in the brood nest, bringing the outside combs, containing but little brood, into the center, where they will be filled. With a horizontally divisible brood chamber this same object can be secured with less labor by simply interchanging the two sections, putting the lower one at the top and the upper one at the bottom. This divides the "globe" of brood in the center, and brings the convex spherical parts together in the center of the hive. Nothing is gained by uniting weak colonies, nor by taking brood from strong colnies to strengthen the weak. See that all have good queens, abundant stores, and are packed up snug and warm, then if any uniting *is* to be done, wait until just before the main honey harvest, when brood may be taken *from* weak colonies and used to bring some colonies up to the standard that are a little lacking in numbers. As a rule, I don't approve of such work; it is too much like robbing Peter to pay Paul. Weak colonies can usually be used to the best advantage in raising extracted honey.

I have devoted considerable space to this topic, because, unless our hives are overflowing with bees and brood at the opening of the harvest, there is little chance of success.

Bee Hives and Their Characteristics.

IN "Bees and Bee-Keeping," under the head of "Hives for Bees," Mr. Frank Cheshire shows that external protection is essential; that, lacking this, a crust or envelope of closely clinging bees must be formed on the outside of the cluster, thus forming a living hive, inside of which it is possible to maintain a temperature of 95°. This envelope or crust would vary in thickness according to the temperature. Upon our hottest days it would break up altogether. By furnishing the bees with an outer covering, the workers composing the "living hive" are released for other labors; but if the hive is too large the bees cluster at one side or corner, thus leaving one side of the cluster exposed, over which must be formed a protecting crust of bees. Mr. Cheshire says: "It is true that hives gather no honey, but in so far as they effect the objects which have engaged

our attention, they are the cause of much being gathered."

These remarks of Mr. Cheshire naturally introduce the question of the *size* of hives. That the hive should be adapted to the size of the colony, the season, etc., is admitted by all, but as to how a change in size shall be effected there is difference of opinion. If the combs are very deep it is impractical to change the size of the brood nest, except laterally, and by the aid of division boards; but this method allows a most complete control of the degree of contraction. Changing the size of the brood nest vertically is practical only with shallow combs; and the shallower the combs the more perfectly can this method of contraction and expansion be managed.

For awhile before swarming time a large brood nest is needed; larger, at least, than is needed after the main harvest has come. As top-storing and tiering-up are now almost universally practiced, and as bees work much more readily in sections that are over the brood, it is evident that a hive allowing vertical contraction is the one for "contractionists" to use.

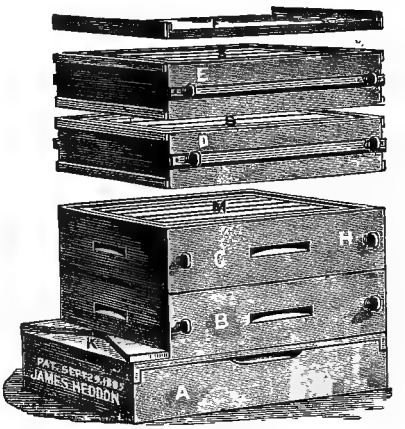
If contraction is not to be practiced, then there arises the question of what size shall be the brood nest? Some plead for a generous space, that the queen may not be "cramped for room," as though this condition of affairs were very undesirable and unprofitable. Were queens expensive, this plea would be worth consideration; but, as the capital is in the combs, honey and hives, rather than in the queens, the question as to which shall be kept employed at the expense of the other's idleness, needs no argument. If the size of the brood nest is to remain unchanged, then let it be of such capacity that an ordinarily prolific queen will fill it at the height of the breeding season. Let the size be less than this, rather than more. Eight Langstroth combs, or their equal, will furnish sufficient room. Many in arguing for large hives, mention how much larger yields *per colony* are secured. True; but do they secure any more per *comb*. Bee-keeping ought to be viewed in a broad light. The question is something like this: Here is an area of honey producing flowers, how shall we secure the nectar with the least expenditure of capital and labor? Small hives enable us to secure a more complete filling of the combs with brood, consequently more workers for the combs we have. Small hives may cost a trifle more in proportion to their size, than large hives, but as an offset there is the greater ease and quickness with which they are handled.

Aside from a small brood nest, to secure a more complete filling of the combs with brood, or to lead to more rapid work in the sections, there may be mentioned the making of hives in such a manner that they may be inverted. The masses have not seemed to take kindly to inversion. Like many new things, it was extravagantly praised; but it is far from valueless. Perhaps one reason why inversion is not more generally practiced, is because it has been discovered that, with a hive having a horizontally divisible brood chamber, the interchange of the parts accomplishes the same results as inversion.

In northern climates, bees need more protection in winter than is afforded by a single wall hive. In Michigan this is best afforded by a cellar; farther south some kind of packing is probably preferable. Whether this packing shall be in the shape of the so-called chaff hive, or in something of a temporary nature that can be removed in summer, is a point upon which bee-keepers differ. It is true that temporary packing calls for extra labor, and there *was* a time when it also resulted in some untidiness and unsightliness in the apiary during the winter, but the neat outer case and improved methods of packing that are now being adopted, have removed the latter objection, and greatly reduced the former. These methods of temporary packing are cheaper than chaff hives, while the advantage of having light, single-walled

hives during the working season, hives can be picked up, handled, manipulated, tiered-up, carried, if advisable, to a distant but more desirable location—hives, in short, that can be handled in a way that means *business*—all these advantages are so great that I should never think of adopting the chaff hive. I know there are methods of management in which the unwieldly, stand-still character of the chaff hive proves no obstacle; but such methods are not the most expeditious.

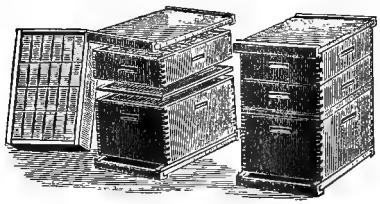
Speaking of the greater ease with which an apiary can be managed when the bees are in single-wall hives, brings up the point of handling hives instead of combs. Preventing after-swarming by moving about the hives is an illustration. With small hives, or those that can be handled by sections, and in which the frames are securely fastened, the queen may be found by shaking out the bees instead of going over the hives comb by comb. When raising extracted honey, the supers, with such hives, may be freed from bees in a similar manner, just as they are driven from a case of sections. It might be mentioned here, parenthetically, that the "bee escape" *promises* to destroy this point of superiority hitherto claimed for this style of super. When contracting the brood nest, one section of the hive is removed instead of taking out combs and putting in "dummies." As the eye of the physician judges of the internal conditions by external symptoms, so the practiced eye of the bee-keeper can easily determine the condition of a colony without removing a comb. As a taking apart and thorough examination of the human body was necessary before it was possible to learn to accurately "judge of internal conditions by observing external symptoms," so movable frames allowed us to learn of the mysteries of the bee hive, and to reach that stage when the taking apart of the brood combs is seldom necessary. Such being the case, hives that allow us the most completely to accomplish our ends by handling them instead of frames, are, other things being equal, the most desirable.



THE NEW, HEDDON HIVE.

I have no hesitancy in saying that, in my opinion, the new Heddon hive comes the nearest to being the perfect hive, of any with which I am acquainted. Just think over the points I have mentioned, and see how fully this hive meets the requirements. It is at once the largest or the smallest hive, by simply removing or adding sections. There is no handling of frames nor of "dummies" or division boards. When the brood nest is contracted, the supering surface remains the same. None of the sections are left "out in the cold" so to speak, with "dummies" instead of brood underneath them. The brood can be "spread" whenever it it is desirable, by simply interchanging the sections. No handling of *combs* in the operation. The combs can be inverted singly or a whole hive at one operation. It is a light, readily-movable, single-wall hive, and its closed-end frames make it particularly adapted to the establishing of out apiaries or the moving of bees to secure better pasture. This hive has often been recommended as an excellent hive for raising comb honey. It is equally as good when producing extracted honey. The shallow frames are peculiarly adapted to the tiering-up plan, which is nearly as valuable in raising extracted

honey as in raising comb honey. Supers filled with shallow combs may be tiered-up and left on the hive for the honey to ripen, when they can be cleared of bees as readily as a case of sections, handled as easily, and when in the honey house it is only necessary to invert a super, loosen the screws, slip off the case, and there stand the combs all ready for extracting. These shallow combs are uncapped more readily than deep combs.



THE DOVETAILED HIVE.

After the new Heddon, my next choice of a hive is the so-called "Dovetailed" hive, which is simply the Langstroth-Heddon hive with a loose bottom and the corners "Dovetailed," or lock-jointed, hence the name "Dovetailed." It is really an excellent hive, and for using the hanging, open-end Langstroth frame it probably has no superior.

Closed-end frames are having quite a boom just now. Contrary to the belief of those who have never tried them, they can be handled even *more rapidly* than the open-end frames. All kinds of frames, unless it be those with metal corners suspended upon metal rabbits, must be pried loose with a knife or screw-driver before they can be moved. After they are loosened, one kind can be handled, *singly*, about as fast as the other; while three or four closed-end frames can be taken up at *one grasp*. This cannot be done with the open-end frames. Most of bee-keepers call to mind the manner in which the bees propolize the ends of the top bars with open-end frames, and then these bee-keepers proceed to imagine how much worse it would be if the end-bars were in contact the whole or a part of their length. They forget how completely the closed-end bars, compressed with a screw or wedge, shut the bees away from those parts that would cause trouble if propolized.

Much has also been said of late in regard to wide, deep top bars, placed at fixed distances, for preventing the building of brace combs. While there is good evidence that such arrangements accomplish the object for which they are used, the fact still remains that queen excluders are needed, and the only satisfactory manner in which they can be used is in a honey board, hence I am inclined to the belief that the honey board will hold its own against the wide, deep top bars.

There are some minor points in hive construction that may be noticed. For shipping bees, or moving them from one location to another, a fast bottom board is an advantage; aside from this, all the advantages, and there are quite a number, are with a loose bottom board. As something must be fastened *over* a hive when it is shipped, it is but little more work to have the same fastening come down and hold on the bottom board, hence there is but little to be said in favor of fast bottom boards. Beveled joints, either at the corners of hives or between stories, are being discarded so rapidly for the plain square joint, that it is almost a waste of space to condemn them. Cloths for covering the frames are being quite generally discarded, the cover to the hive being made flat and brought down to within "bee space" of the tops of the frames.

While there will probably always be users and advocates of large hives, of chaff hives, and of hanging, open-end frames, it is evident that the present tendency is towards shallow, fixed frames, small brood nests, and a system of management that requires but little if any frame manipulation. With such hives the bees must be wintered in the cellar, or the winter protection be such that it can be removed in summer. Such hives allow the principle of tiering-up to be carried to its highest perfection; con-

traction of the brood nest is equally perfect, the top of the brood apartment always being the same size; in short, such hives allow of "short cuts," of a sort of wholesale management that an attempt to follow with other hives brings in a whole lot of loose pieces and an endless amount of manipulation.

Honey Boards.

WITH the majority of frames in use, bees build little bits of combs between the top bars of the frames, and extending the combs upwards, connect them with the cover of the hive, or the bottom of a case of sections, or whatever is next above the tops of the frames. These little bits of combs are called brace combs, or burr combs. It is very unpleasant, unprofitable and untidy to lift off a case of sections, and, in so doing, pull apart a network of combs that connect the bottoms of the sections with the tops of the brood frames. The honey drips and daubs about and attracts robbers, if there are any to be attracted. The bits of comb must be scraped from the bottoms of the sections, and the muss cleaned up as best it may.

The bee-keeping fraternity is, I believe, indebted to Mr. James Heddon, for the modern honey board, which practically does away with all trouble from brace-combs. This honey board is simply a series of slats fastened to a frame as large as the top of the hive and placed over the brood nest. These slats are about 5-16 of an inch thick, placed ⅜ of an inch apart, and of such width and so arranged that each opening between them comes exactly over the center of the top bar of a brood frame below. In other words, the slats break joints with the top bars of the frames below. As the tops of the frames are ⅜ of an inch below the level of the top of the hive, there is a ⅜ space between the tops of the frames and the bottom of the honey board. The outside rim or frame-work of the honey board is ⅜ of an inch thicker than the slats, thus the surplus case is raised three-eighths of an inch above the slats of the honey board. In short, the honey board is a series of slats three-eighths of an inch apart, placed between the brood nest and the supers, with a "bee space" both above and below the slats. In the space below, between the slats and the brood nest, the bees build brace combs *just the same as ever*, but for *some* reason, the space *above* is almost always left free from the disagreeable brace combs. A case of sections can be lifted off as clean and free from daub as when placed upon the hive.

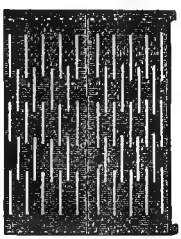


FIG. 1.

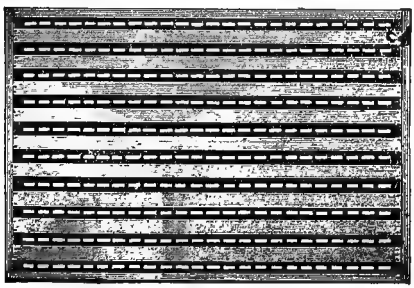
FIG. 2.

WOODEN, QUEEN-EXCLUDING HONEY BOARD.

I once tried to make these slatted honey boards queen-excluding by placing the slats exactly 5-32 of an inch apart. So

far as excluding the queen from the supers was concerned, they were a success; the greatest drawback being the fact that, when the slats were placed so close together bees filled the spaces between them with hard wax. It is also some trouble to place the slats exactly 5-32 of an inch apart and fasten them in such a manner that they will remain exactly that distance apart. I next tried to make a wood queen-excluder by substituting a thin board (3-16 of an inch) for the slats and then perforating it with a small circular saw exactly 5-32 of an inch in thickness. Such excluders worked better, owing, I think, to their being thinner; still, the bees plugged the perforations to such an extent that it became necessary to clean out the hard wax each spring.

The G. B. Lewis Co., of Watertown, Wis., is now making an all-wood queen-excluder similar to this; the only difference being that the perforations are made *across* the grain. If some enterprising manufacturer will invent a machine to *countersink* the openings, that is, chamfer off the wood around the openings until the edges are only about 1-16 of an inch in thickness, I believe that in this manner an all-wood queen-excluder could be made a success. It is my opinion that *across* the grain is the proper direction in which to make the perforations. The edges would be less likely to be injured or to be gnawed by the bees.



WOOD-ZINC HONEY BOARD.

At present, the best queen-excluding honey board is the wood-zinc. It is simply the Heddon slatted honey board with saw kerfs in the edges of the slats, and strips of perforated zinc slid into the kerfs, between the slats. To Dr. G. L. Tinker belongs the honor of having been the first to introduce strips of perforated metal, in this peculiar manner, between the slats of the Heddon honey board.

Whole sheets of zinc have been used as honey boards. The greatest objection seems to be that such large sheets are lacking in rigidity. They are likely to sag, or bend, or kink, thus destroying the perfection of the bee-spaces. If a sheet sags, the space above becomes so large that there is a likelihood of comb being built therein; while the space below becomes so small that propolis is placed between the zinc and the top of the brood frames. The wood-zinc honey board is free from this defect.

During the last year or two there has been an effort made to do away with honey boards. It has been found that wide, deep, top bars, *accurately spaced*, have, at least, a great tendency to reduce the building of brace combs. The spaces between the top bars should be as near 5-16 of an inch as is practical. If greater than this, the danger of comb building is greatly increased; if less, there is a tendency to plug the spaces with hard wax —not comb, but hard, solid *wax*. With the ordinary hanging or open end frame, it is not practical to space the frames sufficiently accurate to prevent the brace comb nuisance; that is, not unless some spacing device is used. Closed-end frames are the best adapted to bring about the necessary accuracy of spacing.

When there is any necessity for the use of a queen-excluder, the only practical way in which it can be used is in the shape of a honey board. In raising comb honey there is little need of a queen-excluder over an old established colony, but when a swarm is hived in a contracted brood chamber, and given the supers from the old hive, a queen-excluder is almost a necessity. In raising extracted honey, queen-excluders are a great convenience. If they are not used,

the operator must always be on the look-out for brood in the extracting supers. Some combs will be found containing only a *little* boood, yet they cannot be extracted without throwing out some of the brood into the honey. Some bee-keepers, when they find brood in the upper story, exchange the combs for the outside combs of the lower story, if they can find any such without brood, but this takes time. To successfully conduct an apiary, the fixtures and methods should be such that the work will move along smoothly and in a systematic manner, without any "hitches." There is also another point to be considered in connection with the use of queen-excluders when raising extracted honey, and that is the freeing of the supers by the use of "bee-escapes." If the super contains several combs of brood and the queen, it is doubtful if the bees could be made to desert it by the use of the "escape." If they did desert it, then something would have to be done with the brood when it was discovered. In short, advanced bee-culture has divided the bee-hive into two distinct apartments—brood and surplus; and unless this division can be maintained, many profitable plans must be relinquished. The queen excluding honey board enables the bee-keeper to thus set a boundary, beyond which the brood cannot go.

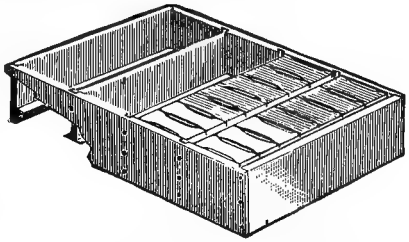
Sections and Their Adjustment on the Hives.

ONLY those who have kept a dollar and cent account with their bees, fully realize that *labor* is the most expensive factor entering into the cost of honey. Let us suppose that a man cares for 100 colonies of bees, and by a series of crooks and turns and complicated methods he secures a good yield; a yield somewhat increased we will suppose by the laborious manipulation. Let us suppose still further, that by improved methods and fixtures he can manage 150 colonies equally as well with no greater expenditure of labor, it is evident that his profits would be greater; they would be greater even though the new departure did not bring the yield quite up to that of the old system. Of course, there is a limit to the increase of colonies that may be made on account of lessened labors resulting from the adoption of improved methods and fixtures, as the further we advance in this direction, the nearer and clearer looms up the spectral head of "Overstocking."

But it is a pleasure to note that the fixtures and methods of to-day are superior to those of a few years ago. In this matter of sections and their management, the plan of putting them on the hive and taking them off one at a time has been most completely discarded. A few bee-keepers still manipulate them by the wide frame-full, but the majority has adopted some sort of a case or super by means of which twenty-five or thirty sections can be handled at one time; and with which "tiering up" may be practiced. The old, cumbersome, complicated, laborious, side-storing system is laid upon the shelf. It is perfectly safe to say that "top storing" and "tiering up" with some kind of a case, crate, or rack, furnishes the best method now known for securing comb honey; that is the only

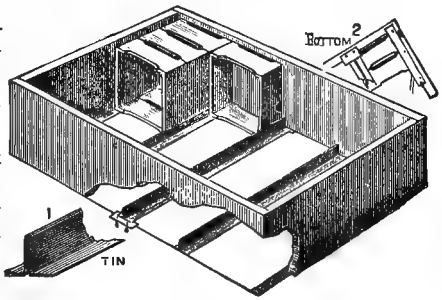
one that enables the bee-keeper to handle a "honey shower" with perfect ease; "rattling" the sections on and off the hives in a rapid, business-like way. It is true that "tiering up" has been condemned, but principally upon the ground that the inability to easily and readily contract the surplus apartment to less than a whole case, results in a larger number of unfinished sections at the end of the season. If this practice enables us to care for more bees, and it certainly does, and we thereby secure more finished honey in the aggregate, why grumble at the unfinished work thrown in?

For making sections, basswood is probably used to a greater extent than any other wood. It is the whitest readily obtainable in all parts of the country, while it possesses the elasticity needed in the one-piece sections. Its faults are that it shrinks and swells badly, becomes mildewed and discolored very easily, and any honey dropped upon it soaks in and leaves a stain. White poplar is the best wood for sections. It is whiter than basswood, very hard, does not shrink or swell readily and is not stained by contact with honey, or easily soiled by handling; but it lacks the elasticity necessary in one-piece sections. There are no handsomer nor better sections than the four-piece white poplar; and the only valid objection that can be brought against them are that they cost more and that more time is required in putting them together. I am aware that I have been pleading for time-saving fixtures, but there must be a distinction made between the hurry and bustle of swarming time and the leisure of a winter's evening; or between the time of an experienced apiarist and that of some boy or girl who can put together sections. The objections to the one-piece sections are that they cannot be made of the most desirable wood, that, as usually made, they do not remain "square" when folded, and that they are made with "naughty" corners that sometimes gouge into the honey when crating it or removing it from the crate. When separators are used the latter objection is removed. The reason why the so-called "naughty" corner is always found upon the one-piece sections,



OLD STYLE, HEDDON CASE. *

is because if the opening is cut clear through to the side pieces, the small film of wood left to hold top and side bar together is more likely to break. When the openings extend clear across, as with the four-piece sections, the combs are more completely built out and attached to the top and bottom bars. The top and bottom bars of sections ought to be ⅜ of an inch narrower than the side bars. Usually they are made too wide, leaving too narrow openings between them. To sum up the whole matter of sections, the



A T SUPER.

one-piece, although possessing some faults, is cheaper and can be put together quicker than the four-piece, which costs more but is *faultless*. My preference is decidedly the four-piece.

*This cut does not perfectly represent the Heddon case. It shows the sections flush with the top of the case, when they ought to be shown "bee space" below, as in the cut of the T super. A handle ought also to be shown on the side. In the cut of the Heddon hive on page 13, two cases filled with wide frames are shown above the hive.

If separators are not needed, there is no kind of case or super better than the old style Heddon case. It is cheap, substantial and perfect. If separators are desired, there are two styles of cases between which to choose: the T super and wide frames one tier of sections deep and placed in a case. The only advantage possessed by the T super, as compared with the Heddon case, is that it allows the use of separators; while wide frames protect the outside of the sections, and for *some* reason, their use also lessens the proportion of unfinished sections. The bees follow the frames begun on out to the ends, before spreading out laterally when the flow is not abundant, so that three or four frames are sometimes entirely filled while those outside are scarcely touched.

To sum up: if separators are not needed, the old style Heddon case is excellent; if they are desired, the T super will allow their use (wooden ones are preferable in the T super), and the cost is much less than for the wide frame case, which, with tin separators, is the most perfect method of adjusting sections on a hive, its only drawback being its cost.

Varieties of Bees.

IN ORDER to give an intelligent answer to the query: "Which are the best bees?" it is necessary to consider the locality in which they are to be kept, also the purpose for which they are to be used. For instance, the Syrians are great breeders. So long as there is a drop of honey in the combs, they rear brood. In climates blessed with Winter's frosts and snows, this is an undesirable trait; but in sunny Cuba, where the honey flow comes in the season corresponding with our winter, this very characteristic proves of value in securing populous colonies at the beginning of the harvest. These same Syrians also fill the cells so full of honey, and cap it so poorly, as to give it a peculiar, dark, watery appearance. In raising extracted honey this is not objectional. The Cyprians have proved so fiery in disposition that they have been almost universally discarded. The Syrians have something of the same style, only in a less degree, and, in their purity, are not needed in our Northern States. A few cling to them when they are crossed with some other variety, but I fail to see why, as they have no good qualities, for this latitude, not possessed by the Italians. For this part of the country there are, in my opinion, only three varieties of bees worthy of consideration, viz., Italian, black and Carniolan. As yet, the latter is on trial. It must be admitted, however, that the Carniolans are holding their own very much better than any variety of bees that has been introduced into this country since the Italians were brought here. They are very prolific.

A word right here about prolificness. Undue prolificness is of no value—it is an objection. Did queens cost large sums of money there would be a shade of sense in desiring those that are prolific; but, to the practical honey producer, they cost almost nothing; and by using hives that are not too large, queens of ordinary prolificness will keep the combs sufficiently filled with brood. In this matter of

brood rearing the Italians are unexcelled. During the spring months they push breeding with wonderful rapidity; but as soon as the honey harvest begins in earnest, breeding is greatly reduced.

It might safely be said that the Italians are the standard variety of this country. There seems to be about them a peculiarly quiet, steady, energetic determination, possessed by no other variety. When honey is coming in slowly, and must be sought for far and wide, it is then that the Italians carry off the palm. For the production of extracted honey they are probably unexcelled; but to the producer of comb honey they have two disagreeable traits. They are loth to store honey outside of the brood apartment, and fill the cells too full of honey. Advanced bee-culture, with its reversible hives, comb foundation and "bait" sections of partly drawn comb, have well nigh overcome the first objection. The latter objection is not so easily removed, but much can be done in this direction by selection in breeding. It is well known that, even of the same variety of bees, there are greatly varying strains. When a colony is found that stores and caps its honey in such a manner as to give it a watery appearance, replace the queen with one reared from the egg of a queen the colony of which shows the best work in this respect. By continual care in this direction, a bee-keeper who prefers to have only pure Italians can secure a strain that will do pretty fair work in furnishing comb honey that is nicely capped.

The blacks do not breed up so rapidly in the spring; and unless the harvest is very abundant they will not bring in so much honey as will the Italians. But once the nectar is in the hive they handle it in a manner that is truly artistic. They are willing to store their surplus in the supers at a distance from the brood, and in capping the honey they leave a small space under the capping, between it and the honey, which gives to the comb an almost snowy whiteness. In short, the Italians are the better *field workers;* the blacks the better *house keepers.* In this respect the Italians are like man, while the Germans resemble woman. To carry the simile still further, they *ought to marry.* In plain English, the producer of comb honey can secure the best bees for his purpose, in the quickest and easiest way by uniting the Italian and German varieties; then by continued selection retain the good qualities and weed out the bad. It is practical to do this without any mating of queens in confinement. Simply rear the queens from the best stocks; the drones ditto; keeping the drone comb out of all undesirable colonies; and giving some of the choice stocks abundance. This will fill the air with choice drones, and the chances of a queen's mating with an undesirable drone will be very slight indeed.

As I have already said, for the production of extracted honey, the Italians are without a rival. Were it not for the difficulty of dislodging them from the combs, they would, for this purpose, be well nigh perfect; and I might add that the use of the "bee escape" *promises* to enable us to overcome even this objection.

The admirers of the Carniolans claim for them the possession of all the good qualities of both the blacks and the Italians, with one or two additional virtues thrown in. It is asserted that they are the most gentle bees known; that they remain quietly on the combs when handled, but are easily *shaken off;* that they are industrious, good comb builders, capping the honey very white, and using but little propolis; that they are prolific; hardy; and just perfection itself. But we must not forget the disposition to praise *new* things. Never until last spring did I have several good, strong colonies of Carniolans in the spring. They certainly bred up the most rapidly in the spring of any bees I have ever tried, and I hoped to compare their honey-gathering qualities with those of the Italians, but the season proved a failure—not a pound of surplus was secured by

any of my bees. Several of the Carniolan colonies swarmed, while not a swarm came from the Italians, and they *do* run about upon the combs in a restless manner, very much like the blacks. They seem to be a *little* less saving of propolis than is the case with other bees, and the capping to their combs out-rivals in whiteness even that made by the blacks. I certainly think that the Carniolans are worthy of an extended trial; but before recommending their adoption on an extended scale, I should like to manage an apiary of them for at least three or four years.

In the production of extracted honey, I *know* that the man who chooses a good strain of Italians makes no mistake. A cross between the Italians and blacks is equally as good, but a little less delightful to handle, while there is nothing to be gained by the cross, as is the case in comb honey production. If a bee-keeper will use the proper hives and fixtures, and employ the proper methods, he can make a success of comb honey production with pure Italians; otherwise, his success will be much greater with a cross between the Italians and blacks.

Let no bee-keeper be caught by that phrase, "general purpose" bee. The bee-keeper who thoroughly understands his resources, knows exactly what he wishes to accomplish, and chooses the best hives, the best bees, and the best methods, to secure the desired ends, will far out-strip the "general purpose" bee-keeper, with his "general purpose" hives, "general purpose" bees, and "general purpose" methods.

Introducing Queens.

TO introduce a queen to a colony of bees, two things must be well considered—the condition of the bees and the condition of the queen. The condition and behavior of the queen is very important. If the queen will only walk about upon the combs in a quiet and *queenly* manner, and go on with her egg laying, she is almost certain to be accepted if the other conditions are favorable. Let her run and "squeal" (utter that sharp "zeep, zeep, zeep,") and the bees immediately start in pursuit. Soon the queen is in a ball of tightly clinging bees, and the only course is to smoke the bees severely until they release the queen from their embrace, when she must be re-caged for another trial. Dropping the ball of bees in a cup of water has been recommended to induce them to release the queen. To the inexperienced this may be the better plan, as, when driving away the bees with smoke, it often happens that one of the bees will grasp the queen and endeavor to sting her, smoke or no smoke,and, in the attempt to rescue the queen, a novice may injure her.

