ADVANCED

Bee Culture
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Advanced Bee Culture

Its Methods and Management

By

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Editor Bee-Keepers' Review

Flint, Mich.

The A. I. Root Company

Medina, Ohio

Fourth Edition—1911
Dedication

To those who are getting their bread and butter by raising honey to spread upon the bread and butter of others, this book is dedicated by The Author.
**Author's Introduction to the 1911 Edition**

During the last four or five years I have been having quite a bit of experience in establishing out-apiaries, and in the production of honey upon a somewhat extensive scale. I have also visited a number of prominent bee-keepers, and photographed and described the methods whereby they made money.

Of course, all of this has appeared in the Review and in Gleanings, but in a more or less scattered fashion; and, for a year or more, I have had in mind the gathering together of this matter, in consecutive order, in a new edition of Advanced Bee Culture. There are several reasons why I have been unable to accomplish this, chief of which has been the lack of health and strength to do the work.

A few months ago a correspondence over the matter sprang up between Mr. E. R. Root and myself, with the result that, under my guidance and sanction, he revised the book, adding the new matter. All of the new matter is something that I have written, but the work of fitting in with the old, so as to make a smooth, continuous story, is that of my friend Root.

W. Z. HUTCHINSON.

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**Introduction to the 1905 Edition**

This book is intended for the professional bee-keeper; hence it is taken for granted that the reader is fairly well acquainted with bees and their management.

No space is devoted to the natural history, anatomy, and physiology of the bee, because my experience has been along commercial instead of scientific lines.

The history of this book, how and why it came to be written and published, would read something as follows: Twenty or more years ago, while making my living in the apiary, I learned that, with my management, it was more profitable to use starters only in the brood-nest when hiving swarms. My experiments and methods were described in print; others tried my plans; discussions followed; and finally it became apparent that the system was really more complex than it appeared on
the surface; also, that short articles scattered through different bee journals did not present the subject in the best possible manner, and, as a result, I published a little book in which I described in detail my method of comb-honey production.

One of the criticisms brought against the book was its small size; and I was repeatedly urged to write a larger book, giving my experience and views more in detail, and upon other points. Flattering as all of this may have been, I doubt if I should have yielded to these entreaties had it not been that, by the time the last copy of the little book was sold, I had been editor of the Bee-keepers’ Review for nearly four years, and had the benefit of reading, and studying over, special discussions, by the most practical men, of the most important questions connected with our pursuit. As it was, I went to work and classified, arranged, and condensed, and gave what I considered the cream of the special-topic discussions that had appeared in the Review. So many new subjects were taken up that the old title, “The Production of Comb Honey,” was no longer appropriate; and as I was giving what seemed to me the best and most advanced methods I called the new book Advanced Bee Culture. Two years ago, the first edition having been exhausted, I rewrote and revised everything necessary to bring it up to date, and got out a second edition, which has since been sold. The present edition has been largely rewritten, many engravings, much new matter, and a more substantial binding, being added, thus bringing the book more nearly up to the ideal that I have for several years had in mind.

Advanced Bee Culture is really the summing-up of the best that has appeared in the Bee-keepers’ Review during the eighteen years of its existence; that is, from a most careful examination of the views of the most progressive men, and a thorough consideration of the same in the light of my experience as a bee-keeper, I have described in plain and simple language what I believe to be the most advanced methods of managing bees for profit, from the beginning of the season throughout the entire year.

The Author Telling Stories to His Grandchildren.
Bee-keeping as a Business

In reply to the query, "What will best mix with bee-keeping?" I have always replied, "Some more bees." When the conditions are favorable I am decidedly in favor of bee-keeping as a specialty—of dropping all other hampering pursuits, and turning the whole capital, time, and energies into bee-keeping. If bee-keeping can not be made profitable as a specialty, then it is unprofitable as a subsidiary pursuit. If bee-keeping must be propped up with some other pursuit, then we had better throw away bee-keeping and keep the prop.