To introduce a queen from one colony to another in the same apiary does not call for the skill needed when the queen has been absent several days from a colony, and is jaded by a long journey. I have frequently taken a queen from a colony, and caged it to send away, and then immediately taken a laying queen from a nucleus and placed her upon the spot upon the comb from whence I had removed the other queen, and had the satisfaction of soon seeing her surrounded by a circle of admiring retainers. I believe there are times, particularly when

honey is coming in freely, when a colony with a laying queen would accept *another* fresh laying queen, simply by having her placed upon the combs; and all would go well until the queens came in contact. Then would be a conflict in which the chances of the new comer would be equally as good as those of the old queen. I have sometimes doubted if bees recognized each other, or the queen, by the scent. I have clipped a queen's wing, and, upon returning her (placing her directly upon the combs), she was attacked by her own bees. Perhaps she acquired a different scent by being handled. If so, then the hnndreds of other queens that I have clipped must also have acquired a different scent, yet they were not attacked.

So far as the queen is concerned, it is important that she be brought before the bees in a natural manner, in such a place and in such a way as they would expect to meet her. When clipping queens I have replaced them by dropping them upon the top bars, or at the entrance of the hive, when the bees would immediately pounce upon them as intruders. A puff of smoke would cause the bees to "let up," when the queen would walk majestically down upon the combs, or into the hive, as the case might be, and here she would not be molested, because the bees here found her where they *expected* to find their queen. When I wish to introduce a queen by allowing her to run in at the entrance, I first shake off the bees, from two combs, in front of the hive; as they are running into the hive, I allow the queen to run in with them. At such times as this there are no guards at the entrance, the bees that are crawling in will not attack the queen, and by the time the colony has recovered its tranquility, the queen is quietly parading the combs.

When a colony has been queenless long enough to build a batch of queen cells, I usually introduce a queen by simply taking a comb, with the adhering bees and queen, from a nucleus and hanging it in the queenless colony. By means of smoke, or a feather, I drive all the bees from the inside wall of one side of the hive, and against this side of the hive I turn the side of the comb upon which is the queen. Thus she is not immediately brought in contact with the excited, strange bees; but the bees intermingle, and, almost unconsciously, the whole colony has accepted the queen. If any of the queenless bees stray near the queen, they find her surrounded by a cortege of her own bees. She is also attending to her duties, and is almost *certain* not to be molested. When queens come from a distance they are more difficult to introduce. They have not layed any eggs in several days, and are in a jaded condition. It is for this reason that it has always *seemed* to me that the Peet cage ought to be an unusually good cage with which to introduce queens. This cage can be attached to the surface of the comb, when the withdrawal of a tin slide allows the queen access to the surface of the comb that is covered by the cage. Care should be taken to select a spot where the young bees are just gnawing out. If a few cells of unsealed honey can be included, so much the better. The queen can then walk about upon the *comb*, and with the Scotchman she can sing:

"My foot is on my native heath."

She can drink nectar from the unsealed cells. She will soon have a retinue from the newly hatched bees that are ready to accept her, as they have never known any other queen. She will begin laying in the few cells at her command, and when she is released, will be in a nearly normal condition, and surrounded by a few followers. Usually the bees release the queen by eating under the cage. If they do not, she can be released by thrusting the blade of a pocket knife through the comb from the side opposite to the cage, and giving the knife a twist or two. The bees will clean out and enlarge the opening, thus letting out the queen. One objection to the Peet cage is that the bees may release the queen sooner than is best. Of course this may be remedied by leaving in the tin slide, but this defeats the advantages, or supposed advantages, aris-

ing from caging the queen against the comb. I say "supposed advantages," because, as favorable as the Peet cage *appears* as an introducing cage, I have been equally as successful with other cages. I have had excellent success with a cylindrical cage, made from a piece of wire cloth four inches square. Ravel about two wires from one edge of the wire cloth, roll it up, thrusting the projecting ends of the wires through the meshes of the opposite edge, and clinch the ends by bending them over. This forms a round tube about an inch in diameter and four inches long. The ends may be stopped by plugs of wood, corncob, or cork, or the ends may be "squeezed" until they are closed. When the queen is confined in such a cage, the cage should be placed between two combs just over the brood nest, and the combs pressed together until their pressure holds the cage in place. That the queen may not perish for want of food, should the bees neglect, or refuse, to feed her, see that one side of the cage is pressed against some part of the comb containing honey.

No definite length of time can be given as to how long a queen should be caged before she is released. The behavior of the bees is the best guide. If they are "balling" the cage, clinging to it in masses, like so many burdocks, their behavior indicates what the queen would have to endure were she within their reach. The operator must wait until the bees are in a different mood; until they are walking quietly about over the cage, as unconcernedly as upon the combs of honey—perhaps the bees may be offering food to the queen and caressing her with their antennæ. This shows that the bees are favorably inclined towards the queen, and that it is safe to release her.

There is probably no method of releasing a queen, let the cage be what it may, that is equal to that of stopping the entrance to the cage with Good candy, and allowing the bees to eat it out. The bees that first meet the queen are in good humor from the candy they have eaten. The queen is released quietly at a time when the colony is undisturbed.

Until quite recently a few of the leaders in apiculture advised bee-keepers to examine a colony within an hour after the queen was released, to see how she was being treated. If she was found in a ball of bees she must be re-caged. No worse advice could be given. The disturbance frightens the queen; she begins to run and "squeal," when the bees immediately "ball" her. When a bee-keeper rescues his lately-released queen from a ball of bees, it may be natural for him to conclude that his interference saved her life; but the truth in nine times out of ten would be that it was this very meddling that put her life in jeopardy. After a queen has been released the colony should be let entirely alone for three or four days, or a week, until the queen had become fully established as queen of the hive.

To be successful in introducing queens that have come from a *distance*, the condition of the colony must be well looked after. It is better that it should be *hopelessly* queenless. Let it build a batch of queen cells, and remove them after all the larvæ are to old to be developed into queens, then the bees are almost certain to accept a queen if given to them in a proper manner. I would sooner release a queen after the bees had discovered the loss of their old queen, and before they had begun the construction of queen cells, then to release her after the cells were under way, *unless* I waited until the cells were sealed over and had been removed.

When engaged in queen rearing, I did not lose one queen in 100 that I attempted to introduce to a colony that had *built a batch of cells.*

Bees are in a much more amiable mood when honey is coming in freely. Don't attempt to introduce queens when no honey is being gathered, without feeding the bees two or three days before the queen is released.

There is one method of introducing queens that *never* fails; it is that of confining the queen in a hive with several

combs of just hatching bees. Go over several hives, and select enough combs, from which the bees are just emerging, to fill a hive. Choose those combs having the least unsealed brood, as the most of this will perish. Shake off every bee and hang the combs in a hive, closing it up *bee-tight*. Allow the queen to run in at a small opening, closing it behind her. This work should be done in the fore part of a warm day. In a few hours enough bees will have been hatched to make quite a little cluster, with which the queen is *absolutely safe*. It might be well to carry the hive into the house at night, for two or three nights. In a week the hive may be given a stand in the apiary, and the entrance opened enough to allow the passage of a single bee. So much trouble is not advisable unless it is with a very valuable queen.

If bees are shaken from their combs into a box, and kept confined, without a queen, several hours, Mr. Doolittle says they will invariably accept a queen if given one in the box. In other words, they are *hopelessly* queenless, and away from their home, and will accept anything in the shape of a queen.

Mr. D. A. Jones is successful in introducing queens by using chloroform. Use a small Bingham smoker. Put a dry sponge at the bottom of the fire barrel. Wet a sponge with chloroform and put on top of the dry sponge. Over this put another dry sponge. Put on the nozzle and then drive the vapor into the mouth of the hive, the same as smoke would be driven, by working the bellows. when the bees begin to drop down on the bottom board, allow the queen to run in, and the work is done. I have never tried either the Doolittle or the chloroform method.

In recapitulation I will say, if you wish to be *sure* of success in introducing queens, received from a distance, observe the following directions: If the bees are not gathering honey, feed them. Have the bees hopelessly queenless. Before releasing the queen, see that the bees are favorably inclined towards her. Allow the bees to release her by eating candy out of the entrance of the cage. Don't disturb the bees for several days after the queen is released. I am aware that success is often achieved when some of the points are neglected, but each has its weight.

Since the foregoing was written I have, for three years, been guaranteeing the safe introduction of all queens that I sold. Of several plans that I have given my customer to follow, none has been more successful than that of the use of tobacco smoke. The instructions that I send to my customers read as follows:—

As soon as you receive this notice, remove the queen from the colony to which you expect to introduce the new queen. When she arrives, put her away in a safe place until after sundown, just at dusk, then light your smoker, and when it is well to going put in a pipeful of smoking tobacco, put on the cover, puff until you get an odor of tobacco, then puff two or three good puffs into the entrance of the hive. Wait two or three minutes, then send in another good puff or two, remove the cover, drive the bees down with a puff of smoke, open the cage and allow the queen to run down between the combs, following her with a puff or two of smoke, and put on the cover. Half an hour later, light up the smoker again, putting in the tobacco as before, and blow two more good puffs in at the entrance. If no honey is coming in, feed the colony a pint of syrup each night from the inside of the hive, but don't disturb the brood-nest for four or five days.

Planting for Honey.

THE BELIEF in the profitableness of raising plants for honey alone has been almost universally abandoned. When the yield from clover or basswood reaches several pounds per colony each day, it is not surprising that bee-keepers should have been led to consider whether it might not be profitable to prolong the harvest by planting something that would fill the "gap"—furnish honey when the natural sources failed. The difficulty seems to have been that not sufficient thought was given to the fact that immense quantities of bloom are needed. Some flowers yield honey so profusely that it may be literally scraped out with a spoon. The so-called Chapman honey plant is an example. With a large apiary, however, there must be acres and acres of bloom, or no surplus will be gathered. I presume few bee-keepers have considered the number of acres to which their bees have access. In the March Review for 1888, Mr. R. L. Taylor gives the following: "Let us suppose that one in a fair field for the production of comb honey has an apiary of 150 colonies, with no other apiary to encroach. His bees, by going 2½ miles in every direction from home, would scour a territory of about 12,000 acres. With everything in good order he may hope, in a good season, to get a surplus crop of 10,000 pounds of comb honey. At a low estimate, I think, we may say there would be enough of fruit bloom, clover, basswood and fall flowers within the territory indicated to stock well 2,000 acres, but I will call it 1,000, and we have as the result, ten pounds of surplus per acre, from land well stocked with honey plants. Who would let the value of that amount of honey, say $1.25, weigh very heavily in deciding on the kind of crops with which to stock his farm?"

Mr. James Heddon once said, in a Chicago bee convention, that he would have nothing to do with any plant that furnished honey alone, even if each blossom yielded a barrelful of honey, if the plant *required cultivation*. Of course, this is an exaggerated statement, but it illustrates a point, and that is this: Those who plant for honey must compete, in the sale of their product, with those who are at no expense in planting for honey—with those who are supplied by nature with an abundance of pasturage. Every one who has ever tried cultivating plants for honey alone has eventually abandoned it. I do not mean that no honey has ever been secured in these experimental ventures, but that the quantity has been too small to allow of any profit. A light yield of honey, unless it comes early in the season when extensive breeding is desirable, may even be a detriment. It will stimulate breeding and more honey may thus be consumed than is gathered, and workers are brought into existence at a time when they will be consumers instead of producers.

The only way in which the raising of plants for honey alone can even approach success, is where, for some reason, there are large tracts of waste land, unfit for cultivation, upon which may be scattered the seeds of some honey-producing plant, like sweet clover, that will grow, thrive and spread without care or cultivation.

Although the raising of plants for honey alone has been painted in such sombre colors, the raising of field crops that yield honey cannot be truthfully depicted in *much* brighter hues. It is true there are field crops that yield honey, but unless it would be profitable to raise them, aside from their honey producing qualities, there is but little encouragement for the farmer-bee-keeper to engage in their cultivation. In other words, the honey that may be secured ought not to be allowed to weigh very heavily in deciding whether a certain crop should be cultivated. The most promising field crops to raise, that furnish honey in this latitude, are alsike clover and buckwheat. As already explained, however, a few acres of these near a large apiary are of but little benefit. If the soil, climate, and other conditions are such that it is profitable for the farmers of a given locality to raise one or both of these crops, then they will be raised and the acreage will be such that the yield of honey from them will be a benefit to an apiary in that locality. Much has been said about bee-keepers encouraging the raising of these crops among the surrounding farmers. They have even been urged to furnish the seed free to those farmers within a certain distance who would sow it. If the natural conditions are such that these crops may be grown to advantage, and the bee-keeper can, in some off-hand way, call the attention of surrounding farmers to the desirability of their cultivation, and thus succeed in securing their general introduction without at the same time attracting attention to their honey-producing qualities, well and good. To some this may seem strange advice, but the point is just here: If attention is called to the fact that such and such crops are fine honey producing plants, and farmers are urged to plant them for this reason, some persons in the neighborhood may, upon hearing of this, decide that *they* will keep bees and thus have a share in the harvest. I know of one bee-keeper in this State who labored for years to introduce alsike clover among the neighboring farmers. The soil was peculiarly adapted to this crop, and as the farmers at last found it the most profitable crop they could raise, he finally had the pleasure of seeing hundreds of acres devoted to its cultivation. But this pleasure was not unalloyed. As neighbors saw him securing thousands of pounds of surplus honey, and *knew* that it came largely from the alsike clover, their course illustrated one of Josh Billings maxims, viz.: "We can never see a fellow pulling fish out of a hole, but we want to throw our hook in there too." In other words, about as fast as the fields of alsike increased, so did bee-keepers multiply; and the man who worked so hard to improve his location by inducing farmers to raise alsike, was, the last time I saw him, beginning to fear that he might be obliged to "pull up stakes" and seek pastures new.

The man who is going to engage in bee-keeping as a business cannot be too careful in his selection of a location, to get one in which *nature* has already done the necessary planting. Let him emulate the wisdom of Mahomet in going to the mountain when the mountain would not come to him.

Specialty Versus Mixed Bee-Keeping.

TIME was when many of the industries were represented in one family. Flax and wool were grown, spun and worked up into cloth and made into clothing. Cows were kept, and cheese as well as butter made for home use. Poultry and a few stocks of bees added to the comforts of the household. But there is no need of going into detail; everyone knows how people lived 100 years ago. Cheap and rapid transportation has encouraged the invention of machinery, the building of factories and the classification of labor. This has brought about *specialty*. No one disputes that this condition of things is better; by it, our comforts are more than trebled. Some industries branched out as specialties much sooner than others. Bee-keeping was among the later ones. At last, however, it is becoming recognized as an industry of itself.

At present, however, there are farmers who are keeping a few bees, perhaps a good many bees, and apiarists who are managing a small farm, perhaps a large one; there are men engaged in some other occupation who are thinking of taking up bee-keeping, or may have already done so; and there are bee-keepers asking "what will best mix with bee-keeping?"

I have little faith in that old saw about not having "all the eggs in one basket." *I* say yes, have them all in one basket, and then carry the basket so skillfully that none are broken. I know there are trying seasons for specialists in any branch of business; times when it might be better, *in that particular year*, if there were more than one egg basket; but the specialist does enough better, in the good years, to bring specialty out at the head in the long run. The specialist can have the best tools, appliances and labor saving implements, things that the dabbler cannot afford; he can do and have many things in a wholesale way that would be unprofitable upon a small scale. Upon this point, Mr. R. L. Taylor, in a communication to the Review a few years ago, said: "A multiplicity of occupations multiplies the burdens of responsibility, induces unrest and embarrassment, and our powers becoming overtaxed, carelessness, slovenliness, unthrift and failure result, A Jack at all trades is almost a synonym of a ne'er-do-well. What reason is there for dulling the edge of skill and sacrificing thoroughness by combining another business with that of bee-keeping? Not certainly to fill up time. Bee-keeping as a specialty is no small business. It is capable of great expansion. It can well furnish work for every day in the year, and the larger the business the smaller the proportional expense of the plant and the management, and, consequently, the larger the profits. If bee-keeping is so unprofitable as a specialty that the operator must pursue another business to eke out a living, then it is too unprofitable to be pursued at all, and should be abandoned altogether. If it cannot be made profitable as a specialty,

with all the advantages that specialty brings, then it cannot be made profitable as a subsidiary pursuit. We see this demonstrated in practice. It is not the specialist, but the *non*-specialist that fails."

Many professional men take up bee-keeping as a pastime. With them I cannot have any more argument than with the bee-keeper who studies music for pleasure. But upon a money basis it is a far different thing. When a man is engaged in some pursuit that is capable of absorbing all of his energy and capital, I doubt if he can add to his pleasure or pocketbook by adding some other business to his regular occupation. The bee-keeping specialist, with his hundreds of colonies, his improved hives, appliances and methods, can and *does* raise honey more cheaply than the man with a few colonies. By specially is not meant that a man does *nothing* else, but that it is his *main* business.

It is true that there are industries in which there is a mutual advantage in their combination. The fattening of hogs and the running of a grist mill, or of a slaughter house, is an example. The keeping of swine and the raising of apples also brings about a mutual advantage. The swine enrich and "cultivate" the soil, and eat the wormy apples that fall. This is good for the trees, and the apples are good for the hogs. There is no business that can be united with bee-keeping to any *great* mutual advantage. There is a *slight* mutual advantage in the keeping of bees and the raising of fruit (not small fruits that must be picked in swarming time), alsike or buckwheat; but not sufficient to warrant a bee-keeper in buying a farm, or a farmer or fruit grower to run an apiary.

I hope no one will imagine that I would advise bee-keeping as a specialty without previous experience. How this experience shall be acquired, although an interesting topic, is not the one under discussion. I might say, however, that nearly all of our specialists acquired this knowledge by beginning in a small way *in connection with some other pursuit.* They were better fitted for bee-keeping, and, at last, the old business was dropped for the new. Some of our specialists learned their business by an apprenticeship to some successful bee-keeper, which is the quickest and most preferable method.

Let us suppose that the highest success is attainable only by specialty. Having done this, we must not forget that there are "many men of many minds," and that "circumstances alter cases;" that all men and all circumstances are not fitted for specialty. Some men prefer to lessen the risk of a total failure, by having the eggs in more than one basket, even if it makes *costly eggs.* A man with a small farm may have time to care for a few bees; or a farmer may have sons or daughters who can do a large share of the work. The reasons *why* a man may sometimes desire, or be compelled, to mix something else with bees are too varied for mention here. It is evident that the greatest success can be hoped for only through specialty; yet no cut and dried, cast-iron rules can be laid down. A man must study himself, his surroundings, and the conditions of his particular case. It will be evident that those occupations will best mix with bee-keeping that can be followed in the winter; or, at least, those requiring little or no attention during the busy season with bees. What would be best for one man would be a poor business for another. Among the vocations that have been mentioned are wood chopping, teaching district school in winter, or teaching singing or writing school, raising grapes or apples or other fall fruits, keeping Jerseys and making winter butter, canvassing, broom-making, etc., etc.

The Arrangement of Hives and Buildings.

IN a small apiary, the matter of arrangement is not of great importance, but as the number of colonies begins to approach 100, the question of arrangement becomes one of considerable importance. Two things need consideration: the convenience of the operator and the giving of such an individuality to each hive that each bee can readily distinguish its home.

Before discussing these points, it might be well to say a few words about the *location* of the apiary. First, it ought to be some distance from the highway. What that distance should be, depends upon what there is between the bees and the street. If there are buildings, or trees, or even a *high* fence, the bees may be quite near the road; as, in their flight, they rise above these obstructions, and thus pass over the heads of the passers-by. If there is nothing between the apiary and the highway, the apiary ought not to be nearer the street than ten rods, and fifteen or twenty rods would be better. It is possible with a small apiary to avoid trouble even if it is located quite near the street. If it is necessary to handle the bees when no honey is coming in, and such handling is likely to irritate them, such work can be done just before dark, when the bees will not fly far from the hives; but in a large apiary there is too much work that must be done when the bees may not be in an amiable mood, to enable the operator to perform it during the twilight of evening. If necessary, the bee-keeper can protect himself with a veil, and, armed with a smoker, he can go on with the work, even if the bees are a little "cross," but the apiary must be isolated. Nearly level ground is preferable for an apiary. If it slopes gently to the south, or east, so much the better. It should never be in such a location that water will stand upon the ground.

I have tried placing the honey house in the center of the apiary, and having the hives in long double rows that radiated from the honey house as the spokes in a wheel radiate from the hub. In each double row a space large enough for a wheelbarrow is left between the rows, and the entrances of the hives are turned away from the path left for the operator and his wheelbarrow. So far as reducing the labor of going to and from the hives is concerned, this arrangement is excellent, but it has the very serious objection that only part of the apiary can be seen at one glance from the honey house. In watching for swarms it is necessary to look in *four* different directions in order to ascertain if a swarm is out. When the honey house is at one side of the apiary, the whole apiary can be taken in at a glance. Other things being equal, the south side of the apiary is preferable for the honey house. In looking for swarms the bee-keeper does not look towards the sun, but has the clear northern sky for a background, while the shady side of the building,

which will be naturally sought by the tired bee-keeper as the best spot in which to take a breathing spell, is towards the apiary.

It is universally admitted that it is best that the honey house be upon the *side* of the apiary, and most bee-keepers are in favor of having the building two stories high, using the upper story as a store room for hives and fixtures, the lower story for work shop and honey room, the latter being partitioned off by itself, and the cellar under the building for wintering the bees. The usual mistake in making such buildings is in not having them large enough. The honey room ought to be located in the southeast corner of the building, and the walls made of some non-conductor of heat. Some even paint the side of the building some dark color where it comes over the honey room, in order that as much as possible of the sun's heat may be absorbed. The idea is that the honey must be kept as warm as possible. If there is any unripe or unsealed honey, this high temperature causes evaporation and improvement. By keeping such a room warm with a stove in winter, honey has been kept over until another year, and actually improved by the keeping.

But to return to the arrangement of hives. When the honey house is at one side of the apiary, the hives may still be arranged upon the radiating plan, by having them radiate from the honey house door, thus forming one-half of a large wheel instead of the whole of a small one, as in the case of having the honey house in the center. Where the radiating rows are very long they become very far apart at the outer ends, or else very close together at the inner ends. To remedy this, shorter rows, or "spurs," are put in between the rows at the outer ends.

Another arrangement is that of placing the hives in a hexagonal manner, each hive being the center of six others. I see no particular advantage in this arrangement.

Still another arrangement is that of placing the hives in circles. The entrances of the hives in the inner row are towards the center, while those of the outer row face outwards. This leaves the space between the two rows comparatively free from bees, and the operator can work in this space without annoyance to himself or the flying bees. If the two circles do not furnish sufficient room, more and larger circles may be added, or there may be two sets of circles, or three sets, arranged in the form of a triangle, or even four sets and arranged in a quadrangle.

In all of the large apiaries that I have visited the hives were arranged in straight, simple rows, like the squares of a checker board, the entrances, in some instances, facing the same way when the hives were from six to eight feet apart. I would prefer to have the entrances of each alternate row turned towards the east, and the entrances of the hives in other rows turned towards the west. This would leave each alternate passageway comparatively free from bees, and the operator could work here without the bees bumping their heads against his. I would have the entrance to every hive face either east or west, because I wish to shade the hives with a light board, 2 x 3 feet in size, laid over each hive and projecting towards the south, and this projecting board would be in the way of the flying bees if the entrance were upon the south side. When the hives are arranged in rows radiating from a common center, I always turn the entrance of each hive so that it is either east or west.

There is no necessity of placing hives further apart than is necessary to afford sufficient space on all sides for the operator. Bees do not locate their hive so much by the distance that it my be from other hives, as they do by its surroundings; and these surroundings are usually other hives. To illustrate: Let the end hive be removed from a long row of hives, and the bees belonging to the removed

hive will almost unhesitatingly enter the hive that has *become* the end hive in the row. Two hives may stand side by side, perhaps almost or quite touching each other, and each bee has no difficulty in distinguishing its own hive. In a row of three, four, or even five hives, the same might be said, but as the number goes beyond this, there is a little uncertainty about the matter. When their hives are in long rows, some bee-keepers arrange them in groups of three or five in the row, leaving a wider space between the groups than there is between the individual hives composing a group. Arranging hives in circles gives a greater individuality to each hive than can be secured in almost any other arrangement; that is, if the entrances are faced directly into or out of the circle; but my objection to this plan is that it interferes with the proper use of shade boards.

The greatest objection to any uniformity of arrangement that makes it difficult for the bees to "mark" their location, is that queens may enter the wrong hive upon their return from their "wedding trip." With my method of management, in which the young queen is given a new stand to prevent after swarming, *a la* Heddon, this difficulty is easily remedied by placing the hive in some location that is easily marked, the end of a row for instance. When this cannot be done, the hives containing unfertile queens may be marked in some conspicuous manner that will easily enable them to distinguish their own hives. I believe that where foul brood is in the apiary, this regularity of arrangement leads to a greater danger of spreading the disease by bees from infected colonies entering some other hive by mistake.

In queen rearing it is important that the small hives, containing the nuclei, be scattered about promiscuously; the greater the irregularity and oddity of arrangement, the less will be the loss of queens from their entering wrong hives; but in a large apiary managed for honey it is doubtful if there is a better arrangement than that of placing the hives in rows; and it seems to me that a little is gained, and nothing lost, by having the rows radiate from the honey house door.

Separators.

BY filling the frames with sheets of foundation we can secure perfectly straight and even combs in the brood nest. Why will not the same treatment of the sections result in straight combs? Because all combs in which brood is reared must be of a certain thickness, while store combs may vary in thickness from half an inch to four inches. Bees place their brood combs an inch and a half apart from center to center, and the nearer our sections approach this width the more perfect will be the combs when no separators are used. It is well nigh impossible to secure straight combs when the sections are two inches wide, unless separators are used. When the sections are only 1¾ inches wide, fair success may be attained with no separators if other conditions are right. When the sections are scant 1¾, or seven-to-the-foot, but little

would be gained, so far as securing straight combs without separators is concerned, by having them narrower.

Aside from the width of sections used, the need of separators depends somewhat upon the fixtures and methods employed, but principally upon the locality. Perhaps it will be asked what bearing locality has. It has this: When the honey flow commences suddenly, comes with a rush while it lasts, and stops off short at the end, the combs are all commenced at about the same time, all grow together and are alike, and are finished at the same time, hence they are straight and perfect —no thick, thin, or bulged combs. When the honey resources, or the changes in the weather, are such that the honey flow begins slowly, or having commenced, is not steady, it is difficult to secure perfect combs unless separators are used. If the honey flow is light at first, the bees will begin work in the central sections over the brood nest, and when the cells of the most advanced sections have reached that length where, in order to produce a straight, perfect comb, they ought to be sealed over, the bees do *not* seal them, because the work in the adjoining sections is not sufficiently advanced to reduce the space between the combs to the right distance. The bees continue to draw out or lengthen the cells of *both* sections, and the result is that the comb of the most advanced sections is bulged out, and the adjoining side of the next comb is made correspondingly concave. Then the outer side of this second section is made convex and bulges into the *next* section; and this series of curves is continued, increasing with each section, until the outside section is reached, which cannot be bulged upon the outside because the side of the case is in the way, consequently this outside section is a slim affair.

If the first case of sections given a colony in the spring can be filled with partly finished combs kept over from the previous season, I think it results in several advantages. One advantage is that by a little care in arranging the combs, those with cells of about equal depth can be placed together. The combs nearest completion can be placed in the corners and on the outside, and those with the shortest cells in the center. By this method nearly all the combs are completed at almost the same time and with but little bulging, and by the time that another case of sections is needed, the colony will have increased in numbers and the flow of honey become so great that work will be commenced at once on all of the sections.

So far as dispensing with separators is concerned, it may be well to be a little slow in giving sections, unless they can be filled with comb as just mentioned. To illustrate: I have waited, before giving sections to a colony, until it was overflowing with bees, and the flow of honey from clover fully established. Within five minutes after giving the case it was full of bees and they were at work drawing out the foundation in *every section*. I am not inclined to indorse this method, particularly if the bees are Italians, as this variety of bees is loth to store honey at any great distance from the brood nest, and every enticement should be offered to induce them to begin work in the sections, and thus relieve the pressure upon the brood nest Nothing will start bees to swarming any quicker than to have no place to store their honey except in their brood nest.

Aside from their cost, I know of no objection to the use of separators. Upon the amount of surplus honey secured, I believe their use has no influence. When they are used there is a trifle more labor until we come to crating the honey for market, when the boot is on the other foot, particularly so if the combs are very much bulged. When no separators are used a simpler form of super may be used.

But, shall I use separators? That is the question that each bee-keeper must answer. If you cannot secure straight combs without, yes. By straight combs is not necessarially meant combs as

straight as a board, but so straight that they may be crated, or pulled out of the crate or case, without injury to combs. If a man can secure nearly all straight combs, and has a home market for the few bulged sections, then separators are a useless expense.