General farming is very poorly adapted for combining with bee-keeping, yet the attempt is probably made oftener than with any other pursuit. There are critical times in bee-keeping that will brook no delay; when three or four days' or a week's neglect may mean the loss of a crop; and these times come right in the height of the season, when the farmer is the busiest. Leaving the team and reaper standing idle in the back field while the farmer goes to the house to hive bees is neither pleasant nor profitable. Drawing in a field of hay while the bees lie idle because the honey has not been extracted to give them store room is another illustration of the conditions with which the farmer bee-keeper has to contend. The serious part of it is that the honey thus lost may be worth nearly or quite as much as the hay that is saved. Some special lines of rural pursuits, like winter dairying or the raising of grapes or winter apples, unite with bee-keeping to much better advantage than general farming; but when bee-keeping is capable of absorbing all of the capital, time, and energy that a man can put into it, why divide these resources with some other pursuit? It has been said that bee-keeping is a precarious pursuit; that it can not be depended upon alone to furnish a livelihood, and for this reason it should be joined with some business of a more stable character. It is true that there are many localities where there is often a season in which little or no honey is secured, and, in the Northern States, winter losses are sometimes very heavy, hence it would be risky to depend entirely for a living upon keeping bees, in a limited way, in such localities; but if the average profit from bee-keeping, one year with another, is not the equal of other rural pursuits, why keep bees? The truth of the matter is, it is greater; and if bee-keepers would only drop everything else and adopt methods that would enable them to branch out and keep hundreds of colonies where they now have dozens,

As fast as the timber is lumbered off, red raspberries spring up in myriads, furnishing bee pasture that is simply incomparable.
they would secure enough honey in the good years to more than carry them over the poor years, and thus not only make a living but lay up money.

When a man decides to cut loose from everything else, and go into bee-keeping extensively, making it his only and his life business, the question of all questions is that of locality. There are few localities in which a small apiary might not yield some surplus; but when a man is to make of bee-keeping his sole business the securing of the best possible location is time and money well spent. What a good solid foundation is to a "sky-scraper," a good location is to the building-up of a successful, extensive bee business. Having settled in a locality, the bee-keeper can not study it too thoroughly. Especially must he understand its honey resources; the time when each flow begins, its probable duration, its quantity and character. He must know whether to expect a spring flow, like that from dandelion, hard maple, or fruit-bloom, that will build up the colonies for the main harvest that is to come later. If there is likely to be a season of scarcity between the early flow and the main harvest, it must be known, and preparations made to keep up brood-rearing by means of feeding or the uncapping of honey. The management will depend largely upon the source of the main honey-flow, whether it be raspberry, clover, basswood, buckwheat, alfalfa, sage, or fall flowers. Whatever the source, the bee-keeper must know when to expect it, and plan to have his colonies in exactly the right condition to gather it when it comes. This is one of the fundamental principles of successful bee-keeping.

Having secured the most desirable location, the next step is to procure the best kind of bees that can be obtained. There are several different varieties of bees, each with its peculiarities; but, aside from this, every bee-keeper who has had experience with several strains of the same variety knows that some strains are far superior to others—that there is scrub stock among bees just as there are scrub horses, cattle, sheep and poultry. With scrub stock, the cost of hives, combs, and other appliances remains the same; it is no less work to care for such stock; and it requires the same amount of honey to raise and feed it as it does the best stock in the world. In proportion to its cost, no investment brings the bee-keeper greater profit than the securing of superior stock.

Having secured a good location and good stock, the bee-keeper should adopt such hives, implements, and methods as will enable him to branch out, establish out-apiaries, and keep a large number of colonies. At the present time the greatest failing of professional bee-keepers is the keeping of too few bees—of clinging to some other hampering pursuit. Many keep enough bees to furnish them a fair
Apple-orchard in Full Bloom.