If separators are to be used, then another question arises; shall they be wood, or tin? Fortunately, bee-keepers are agreed upon this point. If they are to be used loose, as in the T super, wood is the material to use; if nailed fast to wide frames, tin is preferable. If a wood separator is nailed fast, the shrinking and swelling of the wood causes the separator to curl sidewise, or it may split. If it becomes injured in any way, there is the annoyance of its removal and the nailing on of another. If a tin separator is not nailed fast at its ends, it takes advantage of this freedom to bend a little here and there, instead of keeping stretched out straight, while a wood separator will not bend in the direction of its length.

Before closing, let me tell my readers how they can nail tin separators on wide frames and have the tin remain taut. Nail two blocks upon the top of your work bench at such a distance apart that you can just "spring" in between them the top and bottom bars of a wide frame that is put together. This shortens the distance between the end bars. While held in this position, nail on the tin separator. Upon removing the frame from between the blocks, the top and bottom bars will straighten out, and, in so doing, draw the tin as taut as a drum head.

Increase, its Management and Control.

THERE are two classes of bee-keepers who desire to prevent increase in the number of their colonies. The first and by far the larger class, own only large home-apiaries, and prefer surplus to increase. This class can allow *swarming* if, by some simple manipulation, the number of colonies can be kept the same; and the bees induced to devote their energies to the storing of honey. The second class are possessors of out-apiaries; and they desire not only to prevent increase, but to suppress swarming. This accomplished, the out-apiaries can be left alone, except at stated intervals.

In reply to the question, "Why do bees swarm?" it has been replied that, "It is natural." "It is their method of increase." This may be true in part, but it is not a satisfactory answer. I have never known a season to pass in which all of the colonies of my apiary either swarmed or didn't swarm. One year I had seventy-five colonies. They were worked for comb honey. Forty of them swarmed; thirty-five didn't. It would have been just as "natural," just as much "according to nature" for one colony to swarm as for another. In Gleanings for 1889 there was quite a lengthy discussion in regard to the causes that led to swarming. The chit of the decision seemed to be that an undue proportion of young or nurse bees to the brood to be nursed was the prime cause of swarming. If the brood nest be well filled with brood, then for lack of other room the bees begin storing honey in the cells from which the bees are hatching, the result is that soon there is but little brood to care for compared to the num-

ber of nurses, or young bees. This theory is strengthened by the fact that when bees are given an abundance of empty comb in which to store their honey, swarming very seldom occurs. In short, extracting the honey, or, to be more exact, giving plenty of empty comb, is the most successful, practical method of controlling increase. In large apiaires, especially out-apiaries that can be visited only at intervals, it is well nigh impossible to keep every colony always supplied with empty combs, hence there will be occasional swarms. If there is to be someone present to hive what few swarms *do* issue, and prevention of increase is desired simply that the amount of surplus may be greater, and the surplus is preferred in the extracted form, then the man with these desires can have them gratified.

In the production of comb honey, I doubt if there is a *profitable* method of preventing swarming. It may be *discouraged* by giving as much surplus room as possible; but foundation does not equal drawn comb as a discouragement to swarming. The issuing of after-swarms can be prevented, but the best that can be done with first swarms is to let them come, and then so manage as to make the most of them. When the season for surplus honey closes with clover or basswood, it is better not to try to secure surplus from both the parent colony and the swarm. Hive the swarm upon the old stand, transferring the supers from the old to the new hive. If the brood chamber of the new hive is not too large, work will at once be resumed in the sections. Place the old hive by the side of the new one, but with its entrance turned to one side. That is, have the rear ends of the hives nearly in contact, but their entrances perhaps two feet apart. Each day turn the entrance of the old hive a few inches towards that of the new hive. At the end of the sixth day the two hives should stand side by side. Practically, the hives are on one stand. True, the bees of each hive recognize and enter their own home, but remove either hive, and all of the flying bees would enter the remaining hive. Usually the second swarm comes out on the eighth day after the issuing of the first. Now, if the apiarist will, on the seventh day, about noon, when most of the bees are a-field, carry the old hive to a new location, all of the bees that have flown from the old hive since the issuing of the swarm, that have marked the old location as their home, will return and join the newly hived swarm. This booms the colony where the sections are, and so reduces the old colony, just as the young queens are hatching, that any farther swarming is abandoned. The old colony just about builds up into a first-class colony for wintering. If there is a fall honey flow, such a colony may store some surplus then. This method of preventing after-swarming, called the Heddon method, is not *infallible*. If a colony swarms before the first queen cell is sealed, the first young queen may not hatch until the old colony has been upon the new stand long enough for a sufficient number of bees to hatch to form a swarm, when they may swarm; but as a rule, this plan is a success.

If the bee-keeper desires no increase, let him pursue the plan just given, for the prevention of after-swarming, until the point is reached where the old hive is to be carried to a new location, when the old hive is simply to be shifted to the *opposite* side of the new hive with its entrance turned away as in the first instance. Each day the hive is to be turned slightly, as before, until the hives are again parallel, when, at the end of a week from the time the "shift" was made, the hive can again be changed to the *other* side of the new hive. By this management the young bees that are continually hatching in the parent colony are being enticed into the hive containing the swarm. At the end of the third week, the combs of the old hive will be free of brood. That left by the old queen will have all hatched,

while the young queen will not have been laying more than two or three days at the most. The few remaining bees can now be shaken from the combs of the old colony and allowed to run into the new hive. If there is any choice of queens, the apiarist can kill the one that is the less desirable; otherwise he can allow the queens to settle the matter for themselves. I prefer the latter course. What little honey is left in the combs may be extracted, and the combs, unless there is some immediate use for them, stored away and close watch kept over them, that they are not injured by the bee-moth's larvæ. I don't like the plan of putting the brood combs of a colony from which a swarm has issued, upon some other hive, the cells being filled with honey as fast as the bees hatch. There seems to be no good plan of allowing bees to swarm and then preventing increase by uniting, without having an extra set of combs built for each swarm that issues, but I believe such combs are produced at a profit. There is still another plan of preventing increase, besides that of merging the old colony into the new; it is that of contracting the brood nest of the newly hived swarm to such an extent that the end of the season will find it too reduced in numbers for successful wintering, when it may be united with the parent colony.

I do not wish to be understood as saying or even intimating that there are no other methods of preventing or controlling increase. There are several. But it is not always a question of what *can* be done, but of can it be done *profitably?* Some have practiced, and reported favorably, the plan of allowing a swarm to return to the old hive, then removing the queen, and afterwards cutting out all the queen cells except one. It has this in its favor: The colony is requeened; but, as an offset, there is the labor of cutting out the cells, with the possibility that one or more may be overlooked, or that the one left may not hatch. With the prices at which honey sells, there must be as little of this "puttering" work as possible. The cutting out of queen cells, handling of combs singly, changing them about, etc., must be dropped for more wholesale, short-cut methods. There must be more handling of hives and less manipulation of combs.

For some reason a colony with a queen of the current year seldom swarms. *Perhaps* one reason is that her vigorous laying does not allow the bees to crowd her out, and thus reduce the amount of brood compared with the number of nurse bees. In order to be effective, the young queens must be introduced early in the spring, before there are any preparations for swarming. It is difficult to rear queens so early in the season, and expensive to get them from the South.

Quite a number of bee-keepers have succeeded to their entire satisfaction in preventing after-swarming, also in preventing increase, while but very few have succeeded in preventing swarming. Probably the only *certain* method that has been used to any extent, in this country, is that of removing the queens just at the opening of the swarming season, leaving the colonies queenless about three weeks. Of course, queen cells must be cut out at least twice during this interval. Although a *few*, good men practice this method, I never could bring myself to adopt it—there is too much labor. I have said nothing in regard to making increase artificially, because, unless there is a desire for unusual increase, or to leave the apiary unattended, I think natural increase is preferable. One difficulty in dividing bees to forestall swarming, is that all colonies are not ready for division at the same time. There is danger of waiting too long or of dividing too soon.

The man who is raising honey as a *business* will find it to his advantage to allow each colony to swarm once, if it *will*, (and no more) then make the most out of the swarm. Whether the swarm and old colony shall be again merged into one depends upon the desirability of increase,

Shade for Bees.

SHALL we shade our bees? If so, why, when, how? Some bee-keepers do not shade their hives; others do. Why do they do it? Is it really necessary? Do they thereby secure more honey? These are pertinent questions to which it is difficult to give definite answers, but about which it is advisable to know all that *is* known.

The temperature of a colony of bees in the summer, when brood is being reared, is nearly 100.° Until the temperature in the sun, reaches this point, shade is no benefit; rather is it an injury, as it deprives the bees of the warmth of the sun at a time when it would be of some benefit. When the temperature in the sun goes above 100°, and begins to climb up to 110°, 120°, 130°, 140°, then the effort upon the part of the bees is to lower instead of raise the temperature in the hive. Crowds of bees stand at the entrance of the hive, and with their wings create strong ventilating currents of air. It has been asserted that the bees leave the combs of honey well-nigh forsaken when the temperature is very high; the reason given being that the combs can be kept cooler when not covered with bees. I have also read and been told, that bees would "hang out," that is, cluster upon the outside of the hive, instead of working, if their hives were left unshaded during a hot day; that they were compelled to thus desert their hives to save their combs from destruction. I have always kept my hives shaded during the hot weather, hence cannot speak from experience upon this point; but, if it is true, then it would seem that shade, in very hot weather, is both desirable and profitable. This much I have noticed, that weak colonies, nuclei, for instance, seldom make any demonstration of discomfort from heat, even when left unshaded, while strong colonies are puffing and blowing like the runner of a foot-race. Why is this? Isn't it because the strong colony is suffering from the accumulation of its own heat—that generated by itself—that cannot escape fast enough? If this be true, why isn't a chaff hive the most insufferably hot place imaginable for a colony of bees in hot weather? Possibly the point is just here: the bees in the chaff hive have to contend with their own heat only, while those in the single-wall hive have that from the sun in addition to their own. The thick walls act as a sort of absorbent of heat; taking it up and retaining it during the day and gradually giving it up during the cool of night. Let this be as it may, a colony can be kept the coolest in a thin wall hive in the shade. How do *we* keep cool in hot weather? We wear thin clothing and lie in the hammock in the shade. A colony of bees is a living heat-producing body, and can be kept cool in the same manner that we keep our bodies cool, viz., let its clothing (hive) be thin, with a free circulation of air upon all sides, above and below, and protect it from the sun's rays.

A WELL SHADED HIVE.

The color of the hives has a great bearing upon the necessity for shade. Black, or a dark color, absorbs heat, while it is reflected or repelled by white. I have seen the combs melt down in an old weather-beaten hive that stood in the sun, but I never saw them melt in hives painted white, even if standing in the sun.

There is still another point that has a bearing upon the question under discussion, and that is the circulation of air about the hives. I have read of combs melting down in hives standing in shade so dense that the sun never shown upon them. The trouble was that growing corn on one side, and dense brush upon the other, made it so close that no air circulated.

Shade is not needed in the spring, fall, morning or evening. The only time that it is needed, if it *is* needed, is in the middle of our hottest days; and some temporary, quickly adjustable, easily removable shade is preferable to an attempt to furnish a permanent shade by growing evergreens, grape vines and the like. In fact, a permanent shade, like that furnished by an evergreen, is an injury in spring, robbing the bees of the benefit to be derived from the heat of the sun. In fact, I know of nothing better than a light board, 2 x 3 feet in size, laid upon the top of the hives. One of the longest edges of the board is placed parallel and even with the North edge of the top of the hive, the opposite edge of the board projecting beyond the South edge of the hive. This shades the hive when shade is needed, and only when it is needed—in the middle of the day. In a windy situation it may be necessary to lay a brick or a stone upon this board to keep it in place. Don't imagine that hooks or something of the kiud will be preferable for holding the shade boards in place. A weight is the simplest, cheapest and most convenient. I make these shade boards by nailing the thick ends of shingles to a piece of inch board four inches wide and two feet long. They cost only five cents each, and in the fall I tack them together and make packing boxes for packing the bees.

For the comfort of the apiarist, it is well to have a few scattering trees in the apiary, but let their branches be trimmed to such a height that they will not be knocking off his hat or gouging his eyes.

Perhaps this whole matter of shade might be summed up something as follows: If the apiary is located where the cool breezes can fan the heating sides of the hives, wafting away the heat ere it accumulates, and a broad generous entrance is furnished each tidy, white hive, I am persuaded that shade is not so *very* essential. If the hives are dark in color, or the apiary is located where there is not a free circulation of air, I feel sure that shade is an absolute necessity to prevent the combs from melting, if for nothing else.

Contraction of the Brood Nest.

THE brood nest is contracted to prevent the production of brood at a time when the resulting bees would come upon the stage of action at a time when there would be no honey to gather—when they would be consumers instead of producers. It is also contracted to compel the bees to store the honey in the sections instead of in the brood nest. There are several reasons why this is desirable. The honey from clover and basswood is white, fine flavored, and brings a higher price than that gathered later; hence it is more profitable

to force this higher priced honey into the sections, and allow the bees to fill the brood combs, later on, with winter stores from such sources as yield honey that brings a lower price. When it is desirable, either from its cheapness, or from its superiority as a winter food, to use sugar for winter stores, contraction of the brood nest can be so managed as to leave the bees almost destitute of honey in the fall, which does away with the trouble of extracting, and leaves nothing to be done except to feed the bees. Such, in brief, are the advantages of contracting the brood nest. Where the honey flow lasts nearly the whole season, with no long periods of scarcity, and the quality of honey is uniform throughout the season, and no advantage is found in substituting sugar for honey as winter stores, I see little need of contracting the brood nest, and would advise that it be of such size that an ordinarily prolific queen can keep the combs well filled with brood in the early part of the season; but where any of the first mentioned conditions exist, the bee-keeper who neglects "contraction" is not employing all the advantages that are available.

As a rule, I don't advise the contraction of the brood nest of an established colony. If it does not properly fill its hive, is too weak, and the time for putting on sections has arrived, then contraction is necessary if the colony is to be worked for comb honey. But when a colony completely fills its hive and has its combs well filled with brood, I doubt if much is gained by contracting the brood nest. So long as the combs are kept full of brood, the surplus will go into the supers. If any of the combs of brood are taken away, they must be cared for by *other* bees somewhere else, so nothing is gained.

It is in the hiving of a swarm that I have found contraction of the brood nest advisable. Years ago some of the "big guns" in apiculture were given to lamenting the swarming of bees, because, they said, with the swarm went all hopes of surplus. As the business was then conducted, the "big guns" were correct in many instances. The swarm would be hived in a ten-frame hive, and no supers put on until the hive was filled. If they *were* put on they would not be occupied until the lower hive was filled, and by the time that this was accomplished it often happened that the white honey harvest had passed. If the old colony did not swarm (usually it did), some return might be expected from that, unless the season was nearly over. In most of our Northern States the crop of white honey is gathered within six weeks, often within a month. If a colony is in condition to begin work in the supers at the opening of the white honey harvest, and continues faithfully at work without swarming, as I have already said, no contraction is needed, but, suppose the harvest is half over, the bees are working nicely in the supers, there may be one case of sections almost ready to come off, another two-thirds finished, and a third in which the work has only nicely commenced, now the colony swarms, what shall be done? By hiving the swarm in a contracted brood chamber upon the old stand, transferring the supers to the newly hived swarm, and practicing the Heddon method of preventing after-swarming, work will be resumed and continued in the supers without interruption, and the surplus will be nearly as great as though no swarming had taken place.

Where the brood-nest has only one tier of frames, the only way by which it can be contracted is by taking out some of the outside combs, and filling the space these left, by the use of "dummies." A "dummy" is simply a brood frame with thin boards tacked upon both sides. It hangs in the hive and occupies space the same as a comb, only it is a "dummy" just as its name indicates. A frame wider than a brood frame may be used, and this will make the "dummy" thicker. Don't have a dummy touch the side of the hive, then the bees cannot glue it fast. How thick a dummy should be, de-

pends upon how many combs are to be removed. When using the Langstroth frame I prefer to contract to five frames.

With the Heddon hive, in which the brood chamber is horizontally divisible, simply using only one section of the brood nest contracts the brood nest to about the proper capacity. This method of contraction is preferable to using dummies. Not only is there less labor and complication, but the flattening of the brood-nest, and the absence of any dummies under the outer sections, makes the bees more inclined to work in the supers.

When the brood nest is very much contracted, it has a tendency to cause a newly hived swarm to "swarm out" and leave the hive. When there is trouble from this source, the brood nest may be used nearly or quite full size for two or three days, until the swarming fever has abated, and the bees have settled down to steady work. If newly hived swarms begin "swarming out," when I am using the new Heddon hive, I use a full size brood nest for three days, and then shake the bees from the lower section of the hive, and use this section for the *upper* section of the next hive in which I put a swarm.

It has been urged against contraction that it results in small colonies at the end of the season. If it is carried to too great extent, and too long continued, it certainly does. If a man wishes to turn bees into honey, contraction will enable him to accomplish his object. If colonies are too weak in the fall as the result of severe contraction, they must be united; but the course pursued by nearly all who practice contraction, is to enlarge the brood nest again in time for the colony to build up sufficiently for a fall flow of honey, if there is one, or to become strong enough for winter. When bees are wintered in a repository of the proper temperature, I have never found that unusually populous colonies were any more desirable than smaller ones. This is one advantage of cellar wintering, the population may be reduced to the minimum during the comsumptive, non-productive part of the year.

Hiving Bees.

THE hiving of a swarm of bees is a very simple operation when only one swarm comes out at the same time, and hangs itself up on the limb of a tree within easy reach of the bee-keeper; but in a large apiary, where several swarms are often in the air at the same time, and there are tall trees near by, the getting of all the bees into the hives in the right quantities, accompanied by queens, is no light task.

To my mind, there is only one way in which these hosts of circling, whirling, excited little bodies can be satisfactorily controlled; and that is through the queens. No swarm will ever leave the apiary unless accompanied by a queen. If the queens' wings are clipped, or traps in front of the hives catch them as they attempt to leave, there will be no chasing after and losing of swarms. The swarms may unite, when more than one issues, and all may attempt to return and enter one hive, but there will be no loss of bees nor climbing of trees. The bees will *stay in the yard*, and can be brought within *reach* of the bee master; while the absence of queens and the desire of the bees for a qneen, allows the apiarist to control the bees to such an extent that

he eventually becomes master of the situation. I clung to the plan of allowing queens to accompany swarms, until I was *forced* to abandon it. The loss from absconding swarms was too great. Bees do not always *stay* hived after they are hived, and when they swarm out in this manner, they frequently do not cluster again, but make directly for parts unknown. It is true that an absconding swarm can usually be stopped by throwwater with a fountain pump, if the swarm is seen when first starting off, and there is plenty of water handy, some one to bring it, and the bee-keeper is not so busied just then trying to straighten out a "snarl" of four or five colonies that have mixed themselves together.

In a large apiary, in which the queens are allowed to accompany the swarms, *water* is the great agent by which the bees can be controlled. Quite a number of large pails should be keep filled with water and scattered about in different parts of the apiary. There should also be three or four barrels of water, in different parts of the apiary. Waiting one-quarter of a minute for water, sometimes means the loss of a swarm. Sometimes swarms go beyond the limits of the apiary; then two persons are really needed; one to carry water, and the other to work the pump. Whitman fountain pump is the best. With this a stream of water can be thrown a distance of thirty or forty feet. If two swarms issue at the same time they can frequently be kept apart by the use of the pump. It is not necessary to throw a stream of water directly into the center of the swarm, but along one side of it, with a sort of sweeping movement of the arm, that makes the stream fall in a sort of shower. The bees dislike the water and edge away from it. In this way they can be driven in any direction. Two or three pails of water thrown in this manner upon a swarm seems to disconcert them, and they then begin to look for some alighting place. If the operator once has a swarm well in hand, and there is plenty of water at hand and he knows how to use it, it is well nigh impossible for the swarm to get away.

Unless the queens are clipped, or the queen trap is used, there should be no tall trees near the apiary, as the swarms *will* go where it will be difficult, even dangerous, to get them. It should be possible to reach the tops of the trees with a long, light ladder. If the tops are no higher than can be reached with a step ladder, so much the better. Besides the pails of water, fountain pump, and ladders, the bee-keeper will need three or four baskets. Clothes baskets are excellent. Upon one side should be sewed a cover of burlap. When the swarm has been shaken into the basket, the cover can be thrown over the top of the basket and will keep the bees from flying out. Blocks of wood nailed to the corners of the cover hold it from being blown off or from dropping down into the basket, should the bees cluster upon the cover. If set in a cool place, a swarm may be left in such a basket several hours. When the hive is in readiness to receive the swarm, the cover to the basket may be turned back and the bees shaken down in front of the hive. A few of the bees soon find the entrance and set up their "call" of a home is found, when the others follow them into the hive. If another swarm comes out and attempts to join the one just entering its hive, a large sheet may be thrown over the hive. Where several swarms come out at the same time and unite, the best that can be done is to divide them up as nearly equal as possible into several swarms. When a queen is found she is to be caged. Any swarm that has no queen will soon show its queenlessness by its restlessness. The bees will begin running out of the hive and taking wing. One of the caged queens should be given such a swarm, when, as by magic, the bees will change their behavior.

When the bee-keeper has all of the swarms out that he can possibly manage, there is one infallible method of prevent-

ing any more from issuing. As he works, let him frequently cast his eye quickly over the entire yard. The moment he sees a swarm beginning to come out, let him run to the hive, quickly remove the supers and dash a quantity of water into the hive. The effect is a most radical one; that swarm will not issue for at least a day or two. Throwing water into the brood nest is not injurious to the brood or bees; as the water so used is warm from having stood in the sun in the pails heretofore mentioned.

I believe that the majority of advanced bee-keepers now hive their swarms by having the queens' wings clipped, and allowing the bees to return to the old location, which they will do when they find that the queen is not with them. Of course the queen *attempts* to follow the bees, and is found in front of the hive by the bee-keeper, who cages her, and sets the old hive to one side, replacing it with a new hive prepared for the occupancy of the swarm. When the bees return, they enter the new hive, supposing it to be their old home, thus hiving themselves. While they are entering the hive, the queen is allowed to run in with them—and the work is done. There is another method of carrying out this principle; it is that of catching the queen in a trap in front of the hive. The lower part of the trap is covered with perforated zinc, the perforations being of such size that the workers can pass, but the queen finds and passes through a cone shaped opening in the upper part of trap. There she finds herself in another apartment, and the chance that she will find the narrow mouth of the cone and return is as one in a thousand. The use of the trap saves clipping the queen's wings, also the trouble of looking for her when the swarm is out, together with the possibility of her being lost. The objections to the trap are its cost, a slight hindrance to the bees passing out and in, and its interference somewhat with the ventilation of the hive. A trap placed over the mouth of a hive containing a newly hived swarm, will prevent loss from "swarming out." Taking everything into consideration, my preference is clipped queens.

If only one swarm would issue at a time, there would be no difficulty at all in managing swarms with clipped queens. When two or more swarms come out at the same time, and no water is thrown between them, they are almost certain to unite. After circling about for awhile the bees return. If each bee would return to its own hive, all would be well; but when the bees of one swarm begin to go back, a large share of the bees in the air follow them. A few bees from each swarm usually return to their respective homes, but the majority "follow my leader." It is impossible to give any set rules that may be followed in such emergencies. If only two swarms have united, the bees may be allowed to enter until it is estimated that one-half the bees are in the hive, when it may be removed and the other hive brought and put in its place. It should not be forgotten that, as a rule, other things being equal, a bee will do as good work in one hive as in another. Some bee-keepers, when several swarms come to one place, take supers from other hives, where the bees are working none the best, and place them upon the hive into which the bees are entering. As soon as the supers are full of bees they are returned to the hive from whence they were taken. A colony made unusually strong by uniting swarms, will store a larger quantity of honey, but will be no stronger at the end of the season.

Another plan of managing, where several swarms come out at the same time, is not to allow the bees to return to hives, but put the caged queens in baskets, each queen in a separate basket, and hang the baskets on the branches of a tree where the bees show a disposition to congregate. The bees soon find and cluster about the queens in the baskets. As soon as a queen is found with sufficient bees to form a good swarm, remove that

basket to a shady place and cover with a cloth. Then remove the next basket that secures the proper quota, and so on to the end. Or the bees may be allowed to cluster about a single queen in a single basket, and then the cluster divided up, and each division furnished a queen.

And now I am going to give something that, in actual practice, by a large number of bee-keepers, *may* not turn out so well as represented.

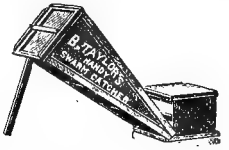
Every bee-keeper knows of the disposition of bees to crawl *upwards*. To induce a queen to leave a cage, turn the opening *up*. Those who have watched the motions of a clipped queen in front of the hive from which a swarm has just issued, have probably noticed her disposition to crawl *up* a spear of grass or anything of this nature that she can find. At a recent meeting of the Huron, Tuscola and Sanilac Co. bee-keepers, a Mr. West told how it was possible to take advantage of this climbing disposition on the part of the queen, to induce a swarm with a clipped queen to cluster and remain upon a stake in front of the hive from which it had issued.

This discovery was the result of an accident, or rather of a lucky "happen so." In front of one of his hives a mullein had been allowed to form a stalk. Coming home one day he found a swarm from this hive clustered upon the mullein stalk. He at once reasoned that the queen, as she alighted in front of the hive, found and climbed the mullein stalk, and the swarm, upon its return, found and clustered about her. Taking a hint from this he cleared away all rubbish from in front of all the hives, and a few inches in front of each hive he thrust into the ground a branch of an apple tree. He used branches perhaps an inch in diameter and two feet long with a few short twigs at the top. The twigs were cut off to a length of four or six inches. The branch was not planted in an upright position, but leaning away from the mouth of the hive. Then it was not in the way of the workers as they passed out and in the hive, while a swarm clustered at the top would be held so far from the entrance of the hive that there would be no danger of its being enticed back into the hive.

This plan proved a perfect success. He had practiced it for three years, and one year had as many as sixty swarms, and it had *never failed*. It seemed to me that the queen might not always find the tree to climb, but would crawl off in some other direction, but he said not; that the stake was planted just about where she would naturally strike the ground when leaving the hive, and she *invariably* found and climbed the pole, and that the bees clustered about her and *remained*. As the queen could not take wing and the bees would not desert her, it naturally followed that they would remain until removed by the bee-keeper.

Sometimes a good thing is brought out, illustrated and described, yet it falls dead—does not "take." The T super had a hard struggle before its merit was recognized. "Bee escapes," are another illustration of this truth. I well remember how my brother and I laughed, and rolled over in the grass, when I read a letter from some one who had planned a bee escape. "If we can produce the honey, I guess we can get the bees off from it," was the comment we made. It was really two or three years before I could bring myself to regard the bee-escape seriously. I think that what is called a "swarm catcher" must be placed in the same category. It was first brought out by a Mr. W. J. Bailey of Wisconsin. I well remember how some of us pooh, poohed at it. "Who would think of bringing such machinery as that into the yard, and then stand around and wait for a swarm to issue so that we can fit this rigging over the hive?" That is the way we talked. Later, the late, lamented B. Taylor of Minnesota took up the idea and made a great success of it. When I was up to Minnesota last winter, attening their State convention, I found several practical bee-keepers were using the swarm catcher, yet, strange to say, it

has not come into general use. Where one man is caring for a large apiary, all alone, I know of no more perfect arrangement for managing several swarms that issue at nearly the same time. There is no catching of queens, nor climbing of trees, nor mixing of swarms. The control is perfect.



The catcher is simply a light frame-work, about three and one-half feet long, sixteen inches square at the large, or outer end, then tapered down to about three by sixteen inches at the other end. The outer end is closed with a removable door covered with wire cloth. The rest of the frame-work is covered with canvas or ducking. The small end is so made that it fits nicely to the entrance of a hive, and a portion of the cloth covering is so made as to form a sort of flap that can be drawn over the mouth of the catcher to keep the bees in after they have entered. In a large apiary there should be as many as half a dozen catchers scattered about the yard. When a swarm is seen issuing, a catcher is quickly adjusted to the entrance of the swarming-hive. In five minutes, the whole swarm is in the catcher, when the catcher is closed and set in the shade, or carried to some cool place, like a cellar. The queen is usually among the last to leave the hive, so there is seldom a failure in catching her. If the swarms come thick and fast, there is no objection to leaving the swarms several hours without hiving, provided they are not left in the sun. Although there is probably no necessity for it, they can be kept two days in a cellar. When the bees have been "cooled down" in this manner, and are shaken in front of the hive that is to be their home, they march in without fifty bees taking wing. When swarms are caught in this manner there are no mixed or united swarms to separate—no tangles to straighten out. It reduces the hiving business to an exact system.

Foul Brood.