There is nothing in the line of early honey that so stimulates brood-rearing as does that from the pink and white blossoms of the apple-trees.
living in a good season; but when winter losses and poor honey seasons follow one another in quick succession, there is suffering, or, at least, great inconvenience. If a man is going to follow bee-keeping as a profession, his only hope is in a good location, good stock, and the keeping of bees in such numbers that, when a good year comes, he can pile up the honey ton upon ton—enough to keep him several years. The larger a business the more cheaply can it be conducted in proportion to the results; not only this, but the very fact that bees are scattered about in out-apiaries, several miles apart, adds to the certainty of the crop; as one locality often yields a fair crop while another a few miles away yields nothing.

It has been urged against bee-keeping as a sole pursuit, that, while it keeps a man very busy during the summer, it leaves him idle in the winter. Bee-keeping, rightly managed, will keep a man busy every day in the year. Too many bee-keepers fail to realize that the selling of a crop is fully as important as its production. The business part of bee-keeping has been sadly neglected. No set rule can be given as to how a man shall dispose of his crop; but it does seem like very poor business management to send away a crop of honey to some commission merchant, and then sit around all winter when good wages might be made selling honey direct to consumers, or to retail dealers. The selling of the crop, and the preparations for the coming season, may well occupy a man during the winter.

Perhaps a dozen years ago I visited Mr. W. L. Coggshall, of New York. Few bee-keepers have made a greater financial success than has Mr. Coggshall. There have been stories about the thousands of dollars that he has in the bank. Mr. Coggshall has never admitted nor denied these reports; but, let this be as it may, he is certainly well-to-do. As I sat in the train, thinking the matter over while on my way home, I tried to decide why Mr. Coggshall had been so much more successful than many other bee-keepers, when all at once it came to me like a flash, why, he “keeps more bees!” As I continued to think of the matter, it seemed so strange that this point in bee-keeping had never been brought home to me before. Then I thought there were thousands of other bee-keepers, just like myself, fussing and struggling along with a single apiary of 75 or 100 colonies, barely making a living, when, by spreading out, and increasing the number of our colonies, and adopting methods that would enable us to handle them, we might soon be in easy circumstances. I felt almost as though I had made a “discovery,” and yet it was really such a simple matter. From that day on, I have practiced and preached the “keeping of more bees.”

It is with a little elation, and much thankfulness, that I now receive letters from men who have secured a residence on “easy street” by
following the advice to "keep more bees." I can give an example right near home—that of my own brother, Elmer. He had a small farm and kept a few bees, and I hope he will pardon me for saying it, but he had quite a struggle to make a living. Then I became so enthused with Northern Michigan and her wild red raspberries, that Elmer caught the enthusiasm, sold his farm, moved to Northern Michigan, and turned his whole time and little capital to the keeping of bees; and, while it has cost a lot to move and establish apiaries, build cellars and honey-houses, and we have had many things to contend with, the forest fires, for instance, Elmer says that he has never had an easier time to get along and make a living, never felt happier and more free from care, than since he turned his whole time and talents into one channel—bee-keeping. His wife once said to me that they had never had so many things in the house, had as good clothes, and other comforts, as since they had gone into bee-keeping as a sole business.

I am aware that the circumstances and the man are not always adapted to exclusive bee-keeping, but there are many men now mixing bee-keeping with something else who would be better off if they would drop one or the other. It is much better to have a whole lot of one thing to do than to have a little bit of each of a lot of different things. Many say that they would like to keep more bees, but they haven't got them to keep, nor the money to buy them with. Let me say that the first, and most difficult, step in keeping more bees is to decide to keep more bees. Once a man really comes to that decision, makes up his mind that he will keep more bees, he can find ways of accomplishing his object.

It should be understood, however, that bee-keeping is not an occupation in which one can easily become wealthy. In this respect it is much like other rural pursuits. Rightly managed, in a locality adapted to the business, it can be depended upon to furnish a comfortable living, and perhaps enable a man to lay up a few thousands of dollars, but such fortunes as are sometimes amassed in merchandising or manufacturing can never be hoped for by the bee-keeper. Fortunately, however, the perfection of a man's happiness bears but little relation to the size of his fortune; and many a man with the hum of the bees over his head finds happiness deeper and sweeter than ever comes to the merchant prince with his cares and his thousands.
One of six Out- apiaries belonging to M. A. Gill, of Colorado.
Making a Start in Bee-keeping

Bees, and the requisite knowledge for their management, are the two most important factors in making a start in the business. The latter ought to be secured first; or, at least, its acquisition should keep pace with any increase in numbers of the former. As in any business, so with bee-keeping, it pays well to lay broad and deep the foundations of an education in that line of work. So many men fail in different kinds of business because they start in with only a narrow or superficial knowledge of their chosen profession. The time may come when bee culture will be taught at the agricultural colleges, the same as dairying is now taught; but at present the nearest approach to a college course is that of working with some experienced successful bee-keeper. This is the quickest way of learning bee-keeping; and, if the teacher is competent, it is a very desirable method. The beginner is not always able to choose wisely in selecting an instructor, hence it is well to supplement such instruction by a course of reading, and thus be able to make comparisons and discuss the instructor’s methods in the light of those employed by others. In fact, I am inclined to think that a thorough course of reading is the most desirable first step that can be taken by a prospective bee-keeper. One after the other, I would read the leading standard text-books. Having done this, the next step is to subscribe for the best bee journals. At this stage a season with an expert bee-keeper would be of great value, when the previous reading will enable the apprentice to use his mind intelligently, and see the reason of things instead of being simply an imitator, following blindly in the footsteps of his preceptor. Probably nine-tenths of the men who now keep bees never served an apprenticeship. Many have become interested in bees from the capture of a stray swarm. Neighboring bee-keepers would be visited, books or papers borrowed or bought, improved hives and methods adopted, and, as the bees increased, so did the enthusiasm and interest, until, finally, the bees received more time and attention than did the regular business. Thus did bee-keeping eventually become a specialty or the sole business.

When a man has decided to embark in bee-keeping as a business, he should in some manner learn the business thoroughly before invest-
Making a Start in Bee-keeping

ing extensively. No hard and fast rules can be laid down, so much depending upon circumstances. A young man with no established business would do well to pass one or two seasons in the employ of some experienced bee-keeper, as has been already suggested, while an older man already in business, with a family to support, may find it advisable to work into bee-keeping gradually, reading and studying as his bees increase. Whatever the method employed, let the work be thorough; and, especially, let there be plenty of actual experience before venturing extensively.

As a rule, a man already has some bees when he decides to become a bee-keeper. Perhaps he never formally makes any such decision. He captures a stray swarm, or cuts a bee-tree and saves the bees, and the stock increases with such wonderful rapidity that the owner becomes a bee-keeper ere he scarcely realizes it. This wonderful rapidity with which bees increase is one strong argument in favor of a man securing a few colonies and building them up into an apiary instead of buying a large number of colonies at the beginning. By rearing queens with which to furnish the newly made colonies, and furnishing them with full sheets of comb foundation, the extent to which bees can be increased in a favorable season is something almost beyond belief. Just how or where the first colonies shall be secured may well be considered. As a rule, the man who has steady work, at good wages, had better buy bees in such movable-comb hives as he intends to use. If he can get them near home, of some reliable bee-keeper, so much the better. Of course, there are instances in which a man has more time than money, or there may be a trace of the sportsman in his make-up, and, in either case, the hunting of bees, or the putting-out of decoy hives to catch stray swarms, will make him a strong appeal. In those parts of the country where many bees are kept, yet there is not much timber, as in Colorado or California, there is no difficulty in catching swarms in decoy hives; in fact, there is difficulty in keeping swarms out of chimneys and the walls of buildings. While out riding one day with Mr. Gill, of Colorado, he pointed out one house in the walls of which five colonies had their homes. In California Mr. Mendleson set away three empty hives in his wagon-shed; and when I was there, swarms had taken possession of two of the hives. Even in well-timbered localities, stray swarms are frequently caught in decoy hives. Mr. George A. Fenton, of Pine Island, Minnesota, reported in the Review, in 1900, that he had, the previous year, caught more than 50 swarms in decoy hives. He used ordinary boxes instead of hives, and put them pretty high up in tall trees, as a good hive, easily accessible, is quite likely to be stolen. A piece of old black comb is fastened inside the hive or box, and the latter firmly fastened to the tree so as not to be easily blown down, a position being chosen
where the hive will be in the shade. A tree on the edge of the woods is chosen, as, when a swarm reaches the woods, it at once begins a search for a suitable hollow in which to make its home. The hives are examined as often as once a week, oftener if there is time, and when one is found occupied the tree is ascended by the use of climbers, the box lowered by means of a rope, and another box fastened up in its place. Mr. Fenton attributed his success to the fact that the farmers near him who had a few bees did not watch them, but let the swarms go to the woods, and, further, there was no large timber for many miles around.