THERE is no apiary in which there is not a *possibility* that foul brood will sometime appear, hence every bee-keeper ought to be able to distinguish it, and to know what to do when he is so unfortunate as to find it in his apiary. From reading the published descriptions, many bee-keepers form exaggerated ideas of the appearence of foul brood, or rather of its appearance in its *first* stages. They are looking for combs black with slime and rottenness, a stench strong enough to knock a man down and colonies dwindled to handfuls. Unless the bee-keeper keeps a sharp lookout, foul brood may be in his apiary some time before it is known. At first but few cells of diseased brood will be found. It is not advisable that a bee-keeper be continually opening brood nests and critically examining the combs for foul brood. If a colony shows signs of listlessness, or many dead bees are seen in front of one or more of the hives, or a peculiar, unpleasant odor is noticed, it would be wise to make an examination. Whenever handling frames of brood it would be well to *glance* at the brood.

Notice if the "pearly field" of unsealed larvæ is unbroken. If there are desolate patches, examine more critically. If some of the larvæ are discolored, shapeless, ropy, ill-smelling, some of the cappings sunken, perhaps perforated, foul brood is present. Perhaps the one *sure* symptom of foul brood is the ropiness of the larvæ. If a splinter or tooth-pick be thrust into a dead larvæ, and then slowly withdrawn, the matter will adhere to the splinter and "string out" an inch or more in length, then break, and the two ends fly back to the points of attachment. Dr. A. B. Mason, who has had much experience with foul brood, says that he has had many specimens of brood sent him by men who feared their bees were affected by foul brood, and when this elastic, tenacious condition of the brood was absent he had never hesitated to place the suspected brood in a colony of bees, and no harm had ever resulted.

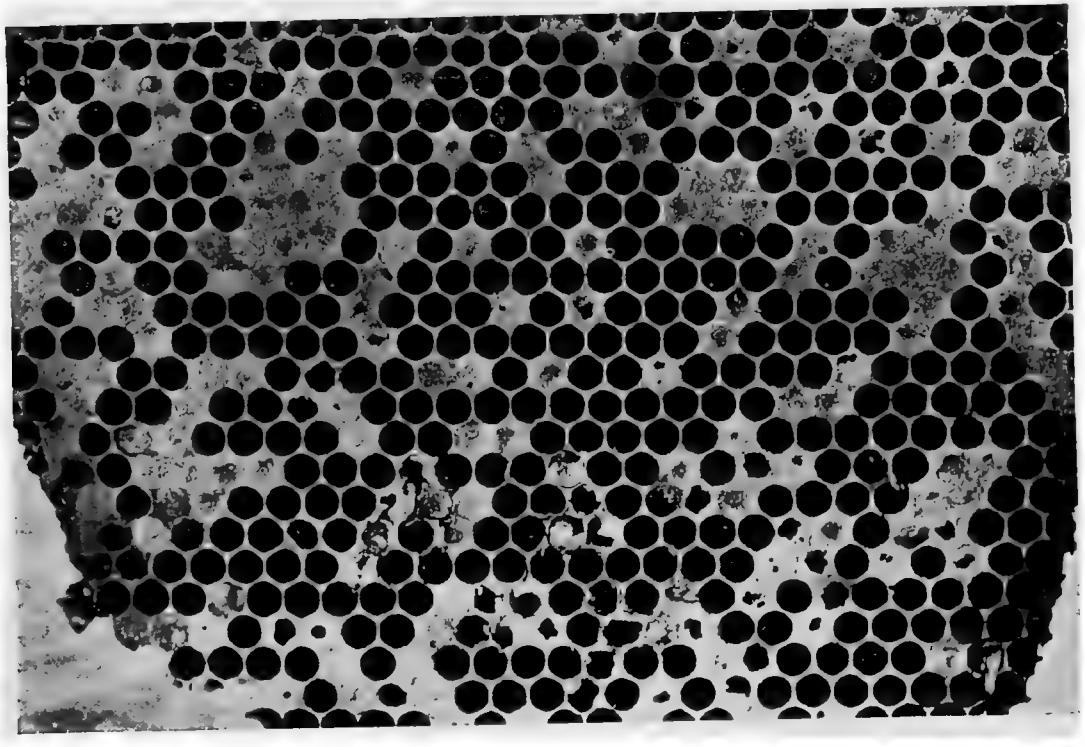
All of the above indications will be seen only during the breeding season. In a strong colony, after the breeding season is over, the cappings are all cleared away, and the dead brood is entirely dried up—mere scales almost of the color of the comb itself, lying fast to the lower side of the cells, and drawn back more or less from the openings. To tell whether combs have been infected, Mr. R. L. Tayler suggests that these minute scales be looked for. He says: "Hold the comb with the bottom bar from you, in different directions, until the light strikes well into the *lower sides* of the cells, when, if infected, the scales are very evident."

Honey is the means by which the disease is usually carried from one hive to another. Mr. Cheshire says that the mature bees, the queen and even the eggs are infected in a diseased colony. Be this as it may, where the bees of an infected colony swarm, or are shaken from their combs and put into a new or disinfected hive, and given no combs in which they can store the infected honey that they may have brought with them, the brood hatched afterwards in this newly formed colony remains free from disease.

When foul brood is discovered, what shall be done? In the first place don't "lose your head" as the saying is. Don't be in such a haste to be rid of the pest, that a crop of honey is lost, and the work of eradication imperfectly performed. What is to be specially guarded against is allowing healthy colonies to have combs or honey from those that are diseased. Robbing is particularly to be guarded against. It is for this reason that curative operations can be carried on successfully only during a honey flow, when bees will not rob. If foul brood is discovered after the honey season is over, treatment must be postponed until the following season.

The spraying of the combs with acids, and the feeding of the bees with medicated honey, seems to be of little avail, so far as eradicating the disease is concerned. Such treatment checks the disease, but cannot be depended upon to effect a cure. The only plan of treatment that can be depended upon to effect a radical cure, is to shake off the bees, during a honey flow, into a new or scalded hive having no combs in which the bees can store (and thus save up) any of the infected honey which they may have brought with them. If there is much healthy brood left in the old hive, a few bees may be left to protect it, and the hive allowed to stand until the brood is all hatched, when the bees from several hives so treated may be united in a new hive and given a queen. Where the hives have loose bottom boards, several hives from which the bees, or nearly all of them, have been taken, may be placed one above the other, when, in three weeks, all of the healthy brood will have hatched and will be already united in one colony, when the bees can be given a new hive and a queen, leaving the combs free from healthy brood.

Mr. R. L. Taylor has had much experience with foul brood. He succeeded in ridding a large apiary of the disease,



A COMB BADLY AFFECTED WITH FOUL BROOD

and that without any very great pecuniary loss. In an essay read at a meeting of the Michigan State Bee-Keepers' Association, he stated at length his varions experiments, all of which resulted in failure except that of the plan just mentioned. His method of treatment was somewhat different, in details, from that usually followed. Among other things he managed to secure a good crop of honey. Perhaps I cannot do better than to quote two or three paragraphs from his essay.

"I found in my experiments, that by feeding a few pounds of honey medicated with salicylic acid, in the spring—the food being placed in an upper story, in a capacious feeder—the disease, though never cured, was completly checked, and the usefulness of the colony for the production of honey preserved. One colony so fed, yielded, notwithstanding the foul brood, twice the average of the apiary.

Another benefit of this feeding is, that it practically prevents, I think, the dissemination of disease from the colony. Taking advantage of this discovery, after much deliberation I decided upon the following plan of operation, as the best under all circumstances.

In the spring, about the middle of May, feed, as indicated above, each colony to be treated, then manage the same as healthy colonies until such time as the brood to be reared from eggs laid will be of little use in the collection of the main honey crop—say thirty days from the probable close of the flow from basswood, then cage the queen in the hive for three weeks, and, at the end of that time, move back the hive, place a clean hive furnished with foundation on the old stand, run all the bees and the released queen into it, remove the old combs and hive to a place of safety, and the work is done. Of course, colonies may be treated in the same manner during any sufficient honey flow."

When freed from bees and healthy brood, the combs may be emptied of honey by extracting, then melted into wax. Thorough boiling of the honey will kill all the germs of foul brood, but, to make assurance doubly sure, some have added to the honey a small proportion of salicylic acid. Honey thus treated may be fed to the bees. The hives ought to be boiled in water fifteen or twenty minutes. Simply pouring boiling water upon them will not answer. Some have advocated the burning of the combs with no attempt at saving the honey and wax. If only a few colonies are to be treated, this might be advisable, but the owner of a large apiary quite generally affected with foul brood, can well afford to take the necessary precautions whereby the combs may be saved. Whoever undertakes such a job must remember, however, that "eternal vigilance" is the price of success, that *one drop* of the infected honey secured by a robber bee, means disease once more in the hive to which it is carried. Some one has suggested that the extracting, etc., be done down cellar. It is a cool place in which to work, and the bees can the more easily be kept out. Others have melted up the combs at night when no bees are flying. There is no necessity for destroying the combs and the honey they contain. If a man can not or will not, exercise sufficient care, it would certainly be better to burn them; but, if he has "gumption" enough to succeed as a bee-keeper, he can save the combs from destruction. It would be well, however, for all to bear in mind that one little "forget" may compel a repetition of the "whole business."

Of late, the bee-keepers of Colorado have been following a plan whereby a man may keep his apiary fairly free from foul brood, even though located in a foul broody district. It is well known that shaking the bees of a foul broody colony into a clean hive, and allowing them to build a new set of combs, frees them the infection; well, these Western men, just at swarming-time, treat *every colony* in the apiary in this manner—make a wholesale sweep of the matter. As this is done at a season when the honey-flow has commenced, and there will be no more rob-

bing until the season is over, the apiary remains free of the disease for that season. It is simply *forced* swarming on a wholesale scale. The old hives are given new locations, perhaps the combs of two or more colonies are put together on one stand. At the end of three weeks, the brood has all hatched, when the combs are again shaken free from bees, the latter, of course, going back into the hive and building new combs, thus establishing colonies that are free from the disease. The honey is then extracted from the combs and the latter rendered into wax. It is asserted that the wax will pay for the labor, while the brood combs are built *at a profit*. After my experience, as given in the chapter on the use of comb foundation, I can well believe the assertion. I believe that this plan can be successfully followed in the East as well as in the West; although, of course, the Western harvest is much longer than ours.

Perhaps it ought to be mentioned that, in the first shaking, the combs are not *entirely* freed from bees, some being left to care for the unsealed brood; and caution should be exercised that the work be not done too early in the season when there would be danger of chilled brood or from robbers.

The Use and Abuse of Comb Foundation.

THAT foundation has been a boon to bee-keepers, no one doubts; that money expended in its purchase is often returned many fold is equally true; but such is not always the case. All through the working season wax is being secreted to a greater or less extent. If not utilized it is lost. Of course, bees that fill themselves full of honey and hang in clustering festoons secrete wax to a *very much* greater extent than those engaged in bringing in honey. The bees of a swarm will nearly always, if not always, be found with large wax scales in the wax pockets. Having found that foundation is used at a profit in some places and at some times, the bee-keeping world seems to have decided, with almost no experiments, that bees ought never be allowed to build comb.

Years ago I practiced hiving swarms on empty combs, upon foundation, and upon empty frames—empty except starters of foundation. The first swarm was hived upon comb, the second upon foundation, and the third upon starters only. This order was continued, the first year it was tried, until fifteen swarms were hived, when the use of empty combs was discontinued, as it was only too evident that they were used at a loss. I have reference here to what was used in the brood nest in hiving swarms when raising comb honey. The difficulty with drawn combs is just this: Before the queen will lay in old combs, the cells must be cleaned out and "varnished" until they shine; and long ere this, especially if there is a good flow of honey, they will be badly needed, and will be used, for storage. In other words, combs are ready for honey before they are ready for eggs, and the bees fill the combs at once with honey, when, from some perversity of bee nature, work, in many instances, comes to a stand still. Having filled the body of the hive, the bees seem disinclined to make a start in the sections. Where bees *commence* storing their surplus, there they seem inclined to continue to store it; and let the

bees once get the start of the queen, by clogging the brood-nest with honey, and that colony becomes practically worthless for the production of comb honey.

The advantages of full sheets of foundation over starters, or *vice versa*, were not so apparent, and until the close of the season, an equal number of swarms were hived upon foundation and upon starters. Enough was proved the first season to show that, so far as surplus was concerned, nothing was gained by using foundation in the brood nest, except for starters, when hiving swarms. I have since continued to experiment, year after year, by hiving swarms alternately upon foundation and upon empty combs, weighing both surplus and brood-nests at the end of the season, and the evidence has been in favor of empty frames *every time*. Occasionally I have hived a swarm on empty combs, but the loss has *always* been so great, that it seems like folly to repeat it.

When full sheets of foundation are used in the brood-nest, and the brood-nest is so contracted that some of the bees must enter the sections, and the sections are filled with drawn comb, or partly drawn comb, the honey must, from necessity, be stored in the supers until the foundation can be drawn out; and even then, having *commenced* work in the sections, the bees will not desert them. But there is only one queen furnishing eggs, while hundreds of busy, eager workers are pulling away with might and main drawing the foundation out into comb, and the time eventually comes when there are thousands of empty cells in the brood-nest. Now nature has no greater abhorrence of a vacuum than has a bee of an empty cell during a flood of honey; and, although the general orders are "up stairs with the honey," no cells in the brood-nest are left empty very long. Especially is this true with a deep brood-nest and yellow Italians.

If a swarm is hived upon frames with starters only, the first step is, necessarily, the building of comb. Now, if a super filled with drawn, or partly drawn, comb (*not* foundation) is placed over the hive, the bees will begin storing honey in the combs at the same time that comb building is begun below. A queen excluder must be used to keep the queen out of the supers, then she will be ready with her eggs the moment a few cells are partly finished in the brood nest, and, if the latter has been properly contracted, she will easily keep pace with the comb building. The result is that nearly all of the honey goes into the supers, where it is stored in the most marketable shape, and the combs in the brood-nest are filled almost entirely with brood. When bees are hived upon empty frames, a small brood nest is imperatively necessary, otherwise large quatities of honey will be stored therein, and when bees build comb to store honey, particularly if the yield is good, they usually build drone comb. They probably do this because storage can thus be secured with the least expenditure of time, labor and material. So long as the queen keeps pace with the comb builders, worker comb is usually built, but if the brood-nest is so large that bees begin hatching from its center before the bees have filled it with comb, and the queen returns to re-fill the cells being vacated by the hatching bees, the comb builders are quite like to change from worker to drone comb.

No fairer question could be asked than: What are the advantages of this system? In reply I will say that, in the first place, the foundation is saved; but althongh this is a great saving, it comes about incidentally, as the non-use of foundation is only a means to an end, and that is the profitable securing of the greatest possible amount of honey in the most marketable shape; leaving the brood-nest so free from honey that no extracting is needed when the time comes for feeding sugar for winter stores. Those who for any reason do not wish to use sugar, may still take advantage of this system by putting the unfinished sections back on

the hives in time for the honey to be carried down and stored in the brood-nest for winter. Or a case of brood combs may be put on over the sections as the harvest draws to a close, instead of putting on another case of sections. This will do away with nearly all unfinished sections, and the case of filled brood combs can be given the colony at the end of the season in place of *its* empty combs. By either plan, the number of *finished* sections is increased.

The objection to this plan is that it cannot be depended upon to produce perfect brood combs. I think I am safe in saying that I have had thousands of combs built under this management, and I think at least eighty per cent. of them were as perfect as it would be possible to secure by the use of foundation. A much larger percentage were perfect when I was using mostly the Langstroth frame, and contracted the brood nest to only five frames. This made the top of the brood nest, where the bees commenced their combs, so small that the bees completely covered it. All of the combs were commenced at the same time. As a rule, they were as nearly perfect as possible, at least so far as straightness was concerned. When I came to using the new Heddon hive more extensively, I discovered that the greater surface at the top allowed room for the starting of more combs, that the outside combs would not always be started so soon as the center ones, and this sometimes resulted in a slight bulging of some of the combs. Perhaps the outer comb would be a trifle thinner and used largely for storage. The comb next to it would bend out slightly to match the lack of thickness in the outside comb. As the frames in the new Heddon hive are placed nearer together than one and one-half inches (the natural distance at which bees place their combs apart) I have sometimes thought the bees, in their efforts to get the combs wider apart (one and one-half inches from center to center) bulged or built the comb of one frame slightly into the space that rightfully belonged to the adjoining comb, and then this adjoining comb must needs be built into the space belonging to the next comb, and so on. When full sheets of foundation are used, the bees are, of course, compelled to build their combs where the foundation is placed.

Sometimes drone comb would be built, even in spite of contracted brood nests. Usually this was the result of old queens. But then, we can't always have young queens, hence I can only repeat that this method gives most excellent results in the way of surplus, but cannot be depended upon to furnish perfect brood combs. So well pleased was I with this system that, four years ago, I wrote and published a little book in which this method was described in detail. Three thousand copies were sold, the methods advised were largely tried, and were freely discussed in the journals, all succeeded in getting good crops of honey, but some failed in getting perfect brood combs. Some keep watch of the brood combs while they are being built, cutting out crooked or drone comb, and using it in the sections. I cannot think favorably of such work. When I hive a swarm, I wish that to be the end of the matter. No opening of brood nests, and puttering with imperfect combs during the hurly burly of swarming time would be desirable for me. But I do think favorably of a plan advised by Mr. H. R. Boardman, that of contracting the brood nest when hiving a swarm, and then uniting the swarm with the parent colony at the end of the season. This allows the newly built combs to be sorted over and the imperfect ones culled out and rendered into wax.

If securing straight all-worker comb is not the greatest benefit arising from the use of foundation, it is certainly next to the greatest. The advantages of having each comb a counterpart of all the others, to be able to place any comb in any hive, in short, to have each interchangable with all the others, and to be able to control the production of drones, to have them reared from such stock as

we desire, and in such quantities, no more and no less, all these are advantages that cannot be ignored, even at the cost of filling our frames with foundation, and securing a little less surplus. We *must* have straight, worker combs. If they can be secured without foundation well and good; if not, it must be used. By using weak colonies, or queen rearing nuclei, or by feeding bees in the fall, straight, all-worker combs may be secured at a profit.

Perhaps the greatest *immediate* profit arising from the use of foundation, is not so much in the saving of honey that would otherwise have been used in the elaboration of wax, as in the quickness with which it enables the bees to furnish storage for honey. When bees are storing honey slowly, the wax that they secrete without consuming honey expressly for that purpose, probably furnishes sufficient material, and there is probably abundant time, for the building of comb in which to store the honey. As the flow of honey increases, the handling of larger quantities of nectar increases the natural or *involuntary* wax secretion; but, as the yield of honey increases, a point is reached when honey must be consumed *expressly* that wax may be secreted. It is quite likely that, at this point, foundation may be used at a profit to aid the bees in furnishing storage. When the yield is so great that the bees cannot secrete wax and build comb with sufficient rapidity to store all the honey that they might gather, then foundation is certainly used at a profit. Furthermore, I have seen the yield of honey so bountiful that even foundation did not answer the purpose; the bees could not draw it out fast enough to furnish storage for all of the honey that could have been brought in. At such times, drawn combs are needed.

It will be seen that this question of foundation is one to which there may be profitably given much thought and experimentation. If the bee-keeper lives where the honey flow is light, but, perhaps prolonged, he will find it more profitable to allow his bees to build their own combs. If he can't get perfect brood combs, he certainly can allow the bees to build their combs for the surplus comb honey. If honey comes in "floods," as it sometimes does in some localities, the man who allows his bees to build their store combs unaided at such a time, loses dollars and dollars. If foundation is needed only for the sake of securing straight worker combs, it need not necessarially be heavy. All foundation in brood frames, upon which swarms are hived, should be wired to prevent sagging and breaking down.

Queen Rearing.

NEARLY all who keep bees do so for the honey the bees gather, but there are quite a number of apiarists, who keep bees to rear queens for sale. For several years I made a specialty of queen rearing, securing no comb honey; what little honey could be extracted from the nuclei in the basswood flow, being all the honey secured. Queen rearing, if rightly managed, is more profitable, according to the number of colonies employed, than is the raising of honey, *provided* there is a ready sale for queens. Taking one year with another, however, a man can make more money, in this locality, by having enough bees to keep him fully employed when engaged in the production of honey. One great

drawback to profitable queen rearing in the North, is the shortness of the season. If I were intending to make queen rearing my business for life, I should think seriously of moving to some one of the Southern States. The income from queen rearing is more of a *certainty* than that from honey production. If the blossoms yield sparingly, no surplus can be secured, but nearly, or quite, as many queens can be reared. The number of queens that can be reared is more a question of *time* than of honey flow. Although a steady and moderate flow of honey is the most desirable for queen rearing, yet queens can be reared, and at a profit too, by feeding the bees.

The great expense in queen rearing is that of nuclei for keeping the queens until they are fertilized and laying. Getting of the cells is not expensive. If I were in the queen business I should be willing to furnish cells just ready to hatch, or just hatched virgin queens, at ten cents each. Advertising, cages, postage, etc., all cost something, but I doubt if all these, combined with the cost of cells, equal the expense for nuclei. I think a great many have their queen rearing nuclei stronger than is really necessary. With large combs this may be necessary, but if queen rearing is to be a specialty, let the hives, combs, and other appliances be adapted to the business. I have always admired the small combs used by Mr. Alley. They are only about four or five inches square, and three or four in a hive. Half the bees that would cover one Langstroth comb would stock such a nucleus. I have often thought I should like to engage in queen rearing, using *sections* an inch and a-half wide for frames, and the old style Heddon surplus case for a nucleus hive, having four nuclei in each case. I have used sections for combs, and put them in an old style Heddon case for a hive, making *eight* little nuclei in each super, and used them for keeping laying queens when there was a dearth of orders. I used three sections for each nucleus. The queen would fill the combs with eggs in about a day, and then go over them again. About this time there would be discontent and swarming-out; and the only way to remedy this was to cover each entrance with a piece of queen-excluding zinc which would prevent the queen from leaving the hive; when, of course, the bees would return. Quite a number of queen breeders have, of late, been successful in getting queens fertilized in these little nuclei, placed over a full colony, the latter furnishing the needed heat that these small clusters of bees seem unable to generate.

Mr. Doolittle makes artificial queen cells, or rather the base to cells, by dipping a round-pointed stick into melted wax, allowing the wax to cool, then dipping again, not quite so deeply, and continuing the process until the wax is of sufficient thickness, when it is slipped off the stick. These little wax cups are stuck to a stick, and into each cup is transferred a just hatched larvæ from the egg of some choice queen. A little "royal jelly" is also placed around each larvæ, when the stick is fastened into a frame of comb, an opening being made in the comb, beneath the cells, and the frame hung in a colony prepared for cell building. The bees proceed to nurse the larvæ and finish up the cells, and when they are "ripe," the cells can be pulled off the stick as easily as we pull cherries from a branch.

Mr. Alley cuts comb containing eggs into strips, then destroys each alternate egg by introducing into the cell the brimstone end of a match and giving it a twirl. Each strip of comb is fastened into a small frame and given to queenless bees.

The advantage of these methods are that one choice queen may be made to furnish eggs for all the cells that can possibly be needed, and each cell is built by *itself*. Unless some such precautions are

taken, the cells are often built in clusters, and it is impossible to separate the cells without destroying some of them.

I have not tried either of these methods. They seem too "fussy." My method of getting cells is to remove the queen from a populous colony and leave the bees undisturbed for six or seven days. By this time cells will be started, and nearly all of the larvæ will be sealed. Young bees will be hatching in abundance, but there will be only a small quantity of brood to be nursed, and in a day or two there will be none. All of the queen cells that have been started are cut out and a comb of just hatching larvæ, from a choice queen, is given. To secure this comb of larvæ, a dry, clean comb (one built the previous year is preferable) is placed in the center of the brood nest of a desirable colony about four days before the comb will be needed. All around the edge of the patch of just hatching larvæ, I cut holes an inch in diameter. Around these holes the bees build the queen cells, usually three or four at each hole. Of course this method mutilates the combs, but, in a good honey flow, the bees will soon refill the holes. About the ninth day after the comb of eggs was given, it is removed, leaned against the side of the hive, and the cells carefully cut out; smoke being used, when necessary, to drive the bees out of the way. The comb is then returned, and another comb of just hatching eggs given. It will be noticed that young bees are continually hatching in this colony, and all the brood there is to nurse is in the one comb that is given. A colony so treated will build three batches of good cells, and I then give it a queen.

Nothing is gained by commencing queen rearing operations before steady warm weather has set in. In this latitude, about the 10th of May is usually early enough to have queen cells started. To secure good cells, three things are necessary; warmth, food in abundance, and plenty of young bees. Early in the season, when the brood is *increasing* all the time, simply removing the queen from a colony does not always result in the best of cells. Later in the season, just at swarming time, for instance, quite good cells can often be secured by this plan. One great objection to this plan seems to be that the bees, in their impatience to secure another queen, sometimes choose larvæ that are too old.

Batches of cells should be started at regular intervals, and there must be no forgetfulness in regard to dates. It is well to have a large calendar hung in a conspicuous place, and the dates and hive numbers marked thereon. It is a difficult matter to so calculate that there shall always be enough laying queens to fill orders, and enough young queens or mature cells to replace them, and none left over. When a breeder has orders ahead all of the time, he can very nearly make things come out even, but not always. A spell of cool weather, or a stoppage in the honey flow, may cause a delay in the queens' beginning to lay, and then there will be no place to put the newly hatched queens. Hot weather or a honey flow may bring opposite results. It is best, however, to always have on hand an abundance of cells even if quite a number of their occupants must eventually be destroyed. With one hundred nuclei I have found it a safe plan to start a batch of cells each day.

After the cells are taken from the hive they are placed in a lamp nursery, where the queens hatch in three or four days. During the day, the lamp nursery is examined about once in two hours. Just at twilight the room is darkened and each cell passed before an aperature in the window shade. Any queen that will hatch before morning can usually be detected—will make some movement with a leg—and may be placed in a cage or apartment by herself. I had sixteen little boxes, two inches square, put into a single wide frame that could be hung in the nursery. Each box had a glass door, fastened on by a piece of cloth pasted on, and held shut by a pin driven into the wood and then bent over the door. To open the door, the pin was turned to one

side. When a cell was found containing a queen that "kicked" it was placed in one of these little compartments with glass doors. A little food in the shape of "Good candy" was placed in the corner of each compartment. The nursery was examined early in the morning, and by this management, very few cells were destroyed.

About three or four days before the first queens are to hatch, enough colonies should be made queenless to furnish bees for the nuclei, as queenless bees will adhere much better to a new location. I would have at least two combs in each nucleus, one of honey and one of brood. Very early in the season it may be well to give three combs, dividing the nucleus later on. When the nuclei are made up, it may be well to shut the bees in until dark. Many of the old bees will return, but as most of the brood is sealed, enough bees (if they are queenless) will remain. When making up nuclei, if the bees have been queenless, I would give each nucleus a cell nearly ready to hatch, or a young queen, at the time of making the nuclei, as it seems to be something of an inducement for the bees to remain in the new location. As many bees return to the old stand, I leave some brood and honey in the hive, also put in some empty combs and give the bees a laying queen. This colony soon builds up and prospers.

When a queen begins laying, she is allowed to fill the combs with eggs before shipment, then if a young queen is introduced soon after her removal, the nucleus receives another "sitting" of eggs in ten days more. By this management all nuclei are kept supplied with brood. One objection to very small nuclei is that the combs are very soon filled with eggs; then the queen goes over them a second time and re-fills them, putting two or more eggs in a cell. After this there is discontent, and it often happens that "swarming out" is the result. When very small nuclei are used, the queens must be removed soon after beginning to lay.

When honey is coming in freely I have lost few queens by allowing the newly hatched queen to run into a nucleus at the same time the laying queen was removed. After a queen has been hatched two days it is rather difficult to introduce her, unless the nucleus has been queenless two or three days. Mr. Alley makes a success of introducing these old (?) virgin queens by first smoking the bees with tobacco smoke until they begin to show signs of stupefaction. If virgin queens four days old could thus be introduced, it would be a great saving of time, as a laying queen could be secured just that much oftener from each nucleus.

As a rule, a queen begins laying when ten days old, but hot weather and a good flow of honey often shortens this period. I have frequently had them lay at eight days old, and in a very few instances at seven. During a drouth, when no honey was to be gathered, I have known queens to be three weeks old before laying. At such times as this it certainly pays the queen breeder to feed nuclei in which there are queens old enough to lay. When engaged in queen rearing, I had some shallow boxes, each of which was just large enough to cover the top of a nucleus. The boxes were filled half full of candy, and when a nucleus was found during a dearth of honey, containing a queen old enough to lay, but *not* laying, one of these boxes of candy was inverted over the nucleus. Two days later the queen would invaribly be found laying.