In all probability, more of my readers would be able to secure bees by finding and cutting bee-trees than by putting out decoy hives; and, as the subject will not be touched upon elsewhere, I will here describe how bee-trees are found. In principle, it is simply that of putting out honey, in times of scarcity, when bees will "rob," watching the loaded bees as they fly home, and following the "line" of bees to the tree; but there are many details the observance of which greatly aids the hunter in his search. Those who hunt bees to any great extent use what is called a "bee-box." This is a small box made in two parts, the lower half being used to hold a piece of comb filled with honey, while the upper part, or cover, is used principally for catching the bees and getting them at work upon the "bait." The top of the upper part is covered with a glass, and a short distance below the glass is a horizontal sliding partition; while still lower, just at the lower edge of one of the sides, is a small opening covered on the inner side with glass. Equipped with his box and a bottle of diluted honey, the bee-hunter begins operations in some field or cleared spot near the forest in which he expects bee-trees may be found. The honey is diluted with an equal amount of water, as it enables the bees to load
"Lining" Wild Bees
and unload quicker, to fly faster, and in a more direct line. Sometimes pieces of old comb are burned, the odor from the "smudge" attracting bees from a long distance. If, by careful search, a bee is found industriously at work upon some weed, the cover to the box is taken off, the slide drawn nearly out, and the open or lower side of the cover held near the bee. A handkerchief is then held upon the opposite side of the bee; and as the cover and the handkerchief are brought quickly together, the bee is caught in the former. Seeing the light, the bee at once buzzes up against the glass top of the cover, when the slide is shoved in, thus making the bee a prisoner. The cover is now replaced upon the box, the box set upon a stump or upon a stake stuck in the ground, the slide drawn nearly out, and the handkerchief spread over the glass top. The bee now sees only one opening, the small one in the side of the cover near its lower edge, and in attempting to escape by the lower opening, the bee comes in contact with the comb of honey in the lower part of the box.

To find the honey is to begin at once "loading up." Occasionally removing the handkerchief shows when the bee has found the honey; and as soon as it is seen filling its sac, the hunter carefully removes the cover and places his eye near the ground. This position is assumed to secure the sky as a background in watching the bee take its homeward flight. Under such conditions a bee can be kept in sight for a long distance. A minute or two suffices for the bee to fill its honey-sac, when it slowly rises in gradually widening circles. Each time around it sways more and more to one side—toward the spot where it lives; finally, having taken its "bearings," it strikes a "bee-line" for home. In a short time it returns with perhaps three or four companions in its wake—eager to learn whence came that fine load of honey. The result is, that a strong "line" of bees is finally at work between their home and the hunter's box. He now puts the cover on the box, shutting in the bees, and moves along on the "line" toward their home. After going some distance the bees are released, when they at once leave for home, only to return and re-establish the "line," when the hunter again closes the box and moves forward. When the bees turn and fly back on the line, it shows that the tree has been passed and must be near at hand. At this point in the game it may be advisable to resort to what is known as "cross-lining;" that is, the box is moved off several rods to one side, and another, or "cross-line," established. The tree must certainly be near the point where these two lines intersect. The trunks and branches of all large trees in the vicinity are now carefully examined, particular attention being paid to any knot-holes or openings. Getting the tree between the sun and the observer greatly aids in discovering
any bees that may be flitting about. An opera-glass is also a great aid in this part of the work.

Bee-trees are also found by walking through the woods in the first warm days in the spring, before the snow is off the ground, listening to their humming and noticing the dead bees that have been brought out and dropped upon the snow.

After the bees have been found, then comes the task of getting them out of the tree and into a hive. Sometimes it is possible, if they are located in a large limb, to cut off the limb beyond the portion occupied by the bees, and then cut off the portion in which they are located, and lower it by means of a rope. Again, it is sometimes possible to rig up a temporary scaffold and cut out a piece of the tree over the bees' home, remove the combs and lower them in a basket. Such proceedings are attended with more or less danger, even when carried out by the most careful of men, and I would rather put up with the more or less broken condition of the combs that usually results from cutting down the tree than with broken legs or arms. Many times a tree can be so guided that it will strike upon smaller trees that will break the fall. The saving of the bees and combs, after they have been reached, is very similar to an ordinary job of transferring from an old box hive to a movable-comb hive. Pieces of comb containing brood must be fastened into frames, and hung in the hive, and as many as possible of the bees guided into the entrance. If the hive is left on the spot for several hours, perhaps over night, nearly all of the live bees will gather into the hive.

As I said at the beginning, if a man has steady work at good wages he will, as a rule, find it more satisfactory to buy bees in good movable-comb hives; but if he has the time and inclination to get a start by hunting bees, or by putting up decoy hives, what I have written will show him how to do it.
Mistakes in Bee-Keeping

It is pleasant to tell of success. Mistakes are mentioned with reluctance; yet they may be of equal value for imparting information. Mr. J. M. Smith, of Wisconsin, is a noted 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 that contained more information than the one in which he recounted the mistakes of his horticultural life. I believe that space can be profitably used in mentioning a few things that experienced bee-keepers look upon as mistakes in bee-keeping.

A man who has decided that he will make bee-keeping his life business makes a mistake when he gets a few colonies and attempts to learn the business all by himself. Both time and money will be saved by passing at least one season in the employ of some 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 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 business 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, of Michigan, once 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 colonies, and striving to secure the largest yield per colony, it is usually more profitable to keep more bees—enough to gather all the honey in a given area, and then when that area is overstocked it is probably a mistake not to start out apiaries. There is much to be gained in having as few kinds of 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.

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 direction is that of trying to adapt hives to bees, to such an extent as almost entirely to 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 compelled 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 objects in view. We don't keep bees, nor arrange their hives, so much with a view to saving them labor as that we may get the most honey with the least labor to ourselves. Drone-traps, queen-traps, self-hivers, queen-excluders, separators, and many other contrivances, are probably not considered "handy" by the bees, but their use is an advantage to us.
It is in line with this method of reasoning that causes some beekeepers to make the mistake of condemning any practice that is not "according to nature." The whole system of modern bee culture is largely a transgression of nature's laws, or of managing differently than the bees would manage if left to their own way of doing things. In some things it is advisable to allow nature to have her own way; in others it is not, and our success is just in proportion as we learn when and 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 that they can improve some of the standard hives and implements, and that before they have fairly learned the business. A beginner with a few brains, boards, and buzz-saw, is the man of all others who feels called upon to invent a bee-hive.

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 novelties, reminds me that it is a mistake to have undue confidence in the leaders, or in any one, for that matter. 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. Read how other men have succeeded, consider their advice, but do your own thinking just the same, and 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, 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 overrun with orders, and ex-
Mistakes in Bee-keeping

Excessive and vexatious delays occur. A delay of a few days, at just the right time, sometimes means the loss of a crop of honey.

It is a mistake to attempt the production of honey, commercially, in a locality not suited for the business. The same may be said of queen-rearing. It is a mistake to attempt it as a business in the Northern States—the seasons are too short. I followed it several years, and, while the experience may be valuable to me in my position, I am now well satisfied that I would have made vastly more money had I turned my whole time and attention to the production of honey.