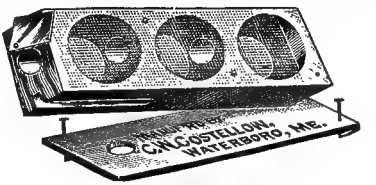
A queen rearing nucleus ought to be examined every three or four days. First, it ought to be examined about three days after a young queen is released to see if she has been accepted; then again in four or five days to see if she has been lost in taking her "wedding flight;" again in three days to see if she is laying. In all these examinations it is unnecessary to find the queen, simply look at the unsealed brood. If no queen cells are started, it is safe to assume that the queen is present. If a young queen is introduced soon after the laying queen is removed,

she will be fertilized before the brood of her predecessor is sealed. If one little piece of advice is heeded by the queen breeder, it will save him a world of trouble and annoyance, and that is, *never leave a nucleus without unsealed brood.* If all goes well, it is seldom necessary to give unsealed brood to a nucleus, but if a young queen is killed or is lost when she leaves the hive to mate, then it will be necessary to introduce brood before the next queen will be furnishing eggs. When visiting nuclei, I always carry a box containing eggs or young brood in comb cut up in small pieces, about an inch square. Whenever a nucleus is found without brood, a hole is cut in one of the combs and one of the pieces of comb containing brood is given. In making examinations, all that it is necessary to look at, is this piece of brood. If queen cells are started, it means that the bees are queenless; if there are no cells, it means that a queen is present. If this course is faithfully followed, there will be no trouble from those pests of careless queen breeders, fertile workers.

Nearly all queens that are lost when out to mate, meet their fate by entering the wrong hive. I don't remember having lost a queen when a nucleus stood in some out of the way place. Let queen breeders scatter their nuclei in all out of the way places imaginable; have no nuclei in rows or in any regular order. If there are no trees or other land marks in the apiary, make some. Set out some trees or bring in some large boxes or barrels and scatter them about—anything to give each nucleus a distinctive location.

In the shipping of queens, success turns largely on the food used. I have used no food that is superior to the "Good candy," which is made by mixing honey and pulverized sugar until it is the consistency of a stiff dough. The novice will be likely to make it too thin. It is well nigh impossible to mix in too much sugar. The maker may think it quite hard and dry, but he will be surprised the next day to find it quite soft aud pliable.

As a *shipping* cage, I think the Benton stands at the head. It has three compartments all in a row and connected by openings. In one of the end compartments is placed the food; the other two are occupied by the bees, but the one next to the food is not ventilated, while the one in the end opposite from the food



THE PRATT-BENTON CAGE.

is freely ventilated. Very properly this cage has been called the "climatic cage," as it enables the bees to accomodate themselves to changes of weather. If it is cool they can occupy the central apartment; if warm, they can remain in the ventilated part of the cage. Some minor improvements have been made in this cage by Mr. Pratt, and as it is now made by Mr. Costellow I think it is what is claimed for it—"Perfection."

As to the number of bees to send in a cage with a queen, that depends upon the time of the year. In the spring and fall more are needed; but I doubt if more than thirty bees are ever needed; in warm weather one-third that number is sufficient.

With a large number of nuclei, it is impossible to remember the condition in which each was left at the last visit. A record of some kind must be kept, and I know of nothing better than the "Queen Registering Cards" sold by A. I. Root. They are made of paper similar to postal cards, and will stand the weather. A card is tacked upon the side of each nucleus. Upon each card are three dials. One contains the months, one the days of the month, and one the following words: "Eggs," "Brood," "Cells," "Hatched," "Laying" and "Missing." Common pins are used as pointers. About ⅜ of the point is bent at right angles and then driven into the center of the dial. When a cell is given, one point-

er is turned to the month, another to the day of the month and the third to the word "Cell." If the queen is found hatched at the next examination, the date is changed, and the pin turned to "Hatched." When found laying, and again when taken out and shipped, the pointers are turned correspondingly. A glance at the register always shows the condition of the nucleus at the last examination. These registering cards are simply indispensable.

Successful queen rearing does not call for any great out lay of physical strength, but consists rather of constant attention to a thousand and one little details; and the man who is not "cut out" for this kind of work will not succeed.

How to Produce Good Extracted Honey.

I believe it is generally admitted that more extracted than comb honey is secured because the bees have no combs to build. No honey is consumed expressly to produce wax, the comb builders are released for other labors, and, above all, when the honey flow is abundant, there is plenty of store room. It has been said that the production of comb honey requires greater skill than does the raising of extracted honey. Be this as it may, the securing of a *good* article of extracted honey calls for knowledge of no small degree.

What is it that gives to honey its value? It is not simply its sweetness, which is of low power; but it is its fine flavor and its rich aroma. These are the qualities that make honey what it is—a luxury—and, if we wish its use, as a sweet sauce, continued, we must learn to raise and care for it in such a manner that its ambrosial, palate tickling qualities will be preserved. Freshly gathered nectar is usually one of the most "silly" tasting and sickening of sweets. To be sure it has the flavor of the flowers from which it was gathered; but that smooth, rich, oily, *honey* taste, that lingers in the mouth, must be *furnished by the bees.* Honey extracted when "green," and evaporated in the open air, is not only lacking in the element that comes from the secretions of the bees, but its blossom-flavor is half lost by evaporation. To be sure, evaporation must take place if left in the hive, but evaporation in the open air, and evaporation in the aroma-laden atmosphere of the hive, produce different results.

One reason why comb honey is, in so many instances, found to be more delicious than the extracted, is because the former is more thoroughly ripened. Seldom do we find extracted honey equal to that dripping from and surrounding the section of comb honey that is being carved upon a plate. Many of those who produce extracted honey in large quantities, extracting before it is *thoroughly* ripened, admit that such honey is inferior, as a table sauce, to that ripened by the bees, but say they cannot afford to produce the best article possible. It costs more, but will sell for no more in the general market. The raising of extracted honey to be shipped away for some commission man to sell, is much like making butter to be sold at a country store. All brings the same price. There is little incentive to produce a superior article. White extracted honey brings so much, dark so much. The honey with the fine, delicate flavor, the

thoroughly bee-ripened, well preserved, superior article will not bring one cent more in the general market, than ordinary, *pretty good* honey. Perhaps, for manufacturing purposes, there is no advantage in having such a superior article, but for table sauce there is; and the only way in which the man who raises a really superior article can hope to receive pay for his trouble, is by selling direct to consumers, or by establishing a reputation for his honey among dealers and their customers. For a man who is so situated that he can make such a market for his extracted honey, I will now go over the ground and tell, as concisely as possible, how to raise, in the cheapest manner, extracted honey that will be the equal of that that drips from the delicate morsel of comb at the tea table.

Until the time of putting on the supers, the management is the same as that in the production of comb honey. In the supers I would use shallow combs, and practice tiering up, the same as in raising comb honey. Right here comes in an advantage not present in raising comb honey; in tiering up, we need not wait for the honey to be *sealed*. Most bee-keepers know that honey is seldom sealed until it is ripened, but all do not know that it may be ripe, and yet not sealed. In fact, the ripening process may be hastened, or made more complete, if the sealing can be prevented. In other words, the ripening process goes on more slowly after the cells are capped, and would not go on at all were it not that the cappings are more or less porous. By raising up these shallow sets of combs as fast as they are filled, and putting another set under them, those the farthest advanced are kept at the top, and the inclination to capping thereby discouraged. If the honey can become thoroughly ripened, with perhaps only one-third or one-half of the cells sealed, what a saving there is in uncapping! If I had plenty of combs, I would leave the honey in the hive until the yield from one source was over. It might be possible to have yields so abundant and prolonged as to render this plan undesired, but, usually, plenty of combs would allow of its adoption. Just notice with how little labor this can be managed; we have only to watch and give additional room when it is needed, and hive the very *few* swarms that issue. I would use a queen excluder; then, when ready to extract, there would be no brood in the way.

One of the most tedious performances attending the raising of extracted honey, is the getting of the bees off the combs. The smoking, and shaking, and brushing, accompanied by robber pests if the work is done after the harvest is over, a a scalding sun overhead, make up a combination that is very trying to the "nerves." There is now but little doubt that the bee escape will yet relieve the bee-keeper of all this unpleasantness. It will only be necessary to go around at dusk and slip a thin board, containing a bee escape, under each upper story. In the morning each upper story with a bee escape under it will be found free of bees, and can be taken off and wheeled into the extracting room.

When extracting with an ordinary extractor, quite a little time is spent in taking out the combs and turning them. The automatic, reversible machine saves this time. Some bee-keepers believe that there will yet be substantial improvements in extractors. Already experiments are being made with a view to making a machine in which the combs may be reversed without stopping the machine.

After the honey has been thoroughly ripened, and is extracted, and found to be in possession of all the fine qualities I have mentioned, what shall be done with it? How shall it be treated that it may retain its flavor? The key to success in this direction is *exclusion of the air*. Seal it up in glass jars or tin cans, or in clean barrels. My preference is the 60-lb., square, tin can, with screw cap, and, when shipped, a jacket of wood. Some

dealers say that barrels or half barrels are as good as anything in which to ship honey.

Upon the approach of cool weather, honey will candy; and if sealed up tight and put away in a cool place, will remain in this condition for years; and when *slowly* and *carefully* brought back to its liquid state, will be found to have retained its original "flavor aroma and boquet."

This is not the proper place in which to discuss the marketing of honey, but I wish to say that I believe that nearly every one prefers extracted honey in its liquid state, and that it should be put upon the market and sent to consumers in this condition. It should be liquefied just before shipment to consumers. For this reason it is an advantage if the vessel in which it is stored, and in which it is to be shipped, is also one in which it can be melted.

Perhaps I ought not to leave this subject without placing more emphasis upon the liability of injuring candied honey when reliquefying it, and to do this I cannot do better than to quote from an article recently contributed by E. E. Hasty to the American Bee-Keeper. He says: "Nearly every one seems to think that so long as honey does not boil, of course it cannot burn. That is an awful mistake.

Let us consider the state of things when a large can is set on a stove. What is the temperature of the iron under the can? Perhaps 250° or 300° The under side of the tin speedily rises to nearly the same, and the upper side to over 212°. In contact with this high temperature the honey remains as long as it can without boiling. It then springs off, and gives place to another film of the same, which in turn is heated to about 210° and sent off. If the whole contents of the can were fluid and warm, regular currents might set in which would modify things and prevent over-heating. But the bulk of the honey is solid and cold and cannot flow back and forth. It is plain that a considerable part of the honey in a can (if not all of it) may be subjected piecemeal to the temperature of 210°; while the mass is not at any time over blood warm. It is very unsafe to heat honey to 210°. There seems to be a great difference in the amount of heat different samples of honey will stand. Some honey can be boiled vigorously with but a moderate degree of damage to its quality, while other samples are ruined without coming to a boil. I am inclined to think that every can of honey ought to go out to its destiny with a plainly printed warning stuck upon it, and a very emphatically worded one, too, ending up with, 'Sample this honey before you heat it, or I will not be responsible for its quality. BILLY FAIRPLAY.'"

"Feeding Back."

BY "feeding back" is meant the feeding back of extracted honey to secure the completion of unfinished sections, or to have combs built new from the beginning. When engaged in the production of comb honey I fed back for this purpose at least 13,000 pounds of extracted honey; but my success was so varied that I never felt like encouraging the practice. One year, with certain colonies, I would meet with such splendid success as to be greatly encouraged, while the results of the next year, or the performances of certain colonies, would, perhaps, lead me to decide that I was done with feeding back. But,

when the next season rolled around, and the close of the linden honey harvest found me with perhaps 2,000 unfinished sections on hand, and I sat down and figured up how much they would be worth when completed, I felt, as Dr. Miller once expressed it at a Chicago convention, that it might pay to feed to secure the completion of unfinished sections, even though the feeding of four or five pounds of honey increased the weight of the sections only one pound.

Did I not consider the use of drawn combs of considerable value in getting the bees started in the supers in the spring, I should unhesitatingly pronounce in favor of feeding back to secure the completion of unfinished sections. That is, that would be my decision so far as the management of my own apiary is concerned; but it does not follow that this would be the proper one at which all bee-keepers should arrive; although it would seem that there is one class that would be glad to so decide, and that is the one that finds the use of drawn combs in sections so very objectionable.

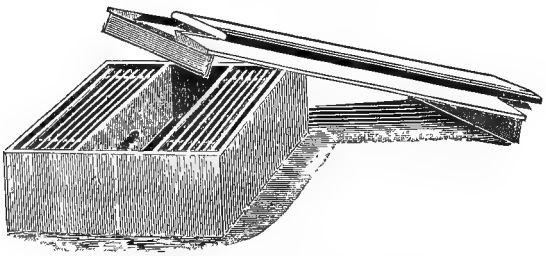
So much by way of introduction; and now, for the benefit of those who, for any reason, may wish to practice feeding back, I will tell what I have learned in the feeding back of those 13,000 pounds of honey. Perhaps the best way will be to tell exactly how I would conduct the operation; but first allow me to say that the feeding of honey, for the purpose of having it stored in the sections; is a distinct branch of bee-keeping—as much so as the raising of queens for market—and there are many things that can be learned only by experience.

In this locality the basswood harvest closes about July 20, and for the next month, or six weeks, until the flow from buckwheat begins, no honey is gathered, and, usually, the weather is hot—just the conditions needed for successful feeding back. As soon as I see that the basswood harvest is drawing to a close, I remove all the sections from the hives, look them over, take out the finished ones, and sort the remainder into three grades, viz., almost finished, half done, and just commenced. The cases containing the first two grades are then placed upon the hives, one case upon a hive, and allowed to remain until the bees have taken possession of them. Then comes the task of selecting the colonies to do the work; and, by the way, this is the most important point, as success is largely dependent upon a proper selection. First, the colonies must be strong; next, they must possess young queens, preferably those of the current year, although this is not imperative; and last, but not least, simon pure blacks are given the first choice. Hybrids are the next best, while, as a rule, Italians do very poor work in this line. Keeping in view these points, I select one-half as many colonies as I have cases of unfinished sections upon the hives, and to these colonies I transfer the cases —sections, bees and all—putting two cases upon each hive. I have never experienced the least trouble, in any respect, from thus mixing up the bees, while populous colonies are secured thereby.

If the brood nests are not already contracted, I contract them. The greater the contraction, the more satisfactory will be the results, so far as work in the sections is concerned, but, if carried too far, it will materially weaken the colonies by curtailing the production of brood. I have sometimes contracted the brood nest to only three Langstroth combs, and these three combs, when I was through feeding, were three solid sheets of brood; but, all things considered, I prefer to contract the brood nest to about the capacity of five Langstroth combs. There is also another point that must not be neglected, and that is the brood combs must not be old and black, otherwise the combs in the sections will become travel-stained unless removed very promptly upon their completion. The newer the combs in the brood nest the better.

When honey is brought in from the fields it is carried up into the sections; that is, the supply, as regards the sections, comes from below; when a feeder is placed above the sections, then the sup-

ply comes from above. In both instances, the sections in which the work is the least advanced should be placed nearest the source of supply. Thus it will be seen that, in feeding back, the sections that are nearly finished are placed next to the brood nest, and above these the grade that is about one-half completed.



NEW STYLE, HEDDON FEEDER.

The feeder used is the Heddon, which is exactly the size of the top of the hive, and placed above the sections. His new feeder is unexcelled for this purpose, as the bees take down the feed from both sides. This might not seem important, but it is, and for this reason, when the feed is carried down upon one side only, the sections upon this side are completed *first*. When the feed is carried down from both sides, the sections are finished up very evenly all over the case. In this feeder the reservoir is in the center, and just over it a part of the cover slides back in grooves. There is no contact with the bees, no smoke is needed, no propolis is disturbed, and the cover fits so snugly that no odor of honey escapes to attract robbers.

The bees seem to be able to handle the honey to better advantage when it is thinned somewhat; say, one quart of water to ten pounds of honey. I heat ten quarts of water over an oil stove until it boils, then mix with 100 pounds of honey, stir it up well, and it is ready for use. The first feeding should be done at dark, as it puts the bees in an excited state, and trouble from attempts at robbing might result. After the bees have become accustomed to finding honey in the feeder, feeding produces little or no excitement; still, at dark is the best time to feed, as the annoyance of having robber bees follow from hive to hive and dive into the feeder reservoir when it is opened, is thus avoided. The feed is given as fast as the bees will take it.

Close watch is kept of the sections in the lower cases, and whenever a case is found in which all or nearly all of the sections are completed, off it comes; the case above it is placed next the hive, and above this case is placed a case of sections brought from the honey house, one containing sections of the third grade, that is, those in which the bees have made the least progress. I continue to bring in the cases of finished sections as they are completed, replacing them with the unfinished ones from the honey house. When the stock of the latter is exhausted, I am ready to begin to reduce the number of colonies upon which I am feeding back, and this is done as fast as the sections are completed.

During all this time, since the feeding was commenced, I have been watching each colony, and jotting down, upon the cover of the feeder, its characteristics; and in reducing the number of colonies, those are rejected that have done the least satisfactory work. I continue to keep two cases upon each hive, and, as the colonies work with greatly varying rapidity, there is no difficulty, by changing about the cases, to keep next to the brood nest those sections that are the nearest completion. In gathering the sections together upon fewer hives, I always take bees and all, thus I am con-

tinually strengthening the colonies upon which I am feeding back.

It is folly to expect the bees to finish up all of the sections upon a hive. Even though the feeding be continued, the sections will not all be completed in a satisfactory manner. So long as the feeding is continued the bees seem to reason something like this: "We must make the cells as deep as possible, and delay the capping to the last moment, in order to make room for all of the honey that we can; and, if there are not cells enough, we must build more, even if it be in the little cramped up places between the tiers of sections." After the combs are drawn out to full length, filled with honey, and nearly sealed, I have secured better results by giving the bees no feed for three or four days; then giving them a light feed, and omitting the feeding for several days. The bees then behave as though they considered the harvest was over and ended. They seal up most of the cells, and from those that they do not seal they remove the honey. But there is a much better way of managing the business. When the sections are all nearly finished, I put them upon as few hives as possible, placing two cases upon a hive, and then upon each hive, above the two cases of nearly completed sections, I place a case of sections filled with foundation. The bees proceed at once to draw out the foundation and fill it with honey, and this additional storing room appears to bring about a feeling that there is no further necessity for holding open the cells below, and they are sealed forthwith.

When the two lower cases are completed, the upper case (that was furnished with foundation) will, perhaps, be found to contain sections one-half completed, and these upper cases may be gathered together, bees and all, and placed, two upon each hive, over those colonies that have shown the greatest apitude for this kind of work, and the feeding continued until the sections are almost completed, when it will again be necessary to place a case of sections containing foundation upon each hive. I have continued this until, at last, all of the sections were on one hive, and had all the sections completed except those in the case last added at the top.

After bees have been fed awhile, they secrete large quantities of wax. The little flakes of it can be seen between the scales of the abdomen, and, unless allowed to build comb, the bees will plaster with wax the woodwork of the sections, the inside of the feeders, cases, etc. The moral is, allow them to build comb. Have a row or two of sections in the upper case filled with starters only; thus there is secured, in the shape of comb, what would otherwise be wasted.

Although we cannot control the temperature, it may be well to know that the hotter the weather the more rapid and satisfactory will be the work of the bees when we are feeding back.

If there is any time when separators are needed, it is in feeding back. If the combs, both finished and unfinished, could be left undisturbed upon the hives, and the bees fed until all the combs were finished, feeding back would be no reason why separators should be employed, but when the unfinished combs are put back in the cases, a great deal of judgment and patience are needed, unless separators are to be used. Bees usually have about a ⅜ space between finished combs, and in putting back the unfinished combs, this fact should be kept in mind. When the space is less than this, no harm is done unless it is so small that a bee can't pass through, when the bees will connect the two surfaces by little bridges of wax, and when the sections are taken apart, these little connecting bridges will pull pieces out from one comb or the other. When the space is much greater than ⅜, and the comb upon each side is sealed, the bees, especially if crowded, will construct comb upon the sealed surface of the other comb, which gives it a very botched appearance. If the comb at one side of the space is sealed, and the other

not, the sealed comb will be left undisturbed and the unsealed cells on the opposite side lengthened out until the space between the two combs is reduced to about ⅜. If, in this instance, the sealed comb is smooth and even, and in the right place as regards the section as a whole, all will be well; but, if it be concave or convex, the unfinished comb facing it will be drawn out in conformity with the surface of the finished comb. If two unfinished surfaces, in the same stage of completion, are brought facing each other near the center of the super, they will be drawn out and sealed straight and true and alike; if they are near the outside, the chances are that the comb nearest the center of the super will grow faster than the one farther out, and a bulge will be the result. Combs near the center of the super are drawn out quicker and finished sooner than those at the outside and corners; hence I place at the outside those sections that are the nearest completion; especially do I take pains to have sealed surfaces come next to the sides of the super, while combs the farthest from completion are placed in the center. By this management all of the sections are finished at about the same time. Unless some of the combs are beginning to show signs of travel-stain, it is better to leave on the super until all, or nearly all, are completed, for, as the combs near completion, this matter of adjustment becomes more difficult.

When foundation is used, and comb honey produced, "right from the stump," by feeding extracted honey, we have none of this bulging, patching difficulty to contend with, as the combs all grow alike; and some of the finest, straightest, plumpest and most handsome comb honey can thus be produced that the eye ever beheld; but I have never found it profitable, except by placing a few cases on top, near the close of finishing up a lot of unfinished sections, to give the bees room, and thus induce them to seal up nearly finished combs, as has been already explained.

I know of only two objections to the feeding back of honey. One is that "fed honey" has a slightly different taste from that stored directly in the combs from the flowers. There seems to be a sort of "off" taste, or a lack of flavor. This lack of fine flavor is not very pronounced, but it can be noticed by one who is experienced in the matter. The other objection is that "fed honey" will candy much sooner than other honey. When the sections are nearly completed, and feeding is done simply to have them completed and sealed over, the proportion of "fed honey" is so small that the candying is not a very serious objection. There is a great difference in honey as regards its tendency to candying, and it has been suggested that thinning the honey with water increases its candying propensity. I have fed but very little thick honey. The bees worked it so slowly that I became discouraged and went back to thinning it. I know that they seal it over sooner when it is fed full thickness, and it may be *possible* that this is the better way of feeding it. The best advice that I can give upon this matter of "fed honey" candying, is that it be sold early and in a market where it will surely reach the consumer before it candies.

Taking one year with another, I have secured about two pounds of comb honey from the feeding of three pounds of extracted. With the right kind of weather and colonies, I *have* done much better—secured four pounds for five.

The advantages of feeding back can be stated in a very few words. Comb honey is more salable, at a higher price, than extracted, and if the latter can be changed into the former, at no great expense, there are quicker sales and greater profits. The greatest advantage, however, is in securing the completion of nearly finished sections.

From the Hive to the Honey Market.

BEFORE taking up the main topic indicated by the heading, I wish to say a few words about "tiering up."

When the first case of sections is partly finished, it is raised and another case placed between that and the hive. At what stage of completion the sections should be when a second case is added, depends upon how crowded the bees are, and the rate at which the honey is coming in. I usually add a case when the sections in the one next the hive are from one-half to two-thirds completed. I have not found it profitable to tier up sections more than three cases high. As a rule, the upper case of sections is ready for removal before it is necessary to add a fourth; if it is not, and honey is coming in rapidly, I would transfer the upper case, bees and all, to some colony having less than three cases, rather than tier up four cases high. With any system in which the sections are finished in close proximity to the brood nest, their removal is necessary soon after completion to prevent soiling by the bees passing over them directly from the brood nest; but with the tiering up system the finished combs are so far from the brood nest that they remain unsullied until a whole case of finished sections can be removed at once. During a regular "honey shower," such as we have *sometimes* here in Michigan, I have seen a colony draw out the foundation in twenty-eight sections and fill them full of honey (and here is where I believe foundation is *very* valuable) in less than three days, *and scarcely a cell would be sealed.* To give the bees another case of sections next the hive is the work of a moment. What other system will enable us to handle one of these "honey showers" with so little labor? At such times it may be advisable to remove the upper case, after the cases have been tiered up three high, even if there are one or two unfinished sections in each corner; and when crating, have an empty case at hand in which to put the unfinished sections, and when it is full place it on a hive.

To remove a case of sections, I have the smoker in good trim, take off the cover and drive a perfect deluge of smoke down among the bees. This starts them out of the case at a lively rate, and before they have time to get back I have the case off the hive. The case is then tremulously shaken in front of the hive until most of the bees are dislodged, when it is taken to the honey house and set on end. In a short time the few straggling bees leave the case and escape by way .of the windows. If the shaking process is found too laborious, and robbers are not troublesome (and they will not be until the close of the season) the case may be leaned against the side of the hive, near the entrance, when the bees will desert the case for the hive. When robbers are troublesome, the stragglers may be driven out with smoke and brushed off in front of the hive.

And right here I wish to say another word in favor of the much abused blacks. We all know of their propensity to run off the combs when smoked or handled, also with what ease they are shaken from the combs; well, these characteristics are of great value as soon as we begin to manipulate hives instead of *frames*. A case of sections, or one section of the Heddon hive, can be cleared of black bees with one-half the time and labor required with Italians. One or two puffs of smoke, and down go the blacks, leaving a case of sections almost free from bees. But, as advanced bee-culture, with its reversible hives, comb foundation and "bait" sections of partly drawn combs, has well nigh overcome the objection to Italian bees on the score of their disinclination to store honey away from the brood nest, so it promises, with the bee escape, to remove any objections there may be to them on account of their clinging so persistently to the combs.

Mr. John S. Reese was the orginal inventor of the bee escape. It works upon the principle of the old fashioned cone fly trap. To use the Reese escape, the case, from which it is desired to have the bees removed, is taken off and set to one side. An empty case is placed on the hive. Over the empty case is placed a thin board, and in a hole in this board is fitted a cone of wire cloth. The base of the cone is uppermost and level with the upper surface of the board. The apex of the cone is down and nearly in contact with the hive or case below. The base of the cone is perhaps three inches across and there is a ⅜ hole at the apex. The bees seem to find that they are cut off from the hive—made prisoners—and are anxious to return. They easily find the cone and pass down through the hole in its apex, but the opening is not very readily found if they desire to return. The result is that, in a few hours, the case is practically free from bees. Mr. C. H. Dibbern flattened out the cone and laid it upon its side, thus making a horizontal escape that can be put into a ⅜ space instead of needing an empty case to give it room. The principle remains the same as in the Reese; that is, there is a big, wide, easily accessible entrance, and a small exit which is not easily found from the side opposite to the supers. Escapes have been made having little swinging doors of tin or brass that can be swung *out*, but not *in*. The trouble with these is that the bees soon cover them with propolis so that they will not swing. Mr. E. C. Porter has invented a spring escape. There is a light spring, under which the bees can pass out, their backs raising the spring slightly. If a bee attempts to return, the *end* of the spring is encountered, which is too low to allow a bee to pass.

Having raised our honey, and gotten it off the hives, the next step is its preparation for the market. What this preparation shall be, depends upon the market—whether it is a home or distant market, a wholesale or a retail one. When honey is to be retailed at home, it might be said that it required almost *no* preparation. When one or two sections of honey are sold to a neighbor, we have simply to wrap them up a piece of paper, or, perhaps, put them into paper cartons. In retailing extracted honey at home, when customers bring in pails, pitchers and pans to be filled, we have only to keep the honey in a large tin can, with a honey gate near the bottom, and have some scales to weigh the honey.

If honey is not thoroughly ripened, heavy and thick, it should stand a few days in large vessels, that the thin honey may rise to the top, when the thick honey may be drawn off at the bottom into the package in which it is to be shipped. Where honey is raised in very large quantities, and shipped in bulk to jobbers, or to be used, perhaps, for manufacturing purposes, I doubt if there is a more desirable package than a barrel. When pains have been taken to raise an extra fine article, for table use, and it is to be shipped direct to consumers, or to retail dealers, I believe that the 60-lb., jacketed

tin is *the* package. It never leaks nor taints the honey; it protects the honey perfectly from the air; is easily opened, and, if the honey is candied, it can be easily liquefied in the can.

Almost everybody prefers their honey in a liquid state. They prefer to buy it in that condition, and thus be saved the trouble of melting it. Honey is more attractive in appearance when in its liquid state. When candied it has no more beauty than so much lard. In order that the beauty of extracted honey may be seen, it must be put up in glass, then its beautiful amber tints sparkle in the light, and the result is that the prospective purchaser ends by saying, "Well, I guess I'll take it." To compete with comb honey as a fancy article of grocery merchandise, extracted honey must be in a liquid state, and put up in glass with tin foil caps and small tasty labels. Of course all this costs money, but any expense incurred in beautifying a commodity is most cheerfully repaid by the consumer. Some purchasers may not be willing to admit even to themselves, of their susceptibility to the attractions of beauty, but what do we care? Upon all packages of extracted honey there should be explanatory labels, stating that, in cool weather, most honey will granulate or candy, but may be liquefied by placing the vessel in warm water. There should also be a caution in regard to the great liability of scorching honey when melting it.