It is a mistake to suppose that a poor location can be changed to a good one by planting for honey. Those who thus imagine do not realize the vast area of bloom that is needed to produce a surplus crop of honey. The bees of an apiary, going 2½ miles in every direction, scour a territory of about 12,000 acres. There is this to be said, however, if the soil, climate, and other conditions are such that it is profitable for farmers to raise such crops as yield honey, then they will be raised, and the acreage will be such that the yield of honey from them will be of benefit to an apiary in that locality. Note the buckwheat regions of New York and the alfalfa-fields of Colorado as examples.
The Author of Advanced Bee Culture Admiring a Luxuriant Growth of Sweet Clover.
The Influence of Locality

In my earlier bee-keeping years I was often sorely puzzled at the diametrically opposite views often expressed by the different correspondents for the bee journals. In extenuation of that state of mind I may say that at that time I did not dream of the wonderful differences of locality in its relation to the management of bees. I saw, measured, weighed, compared, and considered all things apicultural by the standard of my own home—Genesee County, Michigan. It was not until I had seen the fields of New York white with buckwheat, admired the luxuriance of sweet-clover growth in the suburbs of Chicago, followed for miles the great irrigating ditches of Colorado, where they give life to the royal purple of the alfalfa bloom, and climbed mountains in California, pulling myself up by grasping the sage brush, that I fully realized the great amount of apicultural meaning stored up in that one little word—locality.

The basic principles of apiculture are the same the world over; but the management must be varied according to the locality. In the South and extreme West, the wintering of bees is easily accomplished, it being necessary only to see that they have sufficient food. As we go north, some protection must be given—either by packing or by the use of chaff hives. As we go still farther north, successful wintering is secured, as a rule, only by the use of first-class winter stores, and putting the bees into a cellar.

In Cuba and Florida the honey harvest comes in the cooler part of the year, or what corresponds to our northern winter; and those varieties of bees that will breed late in the summer, even though little or no honey is coming in, are more desirable, as more populous colonies are thus secured at the opening of winter. In the Northern States, east of the Mississippi, the main honey-flow comes, as a rule, early in the summer. It may be very abundant, but is seldom of long duration; for this reason those varieties of bees are preferable that rear brood very abundantly early in the season, and then slacken breeding as soon as the main harvest begins. In some parts of the West the honey harvest is much longer than in the East. There are no such rapid flows as we have here sometimes from basswood, but there is a steady flow that may last for months; the conditions being ideal for the production of comb
honey, as there is abundant time in which to build combs for the storage of the honey, fill them, and seal them over.

In the white-clover and basswood regions, swarming and the main honey-harvest come at the same time; in some parts of the Southwest, swarming comes on with the flow from the early minor honey-plants, and is almost entirely abandoned with the advent of the heavy honey-flow that comes on later.

The question of large versus small hives, over which there have been so many spirited discussions, is largely one of locality. In the cooler regions, where the harvest is early and short, small hives find favor, especially in comb-honey production, while the large hive is a favorite in the warmer regions that are blessed with a long honey-flow.

Which the bee-keeper shall produce, comb or extracted honey, is also largely a question of locality. Where the main honey-flow is short, as it is often from basswood, sometimes lasting only a few days, there is not time for the bees to build combs in the sections, fill them, and cap them over, before the harvest is over and past. With full sets of drawn combs in the extracting-supers, a good crop of extracted honey may be secured within a week. Such conditions as these exist in many parts of Wisconsin. Where honey must be shipped long distances to market, as is the case in Cuba and California, one very important reason for producing extracted honey is that there is so much less danger of damage in shipment. Dark honey is, as a rule, much more salable in the extracted form. When the flow is light but constant, and of long duration, as in Colorado, and the honey is white, comb-honey production has its advantages, as honey is worth more when stored in sections than when taken in the extracted form.