If candied honey is to be put upon a retail market, tin pails are the proper receptacle to use. They should vary in capacity from one to ten pounds.

As there will be no danger of breakage, tin pails can be shipped in a box, but bottles of honey should be shipped packed in sawdust. I have shipped thousands of bottles so packed, and never had one broken.

By the way, some recent experiments indicate that extracted honey may yet be retailed in *paper sacks*. The sacks are heavy Manila paper, paraffined, and the honey put in while in the liquid state, and then allowed to granulate. The sacks can be set into small boxes, *a la* egg crate fashion, the boxes holding them square until the honey candies, when the sacks of honey can be packed for shipment like so many bricks. The purchaser can peel off the paper and melt up the honey if he prefers it in that state.. The cost is only about *one tenth* that of tin.

If I have plenty of surplus cases (supers) when taking off comb honey, I leave the honey in them, simply stacking the cases up criss-cross in the honey house, where they remain until I have leisure to scrape the propolis from the sections. The single-tier, 12-lb., shipping case, with glass in the ends, seems to have driven nearly every other case

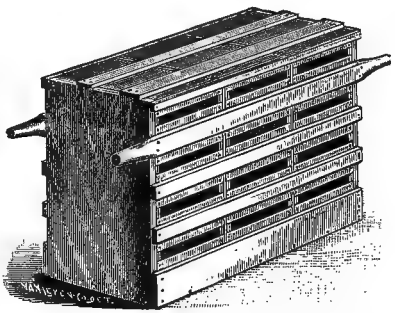
12-LB. SHIPPING CASE.

from the market. It is light and easily handled, and if a comb leaks the honey does not drip upon a lower tier of sections, as there *is* no lower tier. Much has been said about these cases being so small that freight handlers do not "dump" them and thus break the honey. Freight men do not handle them singly, but usually take about four at once, and load them on a truck if the distance is great. I doubt if it is "dumping" by freight handlers that does most of the damage. It comes about by the railroad men putting the cases in the car the *wrong way*, or, perhaps, piling them up too high, which allows the bumping together of the cars to break out combs, or tumble down the pile of cases. When the shipment is so large that a whole car, or half a car, is needed, and the cases can be snugly stacked up with the combs parallel with the track, straw underneath and at the sides, and boards across the end of the pile, nailed fast to the sides of the car, honey can cross the continent un-

injured. It is the small lot that must be "transferred," *en route*, that means topsy turvy treatment.

When our well-filled sections of white honey have been put into their cases of clean, white basswood, and are stacked up in the honey house awaiting shipment, what a beautiful sight! So dainty, so neat, so white. I have sometimes stopped work long enough to step back and gaze in silent admiration. These selfsame, beautiful cases have again met my gaze after they had made the journey to Detroit, to Cleveland, or to Chicago. But my gaze was no longer one of admiration. It was one of wonder, of chagrin, of sorrow, of *indignation*. Had it not been for the stencil marks that I had put on with so much care, I should have felt inclined to disown the cases. *Dirty?* Well, yes. Coal dust and *nastiness* from the floors of cars and warehouses had besmirched the beautiful, white wood until —well, do you wonder that I have sometimes wrapped paper around the cases before shipping them?

I am happy to say, however, that there is a remedy for all these troubles; it is simply putting several of the cases into one crate, not a box, as that would hide the honey, but a *crate*, with slats on the sides so arranged that the openings on the sides will come exactly over the glass in the ends of the cases. The bottom, ends and top of the case are made of boards. A crate may be made to hold nine, twelve or sixteen cases. A little straw may be put in the bottom. The ends of a slat on each side, near the top of the case, are allowed to project and thus form handles. The position of the handles shows which side up the crate should be kept. In fact, these handles are so *inviting* that there is no disposition to put the crate in a wrong position. The handles are so short that the crate cannot be "dumped" without dumping it on the toes of the carriers. Cases of honey crated in this manner never tumble over, and they reach their destination free from even the *finger marks* of a dirty hand. Last year I had four crates



CRATE OF CASES READY FOR SHIPMENT.

filled with cases of honey shipped to the Detroit Exposition, from there to the Lansing Fair, from there home, and then to Columbus, Ohio, and not a comb was broken, while the cases were as clean as when they left home. I greatly favor the plan of placing a large label upon the top of the crate having a large ☞ pointing lengthwise of the crate, and accompanied by the following in bold type: "Load with the hand pointing toward the end of the car or the side of the wagon."

Marketing of Honey.

TO RAISE a good crop of honey cheaply, and to sell it to the best advantage, are two quite distinct processes, requiring greatly varying qualifications. Seldom do we find all these qualifications in the highest degree combined in one person. I believe the majority of bee-keepers are better bee-keepers than they are business men; or, perhaps, salesmen is more nearly the proper word to use. Many of them can't get far enough away from a bee hive to sell the honey that has been stored in it—or think they can't. Every energy is bent to the securing of a great crop; having secured it, many a bee-keeper is actually puzzled as to how to put it upon the market in the best shape, or how, or where, to sell. Mr. McKnight, of Canada, says, "The product of no other industry is put upon the market in such a cumbrous, uncouth and slovenly form." This may seem a little over-drawn, but it is worth thinking of. The improvements in the last few years, however, have been very great, and I think the remark of Mr. McKnight could not be applied to the honey put up at present by many of our bee-keepers.

Let's suppose that the honey is all ready for the market—put up in the most approved style, considering the market to which it is to go—how shall it be sold and who shall sell it? Some men are born salesmen. To these there is no question as to *who* shall sell their honey; that is, if they are so situated that they can visit, personally, the market in which they wish to sell. If a man is a poor salesman, the best thing he can do, unless he can *learn* to sell honey, is to employ some expert to sell his honey for him. This means that some commission man will handle it, or else that it will be sold so cheaply that the buyer can afford to spend his time in finding customers.

Dr. A. B. Mason, of Ohio, once told, at a Mich. State Bee-Keepers' Convention, how two men and a woman sold thousands of pounds of honey in large cities. One man, provided with a map of the city, systematically canvassed, with samples of honey, taking orders and marking upon the map the location of each sale. The other man, guided by the marked map, delivered the honey. When not delivering honey, he assisted the women in liquefying and putting up honey for delivery. Here was a work entirely distinct from honey production. Here was *specialty*. Not only the specialty of selling honey, but each had a special part to perform, learning it to perfection.

Much, both wise and unwise, has been said about developing home markets. Much depends upon the kind of home market there is to develop, and the kind of honey there is to be sold; yes, and upon the man. When the market is supplied with "farmer honey"—that raised with a lick and a brush—that is selling at retail for two-thirds what a first class article will net when sold by a commission man in a distant city, how much en-

couragement is there to "develop the home market?" Very little of my own comb honey has been sold in the home market. Many a time have I taken a case of nice comb honey to some grocer and "showed it up," with the hopes of making a sale: "Yes, that's very nice," would be the comment, "How much do you ask for it?" "Seventeen cents." "Whew! Why we are retailing honey at a shilling. We buy it for ten cents and pay in trade at that." I ask to see the honey. Then some rough pine sections, daubed with propolis and stuck fast in the receptacle in which they were filled, are brought forward. I call attention to the neater and more tasty manner in which my honey is put up. "Oh, yes, your honey is put up very nicely, but it isn't any *sweeter* than this." And the man was correct, too; the honey *itself* was probably as good as mine, but it lacked the dainty surroundings. If I ventured to say that such honey as mine was selling in Chicago for eighteen cents, he would look as though he doubted my word. If honey were selling at such figures in Chicago, it would seem unreasonable that any one would be fooling around home with it.

The most of my honey that has been sold in the home market has been of a low grade—either dark, or the combs unfinished. These lower grades of honey bring almost as much in many home markets as the choicest honey put up in "gilt edge" style; while the commission market of a large city is a poor one for "off" grades of honey. To many grocers in country towns, honey is honey, much the same as butter is butter. To me, it seems that there is a class of consumers in large cities that concerns itself very little about the price of an article, provided the fancy is struck.

The point is just here: the best honey producing fields are far distant from the best markets; the best place to produce honey is not the best in which to sell it. Such being the case, I have never seen any great encouragement in trying to develop a home market, particularly for the finer grades of comb honey. When a man can send off his honey all in one shipment, and done with it, and get an advanced price, with the money all in a "lump," again I ask what encouragement is there for him to develop his home market?

I am not writing in this way for the purpose of discouraging the marketing of honey near home. I am simply stating facts as I have found them, and as I believe many of my readers have found them. It must be admitted, however, that no set rules can be given upon the choice of a market. All must be greatly governed by circumstunces. No doubt there are many excellent home markets, and many more that might be "developed" until they were good, if a man with plenty of time and patience should take hold of the matter in the right way. If a man is determined to build up a home market, he will often be compelled to leave his honey with grocers to be paid for when sold. Comb honey must be graded, and crated in crates with a glass to show the honey, and dealers must be visited regularly and kept supplied with honey. In short, the customers must be followed up and looked after faithfully, the same as commercial travellers look after their customers. Grocers must be educated until they know that honey must be kept in sight to be sold. If a handsome display can be made in a front window it will be a drawing card. There should also be some convenient arrangement for giving each interested visitor a "taste" of honey, accompanying it by a "honey almanac," or some other attractive, printed matter setting forth the desirability of honey as a food.

After all, an out and out sale of the entire crop, for cash, at the end of the season, is the most satisfactory method of marketing; but, only *once*, in my fourteen years of bee keeping, have I been thus fortunate. Although honey is a luxury, it is not perishable like small fruits, yet there are few wholesale dealers who buy it out and out. The great bulk of honey passes through the hands of commission merchants. Are there any

objections to this? Yes. One objection is the opportunity for dissatisfaction. Some bee-keepers think their honey first-class, when it isn't. They see the quotations of some commission man, and send their honey to him, expecting to get the highest price. If they don't get it, they are disappointed and say unpleasant things. The bee-keeper never *knows* how much his honey is going to bring him. The price may decline in the market to which he has sent his honey. When he *sent* it, the market may have been the best. *Now* some other market may be the best, but it may not pay him to have the honey re-shipped; besides, by the time the honey is being sold in the new market, the price may have declined *there*. In other words, by the commission way of doing business, the bee-keeper cannot select his market at the *time of sale*. He can limit his commission man, that is, tell him not to sell unless he gets a certain price. But this is not always wise; for, as a rule, the commission man knows, better than the far away owner, at what price honey can be sold. When there is an out and out sale, at a certain price, there can be no doubt as to whether honest returns are made. When sold on commission, there is only the seller's *word* that the honey sold for so much. Of course it is possible to prove the truth or falsity of returns, but the trouble would be too great, unless in extreme cases. I don't wish to insinuate that commission men are more dishonest than the rest of humanity, but the *opportunities* for fraud are greater than in some lines of business. I believe that some commission men, perhaps the majority of them, are honest; the difficulties arise from the circumstances that furnish conditions for the growth of a *doubt*. It is for such reasons as these that it would be desirable if the commission business could be avoided; but, whether desirable or not, the honey trade has fallen into the hands of commission men, and the prospects are that it will remain there for some time to come, and perhaps the best that most of us can do is to send our honey to those in whom we have the most confidence that they will get good prices and make honest returns.

Quite a little was said at one time about co-operation in some form, as an aid to marketing I have little faith in this sort of thing when applied to honey producers. They are too numerous and too scattered. The peach growers of New Jersey improved their market by forming an "Exchange." The fruit is all sent to a central point, to which buyers resort, where it is sold at auction. If peach growing extended all over the United States, this could not be done.

I have already mentioned the peddling of honey in large cities. Bee-keepers who have facilities, and a taste for such work, may do something in this direction, during the fall and winter, by going from village to village, having a regular route and going over it at regular intervals.

As to the time of selling, it is usually well to have the honey on the market as soon as berries are out of the way, and the cool of fall begins to be felt. Some markets are good even earlier. Don't hold honey until winter is half over, waiting for better prices. The prospects of loss overbalance those for gain.

Migratory Bee-Keeping.

MY FATHER lives in an adjoining county where there is an abundance of boneset and goldenrod. One year, a younger brother, who had not left home, came to my place early in August and carried home with him twenty colonies of my bees. An empty story filled with empty combs was placed over each colony, and the top covered with wire cloth. A hay rack was covered with hay to the depth of two feet, the hives set upon the hay, and held together in a "bunch" by passing a rope around them. The journey of twenty-five miles was made without mishap. Those twenty colonies furnished 400 pounds of surplus; besides, they needed no feeding for winter, while the bees kept at home stored no surplus, and each colony required feeding, on an average, about 15 pounds. I gave one-half of the surplus to my brother as his share of the "spoils." Had buckwheat yielded well, which, in this locality, happens about once in half a dozen years, nothing would have been gained by moving the bees. The inability to foretell the honey flow in any given locality is the greatest obstacle in the way of successful migratory bee-keeping. In the Review for August, 1889, Mr. R. L. Taylor said: "I might have made $1,000 by moving 100 colonies there (to a certain locality) last year, but I might expend $200 each year for the next five years, in moving back and forth, and find at the end of that time that I could have obtained more honey if I had not moved them at all. This, I admit, is not likely, as the advantages of that locality for a full crop are so much greater than this, but it is *possible*."

Only forty miles from here, on a direct line of railroad, is a locality where the main honey flow comes in the fall, yet *nothing* is secured here at that time. All bee-keepers know that the distance of only a few miles often makes all the difference between no crop and a bountiful harvest, and the question is, can't bee-keepers take advantage of this fact? If they can, why don't they do so more than they do? Either the moving of bees to take advantage of transient, neighboring flows is unprofitable, on the whole, or else this part of bee-keeping has been neglected. Bee-yards, honey houses, etc., are all gotten up with permanency of location in view. The bee-keeper gathers about him these conveniences and appliances, arranges his apiary, and, if the honey *comes to him*, all right; if it doesn't, he does not think of *going to the honey*.

The expense of moving to and from a locality a few miles distant need not be so very great. From thirty to forty colonies can be moved on a large hay rack; or a special rack might be constructed by means of which one team could haul fifty colonies. Small, light, readily movable hives are a great advantage. One of the great advantages of fixed frames, about which there has been so much said of

late, is that they need no fastening when an apiary is moved. An apiarist who is going to practice moving his bees to secure better pastures, must have hives, fixtures and other arrangements suitable for that purpose. It ought not to take more than two or three minutes to prepare a hive of bees for moving.

Some localities are blessed with white clover, basswood and fall flowers; and, by the way, the man who is to make a specialty of bee-keeping, ought to seek such a locality; but many who are already engaged in bee-keeping are permanently located, have friends and relations living near, and prefer not to move away even if the profits would be increased thereby. Then, again, it is difficult to find a first-class locality for clover or basswood that is equally good for fall flowers. And the better the locality the greater the danger of its being overstocked by its very attractiveness bringing together so many bee-keepers.

Years ago, movable frames, or combs, were invented. In the last few years many of us have been learning to accomplish many things by handling *hives* instead of combs, and the expression, "*readily movable hive*," has been coined. Now we are beginning to talk about readily movable *apiaries!*—those that, with a day's warning, can be picked up and set down twenty miles away where a "honey shower" is passing.

I scarcely feel like advising a bee-keeper to move his apiary to some other locality with the *hopes* of securing a *greater* yield than it is possible to secure at home, when the yield at home may be a fair one, but when a bee-keeper has only white clover, or basswood, or fall flowers, from which to secure surplus, yet lives only a few miles from one, or both, of the other sources, it does seem to me as though he ought to consider the advisability of moving his bees to these other fields when the harvest is ready for the laborers. To me this seems like a more promising field for experiment than that of planting for honey. Instead of spending time and money for seeds, land and cultivation, let us move our bees to where Nature has already scattered the flowers with a lavish hand.

There is another form of migratory bee-keeping that has long been the dream of apiarists, that of starting with an apiary in the South at the opening of the honey season, and moving northward with the season, keeping pace with the advancing bloom, thus keeping the bees "in clover" during the whole summer. The difficulties to be overcome are those of transportation. There is no single line of railroad running north and south for a sufficiently long distance to make a success of migratory bee-keeping. When shipping bees by freight, on the migratory plan, the delays at junction points are sometimes not only vexatious but disastrous. It is for this reason that longing eyes have been cast at the Mississippi river and her steamboats and, once, C. O. Perrine tried moving several hundred colonies up the Mississippi on a barge towed by a tug. The plan was to run up the river nights, and "tie up" during the day to allow the bees to work. There were several reasons why the plan was a failure. The start was made too late in the season, and accidents to the machinery of the tug caused delays. In order to overtake the bloom it became necessary to confine the bees and run day and night. The confinement for so long was very disastrous to the bees. Those who aided in the enterprise believe that, rightly managed, moving bees up the Mississippi to keep pace with the bloom, might be made a success. Mr. Byron Walker, who has had much experience in bringing bees from the South, greatly favors the Mississippi plan of practicing migratory bee-keeping. He would not put the bees on a barge and tow the barge with a tug, but would load the bees upon a regular steamer running up the river, setting them off at some desirable point, and then shipping them by boat to another point farther up the river as the flow began to wane. In the fall he would take bees back to the South for the winter.

Of course, bees moved in hot weather must have abundant ventilation; but this alone will not save the *brood*. To save the brood the bees must have plenty of water. As obstacle after obstacle has been removed in home bee-keeping, so the migratory plan may yet be robbed of its drawback.

Right here a hypothetical question comes to mind. Supposing that an apiary moving up the Mississippi secures six crops of honey—six times as much as a stationary apiary—would this be more profitable than six stationary apiaries? In other words, which is the more promising field for enterprise, following up the season, or establishing out-apiaries? Upon this point there are many things to be considered, and varying circumstances would lead to different decisions. To establish six apiaries would require considerable capital, and the labor of caring for the honey crop would all come at one time, while there would be only one "chance" of securing a crop. With the migratory plan, only one apiary would be needed, and the work of caring for the surplus would not come all at the same time. With the stationary apiaries there would be no expense for transportation, which is a big item.

Out-Apiaries.

WHEN a man starts an apiary, it is because he thinks his home-yard overstocked; that he will get enough more honey by the division to pay for the extra labor incurred. Overstocking is one of the most puzzling questions connected with bee culture. We all know that a locality *can* be overstocked; but localities, seasons and bee-pasture are so variable that it is impossible to lay down any set rules in regard to the number of colonies needed to overstock a locality. It must not be forgotten that the yield per colony, yes, and in the aggregate, may be diminished to considerable extent by overstocking ere the establishment of an out-apiary would be a profitable move. I have had no experience with out-apiaries, but I believe that the majority of the inexperienced have erroneous ideas as to the difficulties and expense attending the establishing and management of an out-apiary. Land must be bought or hired, some sort of a building or shelter secured and a conveyance of some kind will be needed for carrying bees, tools, supplies, etc. Then there is the preparation of a cellar for wintering the bees, or they must be carted home in the fall and back in the spring, or else protected upon their summer stands. But when a man begins to number his colonies by the hundreds, he knows that *something* must be done. Even if out-apiaries are not so profitable as home-apiaries, they are not usually run at a loss, while the removal of the surplus bees at the home-yard, allows that to make better returns.

When keeping bees upon the out-apiary plan there must of necessity be much moving about of hives from one apiary to another. An out-apiary is seldom supposed to be permanently located. If some locality furnishes but little honey it is wise to abandon it and put the bees in some better locality. It certainly would be wise to take considerable pains to ascertain the character of a locality before going to much expense in fitting

up an apiary there. As J. A. Green said, in the October Review, for 1890, "To make money with out-apiaries it is not enough to measure off the proper distance from the home-apiary in any direction and plant an apiary there, thinking the bees will do just as well as anywhere else. Modern apiculture must do more than that. I cannot escape from the conviction that, to make the most of an apiary, it must be capable of being easily and quickly moved at any time during the working season."

When it is finally decided to start an apiary, how far away shall it be located? We have been repeatedly told that, ordinarily, three miles mark the limits of a bee's foraging grounds, hence, if apiaries were placed six miles apart, there would be no encroachment. But it must be remembered that the pasture ground of each apiary is somewhat circular in form, and that they might be moved towards each other to considerable extent without one encroaching upon the other very much. Dr. Miller has given a very happy illustration. Lay two silver dollars side by side. Lift the edge of one and slide it over the other. Notice how far it may be pushed over without covering a very large portion of the other dollar. Notwithstanding all this, those who have had experienee in the matter are not inclined to put out-apiaries nearer together than four miles, and prefer to have them five or even six miles apart. When the team is "hitched up" and on the road, a mile or two more travel does not take so *very* much time, and the increased yield may more than make it up. We cannot always secure the exact spot desired for the establishing of an out-apiary, and it would probably be well to go a little farther than really necessary rather than to crowd some other apiary.

Having decided upon a site for an out-apiary, the next consideration is its management. Shall comb honey be raised, or shall the honey be taken in the extracted form? Shall the apiary be managed upon the visiting plan, or shall a man be kept there all the time during the swarming season? I believe that, in the majority of cases, extracted honey is raised in out-apiaries, as, by this plan, swarming can be so nearly controlled, and the apiary visited only at intervals.

In raising comb honey, the difficulty is that most of the colonies will swarm, unless the queens are removed. Mr. Manum, Mr. Elwood, Mr. France and a few others practice removing the queens just at the beginning of the swarming season, and pronounce it a success.

I have, as yet, said nothing about the number of colonies to put in an out-apiary. It ought to have as many as the location will bear; certainly enough to make a day's work at each visit during the busy season. It would be unprofitable to drive off five or six miles to do only a part of a day's work. Where all necessary tools, etc., are kept at the out-apiary, and all the bee-keeper has to carry is himself, a bicycle is a very excellent kind of conveyance. It is fast, always ready, requires little care, and stings don't make it run away. If the apiaries are in or near towns connected by railroad, it is a great convenience.

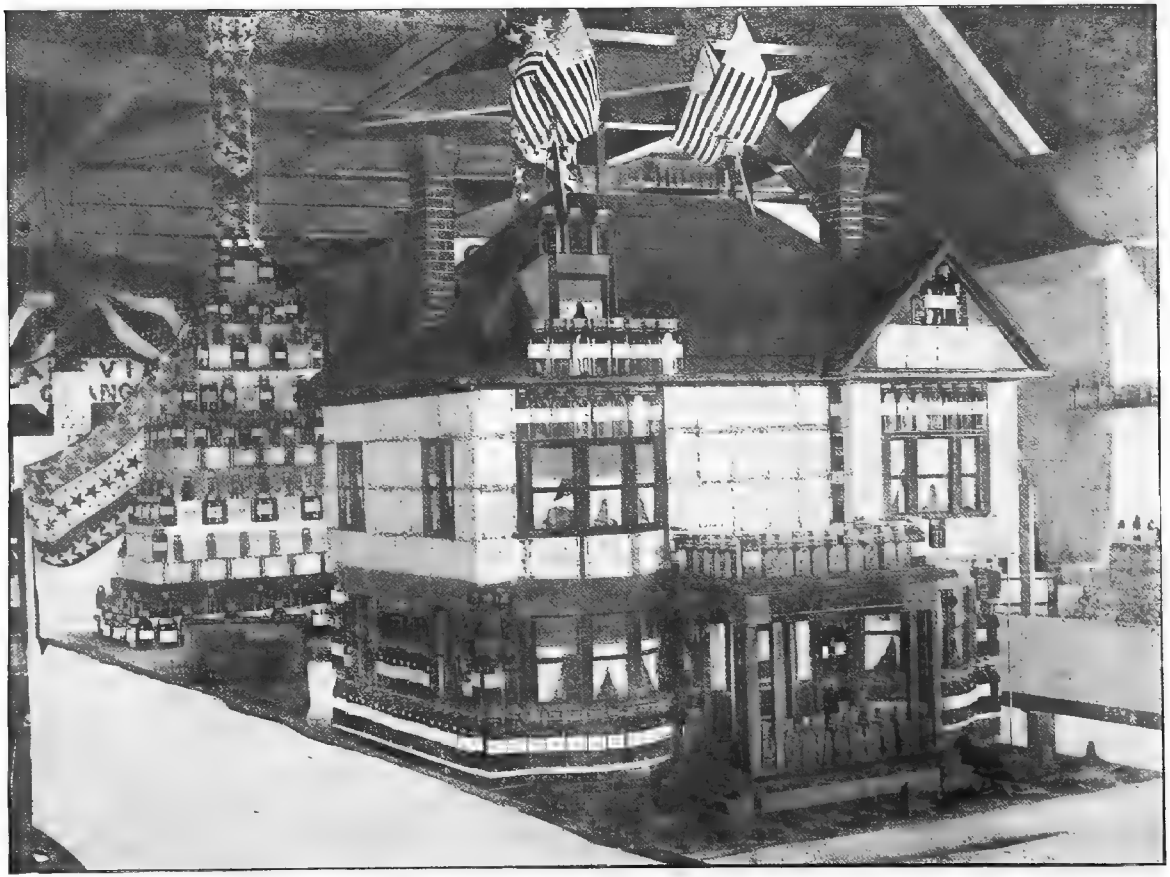
Instead of having any buildings at the out-apiaries, some bee-keepers use a small tent that is easily "struck" and carried from one apiary to another.

Apiarian Exhibits at Fairs.

THERE has been, in times past, some opposition to the exhibition of bees, honey, wax, implements, etc., at our State and County fairs, exhibitions etc., on the ground that such exhibitions were usually made by supply dealers who, in their eagerness to do business, did not hesitate to urge a man to become a bee-keeper, in order to effect a sale. If the fruit of the seed sown at these gatherings *were* a crop of producers, I might admit that, possibly, there would be some injury to existing bee-keepers, but, after an experience of many years in making such exhibitions, I am thoroughly convinced that nothing of the kind occurs; in fact, the exhibitions of hives, implements, and large quantities of honey tastily put up, impresses the crowd with the true importance, magnitude and complexity of modern bee culture; imparting the idea that the bee-business is quite a business—one that cannot be picked up and learned in a day by Tom, Dick and Harry.

Anything that increases the consumption of honey is a benefit to the pursuit, and, as usually managed, these bee and honey shows call the attention of crowds of people to the excellence and deliciousness of honey as a food, and the producer and consumer are brought face to face. At a fair, people are abroad with a disposition for sight-seeing, investigation and the purchase of novelties and nick-nacks; and a fine display of honey, together with its sale in fancy packages, cannot help benefiting the exhibitor as well as the pursuit. Honey ought to be put up in small packages. It may be difficult to put it up in packages so small that one can be sold for five cents, but I believe it has been done, while there is no difficulty in putting up honey in packages that may be sold for ten or twenty-five cents each. People at fairs don't want to be burdened with heavy or bulky packages, and the honey must be put up in such shape that it can be eaten upon the grounds, or else carried in the pocket or hand bag without danger of leakage. I remember that, one year, at the Michigan State Fair, Mr. H. D. Cutting sold nearly $40 worth of honey put up in pound and half-pound, square, glass bottles and in small glass pails. Last fall, at the Detroit Exposition, at least 1,500 pounds of "Honey Jumbles" were sold by three exhibitors in the bee and honey department. These "jumbles" or cakes, are made with honey instead of sugar, and the honey used is of a low grade. Their sale is rapidly increasing, and is, of course, a benefit to honey producers. Such management certainly does the pursuit of bee-keeping no harm, while it is a benefit to the one making the exhibit.

Neither ought the social feature to be overlooked. Every bee-keeper attending the fair hunts up the "Bee and Honey Department," and only one who has been at an exhibition knows of the many new acquaintances thus formed and the old ones that are renewed. It is well to have



AN ATTRACTIVE APIARIAN EXHIBIT.

one day set apart as "Bee-Keepers' Day," giving the date in advance in the bee journals, then all bee-keepers will be present on the same day. When possible to do so, it is an excellent plan for two or three, or more, exhibitors to club together and take a tent, or a portable house, each bringing his share of bedding, provisions and utensils, and live *a la* picnic during the fair. Some of the happiest hours of my life have been spent in going through just such experiences with boon companions.

I doubt very much whether the exhibition of bees at fairs is of any great advantage to the pursuit. The most that can be said in their favor is that they attract attention. But there is certainly no necessity for exhibiting full colonies. A single-comb nucleus with a queen and a few drones and workers, together with brood in different stages of development, can be made to show more that is really interesting than can be shown with a full colony.

Of course, it is impossible to go on and cover, in detail, all the points in regard to making an apiarian exhibition at a fair, as circumstances vary greatly, but I will give a few hints. Extracted honey must be shown in glass. Not in common green glass, but in white, flint glass. Have tin foil caps over the corks, and *small*, tasty labels. Aim to get a white or light colored background for extracted honey. A dark color gives it a muddy or dull appearance. A pyramid of extracted honey, in bottles, in front of a window, is a beautiful sight; the light "shimmering and glimmering" as it passes through the bottles and their contents. Comb honey must be in cases with glass next the comb. There is seldom a fair ground with no bees near it, hence, no honey should be exposed. All honey should be shut up close and no stickiness left on the outside of packages. Wax should be molded into fanciful shapes. Honey and wax should be piled up in pyramids, or in some striking shape. Let the beginner not try to show a great multitude of things, but let what he does show be as good as it is possible for him to show. Competition is so very keen, at least where the premiums are liberal, that it is folly to expect premiums upon second-class products.

Now that I have reached the subject of premiums, it may be well to give what I call a "model" premium list. It is nearly the same as used by the Detroit Exposition, and by the Michigan State Fair. I may have placed the premiums at a higher figure than most societies would care to use, but the amounts can be easily reduced, keeping the proportions as they are.

	1st	2d	3d
Most attractive display of comb honey	$35	20	10
Specimen of comb honey, not less than twenty pounds, quality and manner of putting up for market to be considered	10	5	
Most attractive display of extracted honey	35	20	10
Specimen of extracted honey, not less than twenty pounds, quality and manner of putting up for market to be considered	10	5	
Most attractive display of beeswax	20	10	
Specimen of beeswax, not less than ten pounds, soft, bright yellow wax to be given the preference	6	3	
Single-comb nucleus Italian bees	10	5	
Single-comb nucleus black bees	10	5	
Single-comb nucleus Syrian bees	10	5	
Single-comb nucleus Carniolan bees	10	5	
SWEEPSTAKES ON BEES.			
Display, in single-comb nuclei, of the greatest variety of the different races of bees	10	5	
Collection of queen bees of different varieties	16	8	
Honey vinegar, not less than one gallon, shown in glass	6	3	

Assortment of honey candies,	4	2
Pastry made with honey.....	4	2
The best specimens of the best honey producing plants, pressed and mounted, not to exceed twenty-five varieties,	15	8

SWEEPSTAKES.

The largest, best, most interesting, attractive and instructive exhibition in this department, all things considered,	35	20	10

I think bee-keepers would prefer to have "supplies" included in the premium list, but the managers of fairs have decided against offering premiums, on account of the difficulty of securing satisfactory decisions. The best we can do is to have a "sweepstakes" premium offered upon the largest and best exhibition; *then* supplies will count.

A judge should never be compelled to take an exhibitor's word for anything. Let the article exhibited show for itself. Don't offer premiums on samples of different kinds of honey, when they can be so easily gotten up for the occasion by mixing. Don't put at the head of the list such requirements as: "Honey must be of this season's crop;" or, "Must be the product of the exhibitor;" when there is no way of knowing whether they are lived up to.

In my experience, one man to award the premiums, and he an expert, has given better satisfaction than three judges, It is difficult, and often expensive, to get three men that are experts, and, even then, the work is not always done so conscientiously, because it is not so easy to place the responsibility, each being able to shield himself behind the "other two."

Upon this subject of judging, there is one other point often neglected that ought to be printed in connection with the premiums, and that is a "scale of points" for deciding in regard to the merits of exhibits. Particularly is this true in regard to honey. Miss West of this city suggested, in Gleanings, the following, and I think well enough of it to copy and recommend it:

HONEY—Color, 5; Body, 5; Flavor, 5; COMB—Straightness, 5; Color of Capping, 5; Completeness of Capping, 5; Uniformity, 10; Style, 10. POSSIBLE, 50. By "Uniformity" is meant the closeness of resemblance in the sections composing the specimen. "Style" includes the attractiveness of the section and case, also absence of propolis.

And now a parting word to the beginner. If you make an exhibit at a fair, don't get excited. Don't worry. Keep cool and have patience. Many unpleasant mishaps *may* occur, but don't worry over them; and, above all, don't let the losing of premiums so "sour" you as to spoil your own enjoyment and that of your comrades. When you leave home, have everything in readiness, as nearly as possible, to put right up. Pack everything carefully, but in such a manner that it can be easily and quickly unpacked and repacked. If possible, go *with* your exhibition, even if you are thereby obliged to ride in a freight car (I have done it many a time and enjoyed it too), and *see* your goods handled, or better still, handle them yourself. And when the fair is over, don't "go crazy" to get off the grounds the very next minute. I have known of men sitting up all night swearing and sweating, and fuming and fretting because "their car didn't come," or something of that sort. At the close of a large fair, an immense amount of goods are on the grounds; they have been several days in accumulating, and it is *impossible* to move them *all* in an hour's time. Expect to cut at least one "eye tooth" at each fair you attend.

The Relation of Food to the Wintering of Bees.

IN THE Southern States, and other places not blessed with a stern winter, where bees can enjoy frequent flights, it matters little what the food is, so long as it is not actually poisonous. By this I mean, any kind of sweet like sugar, honey, or even honey dew, will answer as food. In these mild climates little or no protection is needed, but, as higher latitudes are reached, chaff hives are needed and there must be some care exercised in regard to food. As we journey still further from the equator, it is only cellars and the best of food that bring forth uniform results.

It has been asserted that honey is the "natural" food of bees, and that nothing is to be gained by substituting cane sugar. It must be remembered that the "natural" home of the bee is that of a warm climate where there are no long spells of confinement caused by continued cold. Honey is, of course, the "natural" food of bees, but this fact does not prevent their dying sometimes as the result of its consumption, when a diet of cane sugar would have saved their lives.

In my opinion, food is the pivotal point upon which turns the wintering of bees in our Northern States. Food is the fulcrum, and temperature the long end of the lever.

The whole question in a nut shell is just this: The loss of bees in winter, aside from that caused by diarrhœa, is not worth counting. It is *diarrhœa* that kills our bees. What causes it? An overloading of the intestines with no opportunity for unloading them. Cold confines the bees to their hives. The greater the cold the larger are the quantities of food consumed to keep up the animal heat. The more food there is consumed, the sooner are the intestines overloaded. Doesn't it seem clear that the character of the food consumed would have an effect upon the amount of accumulation in the intestines? In the digestion of cane sugar there is scarcely any residue. Honey is generally quite free from nitrogenous matter, being well supplied with oxygen, and when free from floating grains of pollen is a very good and safe winter food, although not as good as properly prepared sugar syrup, which never contains nitrogen but does possess more oxygen. The excreta from diarrhetic bees is almost wholly pollen grains, in a digested or partly digested state, with a slight mixture of organic matter. What overloads the intestines of the bees is this nitrogenous matter that they consume either as grains of pollen floating in the honey, or by eating the bee bread itself.

Repeated experiments have proved beyond the shadow of a doubt that, as a winter food for bees, pure cane sugar has no superior. With this as an exclusive diet, bees never die with the dysentery; and, if kept in a temperature ranging from 35° to 45°, they are all but certain to winter successfully. This being the case, I do not wonder that some are ready

to ask why not take away the honey in the fall and feed the bees sugar? The objections to the use of sugar as a winter food for bees are that every pound of sugar used puts one more pound of honey on the market; the work of extracting the honey and feeding the sugar is something; the bee-keeper often has a crop of honey that is meeting with poor sale, and he has not the money to invest in sugar; while some object to its use on the ground that it lends color to the cry of "adulteration."

The use of sugar as a winter food for bees unquestionably puts a little more honey on the market, but this ought not to weigh so very heavily against the certainty of wintering the bees. Neither need there be any labor of extracting the honey in the fall, as by proper management, such as contraction of the brood nest, the honey can nearly all be forced into the supers, leaving the brood combs nearly empty at the end of the season. What little honey remains in the corners will not be consumed until the next spring, when frequent flights will prevent all troubles that might arise from its consumption. With proper feeders (the Heddon, for instance), tin cans and oil stoves for making the syrup, feeding is not a long nor laborious job. In regard to causing people to believe that by some hocus pocus the sugar that is fed gets into the surplus, no one need know of the feeding, except it might be, in some cases, an immediate neighbor, and the bee-keeper ought to enjoy his neighbor's confidence to that degree that the exact truth can be told him and be believed. As in regard to the increased amount of honey that the use of sugar as winter stores puts upon the market, so the talk about adulteration is overbalanced by the certainty of carrying the bees safely through the winter. The greatest objection to the use of sugar for winter stores is the advancing of money to buy the sugar while the honey may be unsold and of slow sale. The price of sugar is now so low that, unless the price of honey drops in proportion, there will be some more inducement to use sugar for winter stores.

If sugar is to be fed, it ought to be given early, as the bees then have a chance to handle it over, and, in this handling, its character is somewhat changed by the addition of the secretions from their glands. There is also an opportunity of sealing over the syrup, when it is less likely to be injured by changes in temperature, by moisture, etc. If the syrup *is* fed late, it must be made thick, as the bees have no time to evaporate it; and there must be something added to prevent the syrup from crystalizing. After repeated trials, I give my preference to honey. From ten to twenty per cent. of honey is sufficient. September is early enough to feed. When feeding *has* been neglected until it is so late and the weather so cool that the bees will not leave the cluster and go up into a feeder, it may be managed by filling the feeder, with hot syrup and placing it *under* the hive. The heat from the syrup will warm up and arouse the bees, when they will come down and carry up the feed.

But all cannot, or may not wish to, use sugar for winter stores, and many do not *need* to use sugar to insure successful wintering of their bees. There is a great difference in localities. Where one has successfully pursued the same course year after year, it is doubtful if a change would be desirable; but what shall the man do who loses heavily nearly every winter, yet cannot, or will not, use sugar? Possibly he can so manage that his winter stores will come from a different source. O. O. Poppleton takes the ground that the best honey for winter stores is that secured from the most bountiful yields. There may something in this, but I know of one locality where the fall flow is always the most abundant, and I might almost say *always* abundant, yet so surely will it kill bees that the most extensive bee-keeper in that locality, after an experience of many years, kills his bees in the fall rather than at-

tempt to winter them upon this honey by *any* method. But bee-keepers can do this: Notice if any particular kind of honey is more likely to give trouble, and then avoid its use as winter stores. Part of the bees may be protected on their summer stands, and part put into the cellar. In a warm open winter, the bees out-of-doors will stand the better chance; in a severe winter the odds will be in favor of the cellar—and their owner must take his chances.

Out-Door Wintering.

IF BEES can enjoy frequent flights, out of doors is the place to winter them. If deprived of these flights, a temperature of about 45° enables them to bear a much longer confinement than does a temperature below freezing. In the South, frequent flights are assured; in the North, no dependence can be placed upon the matter. Some winters are "open," or there are January thaws, allowing the bees to enjoy cleansing flights, while other winters hold them close prisoners for four or five months. It is this element of uncertainty attending the wintering of bees in the open air that has driven so many bee-keepers to the adoption of cellar wintering. Still, there are some bee-keepers who, from some peculiarity of location, winter their bees in the open air with quite uniform success; others are compelled, for the present, at least, to winter the bees out of doors; in short, a large portion of the bees, even in the North, are wintered in the open air, and probably will be for a long time to come, and while my preference is the cellar, I have no desire to ignore the out-door method.

It does not seem as though the question of whether bees should be protected, in the North, need receive any consideration whatever, yet it has been objected to on the grounds that the packing becomes damp, that it deprives the bees of the warmth of the sun and that they sometimes fail to fly in the winter (because the outside warmth is so slow in reaching them) when bees in single-wall hives may be in full flight. There is occasionally a still, mild day in winter upon which the sun shines out bright and strong for an hour or two, and bees in single-wall hives enjoy a real cleansing flight, while the momentary rise in the temperature passes away ere it has penetrated the thick walls of a chaff hive. On the other hand, there are days and weeks and sometimes months unbroken by these rises in temperature; and the bees must depend for their existence upon the heat generated by themselves, and the more perfect the non-conductor by which they are surrounded, the less will be the loss of heat. When bees are well protected, there is less necessity for flight than when the protection is slight. If the bee-keeper thinks, however, that bees in chaff hives ought to fly on a warm day, but they don't fly, he has only to remove the covering *over* the bees and allow them to fly from the tops of the hives. For several winters I left quite a number of colonies unprotected. I discontinued the practice only when thoroughly convinced that, in this locality, the losses were lessened by protection. In mild winters the bees came through in pretty fine condition. In severe winters the bees in the outside spaces, or ranges of combs, died first; the cluster became

smaller; the bees in more ranges died; and, by spring, all were dead, or the colony so reduced in numbers, and the survivors so lacking in vitality, as to be practically worthless.

I have never seen any ill effects from dampness, but I have always given abundant ventilation *above* the packing. When the warm air from the cluster passes up through the packing and is met by the cold, outer air, *some* condensation of moisture takes place. This moistens the surface of the packing slightly, but it is comparatively dry underneath. With a good strong colony of bees, and ventilation above the packing, I have never known of trouble from moisture.

In the giving of protection, chaff hives have the advantage of being always ready for winter, and of doing away with the labor and untidiness of packing and unpacking, but they are expensive and cumbersome. It is some work to pack bees in the fall and unpack them in the spring, but light, single-wall, readily-movable hives during the working season are managed with enough less labor to more than compensate for that of packing and unpacking. Then there is another point. The work of packing and unpacking comes when there is comparative leisure, while the extra work, caused by great unwieldy hives, comes at a time when the bee-keeper is working on the "keen jump."

For packing material, I have used wheat chaff, forest leaves, planer shavings and dry sawdust. I have never used cork-dust, but it is probably the best packing material. Its non-conductivity is nearly twice that of chaff, while it never becomes damp. The only objection is that it is not readily obtainable and usually costs something, while the other substances mentioned cost nothing. What they lack in non-conductivity is made up in quantity. And this brings up the point of the proper thickness for the packing. I have often thrust my hand into the packing surrounding a populous colony of bees, and found the warmth perceptible at a distance of four inches from the side and six inches from the top. This would seem to indicate the thickness when chaff or sawdust is used. I presume packing has often been condemned when it was not more than half done—that is, when not enough material was used. I don't appreciate the arguments of those who advocate *thin* packing. I don't believe that the benefit of the heat from the sun can compensate for the lack of protection during the *months* of extreme cold.

Hollow walls with no packing have their advocates; and it has been asked if these dead (?) air spaces were not equally as good non-conductors of heat as those filled with chaff. They are not. In the first place the air is not "dead," it is constantly moving. The air next the inside wall becomes warm and rises; that next the outer wall cools and settles; thus there is a constant circulation that robs the inner wall of its heat.

If chaff hives are not used, how shall the packing be kept in place? I know of nothing better than boxes made of cheap, thin lumber. If there is lack of room for storing them in summer, they can be so made as to be easily "knocked down" and stacked up when not in use. Of course, bees can be packed more cheaply by setting the hives in long rows, building a long box about them, and filling it with material used for packing. With this method, the packing must be postponed until there is little danger of the bees flying again until they have forgotten their old locations; else some bees will be lost, or some colonies get more than their share of bees. When the bees have a "cleansing flight" in winter, there is also a likelihood of bees returning to the wrong hives. Then when the bees are unpacked in the spring and moved to their proper places, there is more confusion and mixing; but I don't look upon this as so very serious a matter. At this time of the year, other things being equal, a bee is worth just about as much in one hive as in another. If there is any difference in the strength

of the colonies, the weaker ones might be left nearest to where the bees were unpacked.

Speaking of being compelled to wait about packing the bees until they were not likely to fly again until some time in the winter, reminds me that advantages have been claimed for *early* packing; that the bees in single-wall hives only wear themselves out with frequent flights that are to no purpose, while those that are packed are not called out by every passing ray of sunshine; that the early packed bees sooner get themselves settled down for their winter's nap, and are in better shape when winter comes. It is possible there is something in this, but there were two or three years in which I tried packing a colony or two as early as the first of September; and I continued to pack a colony every two or three days until the fore part of November, and I was unable to discern any advantage in very early packing. If the bees are protected before freezing weather comes, I believe that is early enough.

There is one other point that ought not to be neglected in preparing the bees for winter, whether in doors or out, and that is the leaving of a space below the combs. When wintered out of doors there ought to be a rim two inches high placed under each hive. This not only allows the dead bees to drop away from the combs to a place where they will dry up instead of moulding between the combs. Then if there is an entrance *above* the rim there will be no possibility of the entrance becoming clogged. This space under the combs seems to be a wonderful aid in bringing the bees through in fine condition, and I am not certain *why*.

Weak colonies can seldom be successfully wintered out of doors. They cannot generate sufficient heat. In the cellar, where the temperature seldom goes below 40°, quite weak colonies can be successfully wintered.

As I understand it, this whole matter of out door wintering of bees might be summed up in a few words. Populous colonies; plenty of *good* food, and *thorough* protection. Simple, isn't it? Yet there is a world of meaning wrapped up in those few words.

Ventilation of Bee-Cellars.

A FEW years ago "sub-earth" ventilation of bee cellars was almost universally recommended. Nearly every one who built a bee-cellar, also buried 200 or 300 feet of drain tile; the outer end connecting with the open air and the inner end entering the cellar. To remove the air *from* the cellar, a pipe, connecting with a stove pipe in the room above, extended down through the floor to within a few inches of the cellar bottom. The draft in the stove pipe "pulled up" the air from the cellar, and more flowed in through the sub-earth pipe to take its place. In passing through the sub-earth pipe, the air was warmed. If there were no stove pipe with which to connect the outlet pipe, it was extended upwards until it reached the open air. The air in the cellar, being warmer than the outside air, flowed out of the upper ventilator and more air flowed in through the sub-earth tube.

In order to keep the temperature even there was much opening and closing of

the ventilating tubes. In cold weather it was often necessary to leave the openings closed several days or even weeks. At such times it was noticed that the bees suffered no inconvenience. Not only this, but it was often noticed that when the ventilators were opened, the in-rush of fresh, cool air aroused the bees and made them uneasy. Finally, the ventilators were opened less and less, and, at last, they were left closed all the time.

The amount of air needed by bees varies greatly according to circumstances. When they are excited and full of honey, as is the case with a swarm, the amount of air needed is very great. If they can be kept quiet, a very little air will suffice. In winter, bees are in a semi-dormant state, one closely bordering on hibernation, as that word is properly understood, and the amount of air necessary for their maintainance is very slight. I believe it was Mr. D. L. Adair who, a number of years ago, removed a box of surplus honey from a hive and, leaving the bees in possession, pasted several layers of paper over the entrance to the box. As all the cracks and crevices were stopped with propolis, the box was practically air tight. The bees were kept confined several days, yet did not, apparently, snffer for want of air. Mr. Heddon tells of some man who, wishing to "take up" some of his colonies in the fall, plastered up the entrance with blue clay, expecting to kill the bees by suffocation. Upon opening the hives a few days later, imagine the discomfiture of their owner at seeing the bees fly right merrily. I have several times wintered bees successfully in "clamps" where the bees were buried two feet deep under frozen earth. Prof. Cook even went so far as to hermetically seal up two colonies by throwing water over the hives and allowing it to freeze, thus forming a coating of ice over the hives. The bees survived this treatment.

Special ventilation, simply for the sake of secuing fresher or purer air, seems to be almost unnecessary; the few bee-keepers who plead for special ventilation do so almost wholly upon the ground that they can thereby more readily control the temperature. If the bee repositories are built sufficiently under ground it does not seem as though ventilation would be very much needed for controlling temperature.

When bees settle down into that quiescent state that accompanies successful wintering, their need of air is very slight indeed. When their winter nap is ended, and spring arouses them to activity and to brood rearing, more air is needed. It is then, if ever, that special ventilation is a benefit, but as all that is needed can be so easily secured by the occasional opening of doors or windows at night, if it ever becomes really necessary, it scarcely seems worth while to go to the expense of laying sub-earth pipes. I should not do it, nor advise it.

The Relation of Moisture to the Wintering of Bees.

IS IT an advantage to have the air of our bee-cellars dry? Or, do the bees winter more perfectly in a moist atmosphere? Or, is this an unimportant factor? If it is important, how shall we determine what degree of moisture is most conducive to the health of the bees, and, having decided this point, what shall we do about it? How can we control the amount of moisture in the air of our bee repositories? All these queries and many more, come to the man who is thinking of wintering his bees in a cellar.

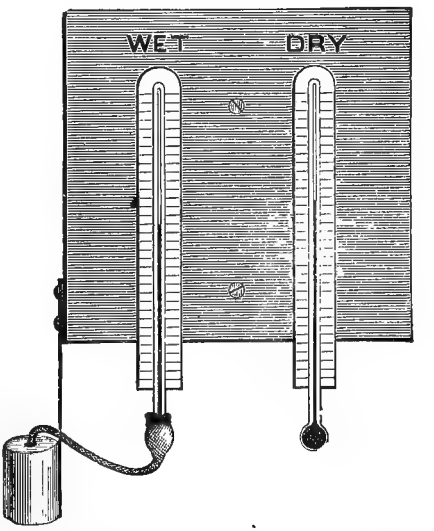
Whether bees can be successfully wintered in a damp cellar, depends largely, almost wholly, upon the *temperature* of the atmosphere. "If the repository be damp, a degree of temperature higher in proportion to the dampness should be maintained."—*N. W. McLain.* Referring to this statement, Mr. Frank Cheshire says: "The reason being that water has an enormous capacity for heat (specific heat) whether in the liquid or vaporous form; the latter abstracts heat from the bees and intensives their struggle." Dr. Youmans says: "Air which is already saturated with moisture refuses to receive the perspiration offered it from the skin and lungs and the sewage of the system is dammed up."

A moist air very readily absorbs heat, and more quickly robs the bees of that element so essential to life; hence it will be seen why a moist atmosphere must also be a warm one if disastrous results are to be avoided.

There is also another point, in the wintering of bees, upon which moisture has a bearing, and that is in regard to its effects upon the exhalations of the bees. If the exhalations are not taken up readily, the "sewage of the system is dammed up." But little moisture is required to saturate cold air; that is, it will absorb but little moisture, the point when it will receive no more being soon reached. As the temperature rises, the absorbing capacity of the air increases. When air of a high temperature, at that of our bodies, or nearly that, is saturated, or nearly so, with moisture, the exhalations from the lungs and skin are taken up but slowly; we are oppressed and say the weather is "muggy." This explains why we feel better on bright, clear days. Heating air increases its power of absorption, hence we enjoy a fire on a damp day. If the air of a cellar is dry, it will be readily seen that the temperature may be allowed to go much lower. In other words, a cold, dry atmosphere, or a damp, warm one, may be about equal so far as effects are concerned. This is a point that beekeepers have not sufficiently considered.

We have had many reports of the successful wintering of bees at such and such a degree of temperature, but nothing is said as to the degree of *saturation.* Bee-keepers ought to use a wet-bulb thermometer in their cellars; then let the degree of saturation be given with that of the temperature, and we would have something approaching accuracy. I say "approaching accuracy," because the strength of the colonies, and the manner in which they are protected, have a bearing. A populous, well-protected colony can warm up the inside of the hive, expelling the moisture and increasing the absorbing capacity of the air. Building a fire in a room on a damp day is the same in principle.

As mentioned in the preceding paragraph, the way to decide in regard to the amount of moisture in the air is by the use of a wet-bulb thermometer. The



arrangement is very simple, and any of my readers could make one. Attach two ordinary thermometers side by side to a piece of board. Just below them fasten a tin cup for holding water. Make a light covering of candle wicking for one of the bulbs at the bottom of the thermometer, allowing the wicking to extend down into the water in the cup. The

water will ascend the wicking and keep the bulb constantly wet. There will, of course, be evaporation from the wick surrounding the bulb. Evaporation causes a loss of heat; hence, the drier the air the greater the evaporation, the greater loss of heat, and the lower will go the mercury in the wet-bulb thermometer. The greater the difference in temperature as shown between the wet and dry bulb thermometers, the drier the air. In the open air there is sometimes a difference of 26°.

Ventilation of cellars has been objected to on the ground that it brought moisture into the cellar, This may be true, but not in freezing weather. Frozen air, if the expression is allowable, has a very low point of saturation. That is, it will hold but very little moisture, and when it is brought into the higher temperature of the cellar, and becomes warmed, its capacity for absorption is greatly increased—it is ready to receive water instead of giving it out. When the outside air comes into a cellar, and and deposits moisture upon the objects therein, it is evident that the incoming air is warm and moisture-laden—warmer than the cellar and its contents.

Mould in bee repositories is usually looked upon as something undesirable, and I will admit that its appearance is far from pleasant, but we must not forget that, in a certain sense, it is a plant—the child of warmth and moisture—and that the conditions necessary for its development may not be injurious to the bees—*may* be more beneficial than a condition under which mould does not develop, viz., one of moisture and *cold*. A very damp cellar ought to be warm enough for the development of mould. But the cellar need not be damp. It can be made both warm and dry. These matters of temperature and moisture are under our control. Either by fires or going into the earth, preferably the latter, we can secure the proper temperature; and by the use of lime to absorb the moisture, a dry atmosphere can be secured. Certainly it is not much trouble to keep unslacked lime in the cellar. A bushel of lime absorbs twenty-eight pounds of water in the process of slacking.

While it is evident that moisture in ordinary cellars is not injurious, provided the temperature is high enough, it is a great comfort to know that there is nothing to fear from a dry atmosphere; that we can indulge our fancy, if you choose to call it that, for dry, sweet-smelling, mouldless cellars, and know that the results will be harmless.

Some bee-keepers have asserted that cellars dug in clay or hardpan are more difficult to keep dry than when dug in sandy or gravelly soil. Mr. J. H. Martin, of New York, says that a cellar in hardpan, or even in clay, can be much improved by digging down two or three feet and filling it with stones at first, then with gravel, and finishing up with a covering of cement.

Influence of Temperature in Wintering Bees.

PROF. ATWATER says, in the Century, that the amount of heat produced in the body is so large that, if there were no way for it to escape, there would be enough in an average well-fed man to heat his body to the temperature of boiling water in thirty-six hours. This heat is gradually passing off by radiation. To prevent too rapid a radiation we cover our bodies with clothing; and, for the same reason, we surround our bees in winter with

chaff or some other non-conductor of heat; but there is no way in which the radiation of heat can be so completely controlled as by surrounding the heat-producing body with an atmosphere of the proper temperature. There is no method by which the most desirable temperature for wintering bees can be so completely secured as by placing the hives in a cellar or special repository.

R. L. Taylor, in an article in the Feb. Review for 1888, so completely covered the subject of temperature as it effects the wintering of bees in cellars, that I cannot do better than to make copious extracts from said article. He says: "I think it is a truth that should not be forgotten that no one can determine, except approximately, the best temperature for bees in another's winter repository. The condition of bees as to numbers, the warmth and ventilation of the hive, the character of their hives, and the state of the repository as to moisture, have each to be considered in deciding upon temperature.

Of course the bee-keeper cares nothing about the temperature in itself; what he is interested in is in knowing what the condition is in which the bees pass the winter with the least loss of vitality. In what manner temperature affects this condition is really a subsidiary question. If we could agree upon the primary question, I think there would be little difficulty in solving the subsidiary one.

What are the distinguishing marks of the condition most desirable for the well being of the bees?

We know that at the beginning of their season of rest, bees cluster closely and assume a state of extreme repose, and we know that so strong is this instinct that this state, late in the fall, continues in a temperature that at another season of the year would cause extreme activity. There is no doubt that this is the state best suited to the preservation of the physical powers of the bee. Labor, activity, anxiety, are wearing to mortal flesh. To live long, one must live slowly. We wish our bees to have the same degree of physical vigor in April which they possess in November. I would emphasize the adverb in the phrase 'cluster *closely*' in using it as an earmark of the condition desired. The quietness sought should be a quietness to the eye and not to the ear only. The right cluster is knit together, and the individual bees thereof only aroused to full consciousness by positive disturbance. Bees in a loose cluster, or spread through the hive, often make little sound while they are wearing themselves out by premature brood-rearing or by over feeding. How does temperature affect the desired condition?

Most bee-keepers know that temperature below a certain point causes activity among the bees on account of the necessity they feel of keeping up the warmth of the cluster by exercise, in order to prevent themselves sinking into such a degree of chilliness that they shall no longer have the power to resuscitate themselves; and all know that as the period of rest lengthens, the bees become more and more susceptible to a high temperature, and are very likely to be pushed by it into unseasonable activity. Again, the temperature may be so low and so long continued that, notwithstanding their efforts, they perish of either cold or starvation.

Of course the temperature that determines the welfare of a colony is that within its own hive, so it becomes very important in fixing the temperature to consider the strength of the colonies, and the size, warmth and ventilation of the hives. A temperature that would enable a weak colony to winter safely would almost surely greatly injure a strong colony in a hive of like size and condition, unless its stores were of good quality, and *vice versa*. Weak colonies should be protected by contraction and a closer hive, the stronger should be given more ventilation. A moist atmosphere conveys away animal heat much more rapidly than a dry one, so that the best

temperature in one cellar might vary many degrees from that which would be best in another.

I have no doubt in my own mind that with stores which are exceptional, every normal colony would winter well in any ordinary bee cellar, where the temperature ranges between 32° and 50°, Fahrenheit, and that we err when we attempt to make successful wintering indoors turn on anything but food; still, no doubt the temperature may be made to assist the bees in contending with the distresses arising from unfit food. Warmth makes the discomfort of their diarrhœtic disease less unbearable. In a low temperature bees afflicted with diarrhœa soon perish miserably. So, for bees thus diseased, I would provide a high temperature; say about 50°, thereby enabling the dying to leave the hive, the diseased to void their excreta outside the cluster, and the well to make a more courageous fight for life.

I need hardly add anything upon this part of the subject, and shall only say farther that, in my own cellars, where the air is neither very moist nor very dry, and where there is no draughts, I consider a temperature of 40° to 44° the best for good colonies in hives from which the bottom boards are entirely removed. If the bottom boards be not removed, I think 5° lower would be about equivalent.

In order to have the temperature as desired, it becomes important to have one's bees in a repository of which the temperature is nearly independent of the outside changes. This is, I think, secured far the most satisfactorily by having the repository entirely, or at least very largely, below the surface of the earth."

As the temperature is higher at the upper part of a cellar, the weak colonies should be placed in the topmost tier of hives.

It has been urged that as spring approaches and breeding begins, the temperature of the cellar should be raised. With a large number of colonies the increased activity of the bees would, of itself, have a tendency in this direction. If there are only a few colonies, artificial means of raising the temperature are sometimes resorted to. Some have used oil stoves in the hatchway to the cellar, others have warmed the air with wood or coal stoves. Mr. H. R. Boardman, who has had much successful experience in wintering bees in cellars, prefers to have a bee cellar with two apartments, in one of which is a stove. When it is necessary to resort to artificial heat he warms the air in the ante room, and then admits it to the bee room. In the use of artificial heat he does not find it necessary to employ it, constantly, or every day, in fact, he says that the best results are secured by giving the bees the benefit of a summer temperature for a short time once a week, and then letting them alone. They will, after being warmed up, become quiet in a short time, and remain so for several days, and no serious results need be apprehended from cold, if in a frost-proof cellar.

Comforts and Conveniences in the Apiary.

BY THESE are meant those things not absolutely essential to success, but that serve to render more smooth and pleasant the somewhat "thorny" path trodden by the bee-keeper. To illustrate: H. R. Boardman has a cart, for carrying bees to and from his bee cellar, with which there is no necessity for even lifting the hives to place them on the cart. It is made like a wheel barrow with two wheels, and having two long prongs projecting in front. When the cart is wheeled up to a hive, one prong goes one side of the hive and the other goes the other side, when, by depressing the handles, the hive is lifted from the ground; cleats upon the sides of the hive prevent it from slipping down between the projecting prongs. Mr. J. A. Green has an arrangement for opening the honey house door by simply stepping upon a pedal. When both hands are occupied with tools, a case of honey, or something of that sort, such an arrangement is quite a comfort. Mr. Green is also the man who keeps kerosene oil in a spring bottom oil can to squirt on the fuel in a smoker when "firing up."

Most of these comforts are comparatively inexpensive. To think of and secure them is often more work than to earn the money with which to buy them, but their possession often makes all the difference between a season of pleasure and one bordering on drudgery, to say nothing of the bearing they may have upon the profit. These little helps and conveniences are, in one sense, the oil that makes the great apicultural machine move smoothly, and I believe it worth while to enumerate a few of them.

I will begin with the bee-keeper himself, or rather with his clothing, as his comfort is largely depended upon that. When there is very much shaking and brushing of bees to be done I prefer to wear light calf skin boots with the trousers tucked inside. When shoes are worn, the trousers must be tucked inside the stockings, or tied up with a string, (which looks so outlandish) or else "dose innocent pees vas grawling mine trousers amoung," which begets a feeling far from comfortable. I don't believe in sacrificing very much comfort for the sake of appearances, but I couldn't be comfortable working day after day tricked out like a clown or scare-crow. Mr. Arthur C. Miller suggests the wearing of canvas shoes that lace well up around the ankle, such as are worn by tennis and base ball players and cyclists. Then he would have the trousers come just below the knee, with canvas leggings to cover up the lower part of the legs. His ideal coat is a close fitting jacket of light weight that buttons up to the throat. The hat that approaches the nearest to perfection in his opinion is the helmet. It has visors front and back and a ventilator all around between the rim and the inner band. It is light and cool and protects both the eyes and the back of the head and neck from the sun. Such suits as those described by Mr. Miller can be had

in white or colored "duck," and are light, cheap, washable and serviceable, and, complete, or in part, are worn by many cyclists and others.

When the grass is wet, *I* wear rubbers over the light calf boots. In the heat of the working season I wear linen trousers, a white cotton shirt and a straw hat. I have seen the wearing of light woolen clothing recommended, but have never given it a trial. Ernest Root mentions the comfort *he* has derived from the wearing of light under clothing, part woolen. But he does not perspire freely, and this under clothing retains the perspiration, keeping the skin moist. With me it is the reverse. I perspire so freely that the clothing is soon "soaked through and through," and frequent changes are necessary. Perhaps each will be obliged to decide this matter by personal experience.

The straw hat that I wear is a good one, made by sewing together narrow braids of fine straw. Such a hat costs about $1.00. I buy a new one each year for "best," and then take the last year's one for every day wear in the apiary.

I never wished a veil attached to the edge of the hat rim. It is only part of the time that a veil is needed, and when it isn't needed I wish it out of the way. I prefer a veil with a string run into a hem around the top then the upper edge can be puckered up until it will just slip down nicely over the hat crown.

Gloves I have never worn, and doubt if I could be led to believe them a comfort.

I know of no comfort in the apiary greater than a smooth surface (of earth) thickly covered with grass. A lawn mower can scarcely be called a comfort, it is a necessity. Sprinkle salt around the hives to kill the grass a distance of six inches from each hive, then the lawn mower can cut all the grass that grows. About the first thing needed upon beginning work in the apiary is a smoker; and oh how much comfort or discomfort can come through this little implement. If any of my readers have suffered from smokers that spill fire, that become stopped up with soot, that go out, or from fuel that will not burn, let them get a Bingham, the size called "Doctor," get a barrel of planer shavings from dry pine for fuel, and take comfort. If there is any trouble in lighting the shavings, use a little kerosene from a spring-bottom oiler, as already mentioned. Keep matches in a safe place near where the smoker is to be lighted. Never be pestered by having to run off some where after a match. Above all don't keep the smoker fuel and matches in the honey house; the danger from fire is too great. Rig up a box, or barrel, or old bee hive, with a rain proof cover, for the keeping of fuel and matches, and have it located some distance from the honey house. I kept the planer shavings in an old wash boiler, and had it "burn out" once. As it was out of doors, no harm was done. Keep the cap of the "Doctor" filled with green weeds or grass and there is no danger of blowing sparks into the hives.

Have a wheel barrow or cart for carrying cases, hives of honey and other heavy articles. With such hives as I use, the cover can be turned up on edge and made to answer the purpose of a seat; where such is not the case, a seat of some kind ought to be provided. Dr. C. C. Miller uses a light box 17 x 12 x 9 inches in size. This gives a chance for having a seat with any one of these heights. It should be made strong enough not to rack and have hand holes in the sides for carrying it by. A hammock in the shade of a tree, or in the work shop, is a great comfort. Ten minutes rest in a reclining position is of as much value as fifteen in a sitting or standing posture.

In the Review for June, 1890, "Rambler" said: "For brushing bees from combs, instead of using the little, inefficient brushes sold by dealers we use a large, Mexican fiber duster. A screw eye is inserted in the end of the handle, a long, strong cord inserted and tied and the loop thrown over the shoulders, when the brush is always at the side ready for use.

Another very convenient tool for many uses in the apiary is a light, thin-bladed screw-driver. This should have a large bright ribbon tied to it, for, brother bee-keepers, you know how such small tools will disappear in the yard. The bright colored ribbon hangs out a signal, "Here I am, grasp me."

An oil stove is another convenience not to be overlooked. A single wick burner will answer, perhaps, but a double wick is better. Water can be heated, wax melted, starch made and kept warm, sugar syrup made if necessary and several other things done.

If swarming is allowed, and queens are unclipped, there should be queen-traps, self-hivers, or a Whitman fountain pump with a barrel of water and plenty of pails.

Let each bee-keeper look about his apiary and see if he is not doing some of his work in an awkward manner, that might be avoided by the providing of a few comforts and conveniences.

Mistakes in Bee-Keeping.

IT IS pleasant to tell of success. Mistakes are mentioned with reluctance. Yet, these may be of equal value for imparting information. Mr. J. M. Smith of Wisconsin is noted as a horticulturist. The crops of berries and cabbages that he raises are something wonderful. His contributions to the press are valuable; but I never read one containing more iuformation than the one in which he recounted the *mistakes* of his horticultural life. I believe that space can be profitably occupied in mentioning a few things that experienced bee-keepers look upon as mistakes in bee-keeping.

The man who has decided that he will choose bee-keeping as his profession, makes a mistake when he gets a few colonies and attempts to learn the business all by himself. Both time and money would be saved by passing at least one season in the employ of a successful bee-keeper.

If a man must start with a few colonies and learn the business by himself, let him avoid the mistake of attempting to follow several leaders or systems. Much confusion and annoyance will be saved if he adopts the teachings, methods and appliances of some one successful bee-keeper. He may make the mistake of not choosing the best system, but better this than a mixture of several systems.

A beginner is quite likely to fall into the error of increasing his colonies too rapidly. There is probably no mistake so disastrous as this on account of its frequency and results. To the beginner this is very tempting ground. If bee-keeping must be learned by experience and reading (without the serving of an apprenticeship) the beginning should be small, and practical knowledge and skill should keep pace with the increase of colonies.

A mistake that has been made by many is in looking upon bee-keeping as a sort of royal road to wealth, or at least a good living, with but little labor, and, some believe, little brains, after they have once "caught on" to a few secrets. (?) To choose any business simply because it is profitable is the height of folly. A busi-

ness that is unusually profitable does not long remain such. It soon becomes overcrowded and loses its bonanza character. A man should choose a business because he and his surroundings are best adapted to the pursuit.

Many fall into the error of judging entirely by *results*, regardless of causes. As that excellent bee-keeper, R. L. Taylor, has said, "The greatest actual results do not prove the method of management by which they were produced to be the best. Time, and labor, and thought, and care, and material, and capital, are all money, so the greatest results numerically may be obtained at a loss, while the least apparent results may yield a profit."

In much this same manner do many bee-keepers make the mistake of computing their income at so many pounds per colony, and at so much per pound. The greatest yield per colony might not be so profitable as a less yield per colony from more colonies, or even a lessened yield from the same number of colonies. If a great yield per colony is the result of a great deal of work, it may be that the work was done at a loss. Bee-keeping should be viewed in a broader light. It may sometimes be profitable to put a great deal of work on each colony, but each bee-keeper should ask himself, how, *all* things considered, can I make the most profit? That is the question, and all other propositions not relating directly thereto are mistakes.

And this leads to the mention of another mistake, the keeping of too few bees. Instead of keeping only a few swarms and striving to secure the largest yields per colony, it is often more profitable to keep more bees—enough to gather all the honey produced in a given area, and then when said area is overstocked, it is probably a mistake not to start outapiaries. There is much to be gained in having as few things to do as possible, and as much of them as can be managed. The proportional cost of doing business is greatly lessened by increasing the volume of business.

Another mistake is that of choosing hives, implements and methods that are complicated and require much time for their manipulation. A most common error in this line is in trying to adapt hives to bees, to such an extent as to almost entirely ignore the adaptability of the hive to the bee-keeper. I remember once hearing a bee-keeper arguing for a hive that it was "so handy for the bees." "Why," said he, "if you were building a house, would you have it so arranged that your wife would be obliged to go up and down stairs between the kitchen and the pantry?" It must be remembered that we build hives for our bees and houses for our wives with altogether different ends in view. We don't keep bees nor arrange their hives with a view to saving them labor, but that *we* may get the most honey with the least labor to *ourselves*. Drone-traps, queen-traps, self-hivers, queen-excluders, smokers and many other contrivances are probably not considered "handy" by the bees, but their use is an advantage to us.

It is in a line with this method of reasoning that causes some bee-keepers to make the mistake of condemning any practice that is not "according to nature." The whole system of modern bee culture is a transgression of nature's laws, so-called. In some things it is advisable to allow nature to have her own way, in others it is not, and we have the best success when we have learned just where we can advantageously, to a certain extent, cross nature's methods with those of man's intelligence.

Mistakes have been made, and erroneous conclusions arrived at, by experimenting upon too small a scale. There are some kinds of experiments which will demonstrate truths just as well upon a small as upon a large scale, while there are others requiring experiments upon a large scale and a repetition of experiments before definite conclusions can be arrived at.

Many beginners make the mistake of thinking they can improve some of the

standard hives or implements, and that before they have fairly learned the business.

Others make the mistake of adopting new hives, implements, methods or varieties of bees upon too large a scale before they are certain that the change will be desirable. When a new thing with one advantage is held up before our eyes, we are too much given to forgetting the many advantages possessed by the article that we are asked to lay aside for the new comer. As a rule, the rank and file can afford to wait until at least good reports are given in regard to a novelty. Then it will be in order to experiment upon no larger scale than that upon which failure can be met and borne.

Speaking of the "rank and file," waiting for the leaders or others to try novelities, reminds me that it is a mistake to have *undue* confidence in the leaders in bee-culture. It is possible that they may be in error, or some unknown circumstances may cause different results at different times in other localities. It is a mistake to pin one's faith blindly to another. Do your own thinking, be original, try things for yourself until you are sure you are right, then go ahead.

One expensive mistake, yet one that is easily avoided, is made year after year by many bee-keepers, and that is in not securing hives, sections, foundation and other supplies in season. They *intend* to buy them soon enough, but wait until the last moment. So many others do the same thing that dealers and manufacturers are over-run with orders, and expensive and vexatious delays occur. A delay of only a few days at just the right time sometimes means the loss of a crop of honey.

Index to Chapters.

VICTOR'S

Strain of Italians Awarded the Diploma as Being the Best Bees at the Pan American

See what Mr. Orel L. Hershiser, Supt. of the Apiarian Dept. says of them.

BUFFALO, N. Y. August 30th, 1901.

My dear Victor:—Queen and nucleus arrived safely yesterday; made entrance to nucleus and allowed them to fly yesterday P. M. Transferred them to Dovetailed hive this morning *without smoke*, and handled them, patting them on the back, and I never saw such quiet and docile bees. If their working qualities are as superior as their handling, I am prepared to say *you have the best bees I ever met*; which would include some 25 or 30 different breeders and all the well known races.

Yours truly, OREL L. HERSHISER.

Mr. W. Z. Hutchinson, President of the National Bee-Keepers' Association, and judge of the bee-exhibit at the Pan American, says.

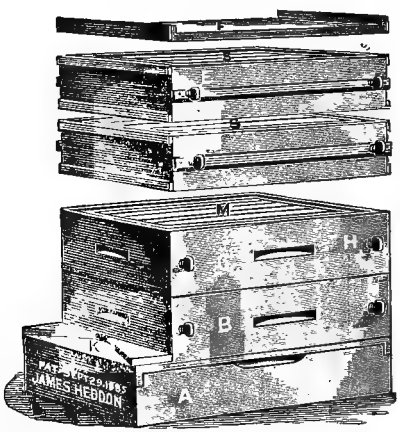
Friend Victor:—Yours of the 30th ult came duly to hand. Yes; your bees were awarded a diploma, which was the *highest award* made to an individual exhibitor. I don't know as I can make any particular statement in regard to your bees, except that they pleased me the best of any that were there.

As ever yours, W. Z. HUTCHINSON.

I am still booking orders for queens of this superior strain, at catalogue prices, for spring delivery. First come, first served. Send for price lists.

W. O. Victor, [QUEEN Specialist] Wharton, Texas

THE HEDDON HIVE



Is pre-eminently the hive for the specialist. The reasons why are given most clearly in the chapter on hives in this book. Turn back and read it. This hive is patented, but we have such arrangements with Mr. Heddon that we can supply these hives, and the right to use them goes with the hives.

Send for our illustrated catalog, and a sample copy of the Progressive Bee-Keeper.

Leahy Mfg. Co.

Higginsville, Mo.

Superior Stock.

Every bee-keeper who has had experience with several strains of bees knows that some are far superior to others—that there is scrub stock among bees, just as there are scrub horses, cattle, sheep and poultry.

Let me give my own experience: Years ago, while living at Rogersville, I made a specialty of rearing queens for sale. Before engaging in this work, I bought queens, and Italianized, not only my own bees, but all within three miles of my apiary. In buying those queens I think I patronized nearly every breeder in the United States; and, even in those years of inexperience, I was not long in noting the great difference in the different strains of bees. The queens from one particular breeder produced bees that delighted me greatly. They were just plain, dark, three-banded Italians, but, as workers, I have never seen them equaled. They seemed possessed of a steady, quiet determination that enabled them to lay up surplus ahead of the others. Easier bees to handle I have never seen. Their honey was capped with a snowy whiteness rivaling that of the blacks. In addition, they were hardy. If any bees came through the winter, it was colonies of this strain. They came as near being ideal bees as any I have ever possessed. All this was more than twenty years ago; but, several times since, I have bought queens of this breeder, and I always found this strain of bees possessed of those same good qualities—industry, gentleness, hardiness and a disposition to cap their honey white. I frequently corresponded with this breeder, and with those who had bought queens of him, and, finally, I became thoroughly convinced that he had a strain of bees far superior to the general run of stock. Whether this superiority results from length of tongue, about which there has been so much talk the past year, I do not know, but I do know that no bees have been found with greater tongue-length.

This breeder had always advertised in a quiet, unassuming sort of way, nothing in proportion to what the quality of his stock would have warranted, when, two years ago, I decided that I could help him, and benefit my readers, at a profit to myself, by advertising these bees in a manner befittingly energetic. I put the price at $1.50, but the conditions were such that it was impossible for any loss to fall upon a purchaser. The queens sent out were young queens just beginning to lay, but I guaranteed safe arrival, safe introduction, purity of mating, and satisfaction to the extent that, any time within two years, a purchaser could return the queen for any cause whatever, if he was not satisfied with her, and his money would be refunded, and 50 cents additional sent to pay him for his trouble. I have sold several hundred queens, sending them to all parts of the United States, and I have been asked to return the money in just ONE INSTANCE. I don't mean by this that no other complaint has been made, for there have been others, but in the other cases purchasers have very kindly allowed me to send other queens in place of those that did not prove satisfactory. Even with the best of stock and management there will occasionally be a poor queen. Possibly long journeys by mail have some bearing upon this part of the question. Losses in shipment are not serious; losses in introduction are not serious, unless it is during the dearth between the summer and fall honey-flows; mismated queens are not worth considering. they don't exceed one per cent ; but all of these losses have cheerfully been made good, and will continue to be made good in the future.

As to testimonials, regarding their superiority, I could fill page after page with them. I have occasionally published a few, but what is the use? Any one can try this strain without taking a particle of risk.

From the very first, the demand has been greater than the supply. The opening of the season usually finds me with at least 200 orders on hand. Any one wishing to try one of these queens, ought to order it some little time in advance, as orders are booked and filled in rotation. I am still offering them at the same price and under the same conditions as before viz., $1.50 for a queen alone, fully guaranteed as above stated, or a queen and the Review for one year for only $2.00. This offer is open to either old or new subscribers. If you wish to try one of these queens, better send in your order, together with a subscription to the Review—remember, $2.00 pays for both.

W. Z. Hutchinson, Flint, Michigan.

Cascade Bee Hive Co.

Does experience count in manufacturing? We think it does. We offer as evidence of our ability to serve you, the fac simile of the medal awarded to our manager by the State of Minnesota. He has been actively engaged in the manufacture and sale of Bee-Hives and Supplies for 15 years; has visited many of the largest factories in the world; has crossed the continent twice, examining factories and equipments, interviewing dealers and consumers of bee goods; has sold hives, sections and supplies by the carload to such dealers as Leahy Mfg. Co., Kretchmer Mfg. Co., Arkansas Valley Bee-Keepers in Colorado, to California and Nevada dealers, and many others; also many small dealers and consumers. Methods of manufacture are improving; we are getting to the front. We want your order, no matter how small.

CAR LOAD BUYERS

Of Bee Hives, and all kinds of Bee Supplies, as well as consumers, will find it to their interest to let us know their needs. We sell to the jobbing trade all over the world. We have financial interests and business contracts with two of the largest factories in the United States, as well as being sole proprietors of a small plant of our own. One of our factories is cutting 12,000,000 of lumber this year. We want your business. Address, for a catalogue,

CASCADE BEE HIVE CO.

River Falls, Wis.

Tennessee Queens

Daughters of selected, imported Italians, selected long-tongued (Moore's) and selected straight, five-banded Queens. Bred three miles apart, and mated to select drones. No bees owned within two and one-half miles; none impure within three miles, and very few within five miles. No bee disease in this part of the country.

All queen cells are built in strong, full colonies, by the most approved modern methods. Safe arrival guaranteed on all queens.

Untested queens, before July, 75 cts each; six for $4.00; twelve for $7.50. After July 1st, single queen, 60 cts; six for $3.25; twelve for $6.00.

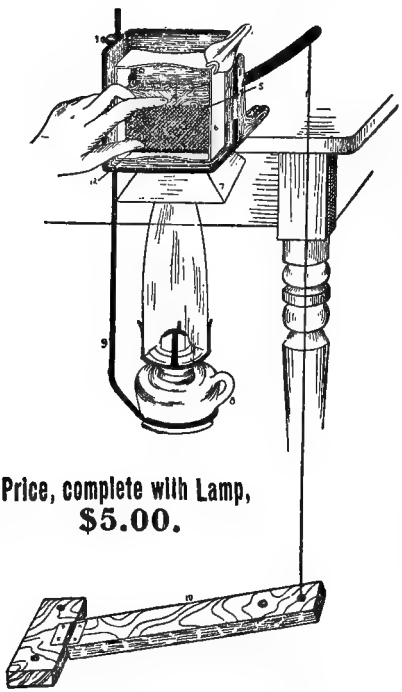
Tested queens, before July, $1.50 each; six for $8.00; twelve for $15.00. After July 1st, single queen for $1.25; six for $6.00.

Discounts on large orders. Contracts with dealers a specialty.

J. M. Davis

Spring Hill, Tenn.

The Rauchfuss Combined Section-Press And Foundation-Fastener



Price, complete with Lamp, $5.00.

Patented Feb. 4, 1896.

Has the following advantages:

1. Sections are handled but once in going from the crate to the super.
2. Its work is more accurate and rapid than that of any other machine on the market.
3. Because of its great capacity, sections need not be put up until wanted.
4. An inexperienced person or a child can do satisfactory work.
5. The work is done in a sitting position.
6. Any temperature at which foundation can be handled is suitable for operating, and a moderate temperature is even better than a high one, for it is easier to handle foundation with some backbone to it.
7. It takes any width of the 4¼x4¼ inch sections. An adjustable guide-block brings the foundation exactly to the center.
8. It can be fastened to any bench or table.
9. Being of metal it resists moisture and with fair usage will last a lifetime.
10. It takes starters, full sheets, or both; or any intermediate size of sheets
11. It saves foundation by melting only the least possible amount from the edge.
12. The wax melted from the edge of the foundation is highly heated and thoroughly grips the fibers of the wood, so that rather than separate from the sections the foundation itself will tear.
13. So small an amount of wax is melted that it cools instantly and causes no delay.
14. For the same season the foundation when fastened appears to be only resting on the wood, giving the finished honey a superior appearance when cut from the section.

These advantages enables it to pay for itself in one season, even in a small apiary.

See what some of the men say who have used the machine:—

LONGMONT, Colo., Jan. 29, 1902.

In putting together sections I use a Rauchfuss, combined machine. If there is any better I have not seen it The sections go right from the crate to the super with one operation. My wife is the champion at this part of the business; her average day's work, of eight hours, being 100 supers.

M. A. GILL.

[Mr. Gill is one of Colorado's foremost bee-keepers, managing about 700 colonies]

Rauchfus Bros. Littleton, Colo.

I have used your Combined Section Press and Foundation Fastener for six years and ***would not sell the same for $25*** if I could not get another one, as it is in my estimation the only perfect machine of this kind on the market, and will gladly recommend it to any bee-keeper.

LEWIS BROCK.

[Mr. Brock keeps 260 colonies in three apiaries and has two of our machines.]

Rauchfuss Bros., 3522 Alcott St., Denver, Colo.

I have used your combined machine for making sections and putting in foundation. After using many other devices for doing the same work, I wish to say that your machine ***gives us the best satisfaction for rapid and reliable work.***

Yours very truly

W. L. PORTER.

[Mr. Porter is one of the most extensive bee-keepers in the State—he runs 600 colonies.]

This machine is manufactured and for sale by

FRANK RAUCHFUSS, 1440 Market St Denver, Col.

It can also be obtained of the following dealers:—

G. B. Lewis Co., Watertown, Wis.
W. T. Falconer Mfg. Co., Jamestown, N. Y.
Chas. Dadant & Son, Hamilton, Ill.
Rob't Halley, Montrose, Colo.
Delta Fruit & Produce Co., Delta, Colo.
Barteldes & Co., 1521 15th St., Denver, Colo.
L. A. Watkins Mdse. Co., Denver, Colo.
The Colorado Honey Producers Ass'n Denver, Colo.

MICHIGAN

Headquarters for G. B. Lewis Co's. Bee-Keepers' Supplies. Dadant's Foundation.

We have the largest stock of supplies in the State, and can ship on one day's notice. Send for our 48 - page, illustrated catalogue, and give us a trial order. 5-02-tf

L. C. WOODMAN, Grand Rapids, Mich.

We want

to sell you bee-keepers' supplies.
to give you entire satisfaction.

For these reasons we deal in ***Root's Goods,*** both wholesale and retail.
Our specialties—***Hives, Sections*** and ***Comb Foundation.*** Cash paid for beeswax.
1-01-tf **M. H. HUNT & SON, Bell Branch, Mich.**

Root's Bee Supplies

In Central Michigan. Cheapest place to buy, and the best shipping point in the State. Bees for sale. Send for list.
W. D. SOPER, Jackson, Mich. F. R. D. No. 3.

If You Want Root's Goods we have them at Root's prices. A so A B C of Bee Culture—one of the best books printed on bees. Catalogue free. Address **D. Cooley & Son, Kendall, Mich.**

QUEENS.

I am a practical breeder of Italian Queens. I make a specialty of rearing three and five-banded queens from the best strain in this country. Untested queens, 75c each; tested, $1.00 each. Dealers supplied at wholesale prices. This is a Money Order office so remit by post office Money Order.

Respectfully yours, for queens
DANIEL WURTH, Caryville, Tex.

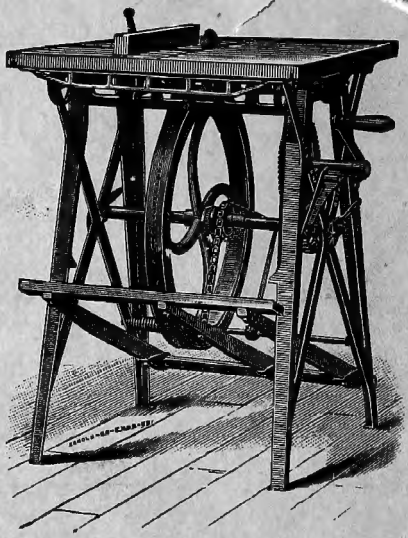
Red Clover

Long Tongued Queens

We are breeding the long-tongued, red clover, honey queens. This strain of bees is ahead of all others as honey gatherers and comb builders. They just roll in the honey while other bees are trying to rob. Give our queens a trial. Untested, in May, June and July, 75c; six for $4.25; twelve for $8.00. Tested, $1.25; select tested, $1.50. Three-frame nucleus and untested queen, for $2.75. Order from this advertisment.

Preston Store & Bee Co.
Dority, W. Va.

Make Your Hives



BEE keeping is busy work in the summer-time; but the winter brings a leisure that many more bee-keepers might profitably employ in making needed hives, supers or shipping cases for another year. Power and expensive machinery are not needed; simply a cozy little shop and a foot-power saw are all that are needed. When a bee-keeper realizes all this, there is no question as to what saw he shall buy; it is made at the factory of

W. F. & JNO. BARNES CO., Rockford, Ill.

The editor of the Review has used one of these machines, and has no hesitation in saying that it is all that is claimed for it. Any one who buys a machine, and is not entirely satisfied with it, has the privilege of returning it and having his money returned. One thing more; there are attachments, such as a scroll-saw, a boring attachment, etc. that can be added at a small cost. Send for catalogue.