California furnishes the most immense crops of honey that are anywhere produced, but they are entirely dependent upon the rainfall that comes in the winter. If the rains fail to come, the bee-keeper knows to a certainty that not only will there be no surplus, but, unless the proper management is given, his colonies will perish from starvation.

In the buckwheat regions of New York, not much dependence is placed upon the early honey-flows for securing a surplus. They enable the bees to breed up, and, as a rule, finish their swarming, before the buckwheat opens, when the main crop of the season is gathered. A colony so weak in the spring that it would be nearly useless in a flow from clover or basswood, has abundant time in which to build up for the buckwheat honey-harvest.

Then, again, there are localities near swamps, where the main flow comes very late, from fall flowers, asters, and the like. The yield is often very abundant, but the quality is undesirable when used for winter stores. If the cold confines the bees for several months upon such stores,
they are almost certain to perish. The only remedy is to extract the honey and feed sugar syrup, unless it might be that of brimstoming the bees in the fall, and buying more in the spring from some other locality—a course which has been followed successfully, as the long season for preparation allows of the building-up of one colony into several.

It would be an easy matter to use pages in giving illustrations of the differences in localities, but it is unnecessary; the thing for the bee-keeper to remember is that, if he changes his locality, he must leave behind him many of his old notions and methods, and seek the advice of his new neighbors who have been successful. The veteran bee-keeper from the verdant hills of old Vermont would make a flat failure were he to bring his apiary to Colorado, and manage it the same as he has been accustomed to do. A bee-keeper can not know his locality too thoroughly. Some men succeed in localities where the majority fail, and one reason is because their more thorough knowledge of the locality enables them to adopt methods more perfectly adapted to the peculiarities of that location. Above all things, know your locality.
Best Stock and How to Secure It

There are only two varieties of bees worthy of consideration for use in the United States; in fact, they are about the only varieties now left here for consideration, and they are the Italians and the Germans (or blacks) as they are commonly called. The prolific Syrians and the fierce, irritable Cyprians, have practically passed away on this side of the waters. These varieties of bees are very prolific, but undue prolificness is of no value—it is really objectionable for this part of the world. If queens cost large sums of money, there might be a shade of reason 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. The great ambition of these varieties seems to be to rear brood instead of to store honey. Their only object in gathering honey appears to be that it may be used in rearing brood. They will rear brood until the last drop of honey in the hive is used. The Syrians also have the undesirable trait of filling the cells so full of honey, and capping it so poorly, as to give it a dark, watery appearance, which is very objectionable in comb-honey production.

Carniolans resemble the Syrians and Cyprians, so far as prolificness is concerned, but are very gentle, and cap their honey with a whiteness equal to that capped by the blacks; but this disposition to extend their energies in breeding and swarming has caused them to be discarded in their purity, although a few bee-keepers still prefer a cross between them and the Italians.

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 main honey harvest begins in earnest, breeding is greatly reduced, and most of the energy turned to the gathering and storing of honey. It might be safely said that the Italians are the standard variety of this country. They are very gentle in disposition, remaining quietly on the combs when being handled, while there seems to be about them a peculiarly quiet, steady, energetic determination possessed by no other variety. Almost any variety of bees will do fair work gathering honey when it is plentiful and near by; but when the flowers yield sparingly, and must be sought for far and wide, then it is that the Italians...
carry off the palm. For the production of extracted honey, the Italians are probably unexcelled; but in producing comb honey the blacks show two points of superiority. They are more willing to store their honey in the supers at some distance from the brood, and, in capping their honey, they leave a small space between the honey and the capping, which gives to the comb an almost snowy whiteness. The blacks are also more easily driven out of the supers with smoke, and more readily shaken from the combs. They are very irritable while being handled, many taking wing, and others running about upon the combs, gathering in bunches and dropping off upon the ground. For the production of comb honey there is probably no better bee than a cross between the Italians and the blacks, at least so far as results are concerned. They are energetic workers, willing and ready to store their honey in the supers, but, unfortunately, they are possessed of a very uneven temper. Either variety, black or Italian, in its purity, is easier to handle than is a cross between them.

Modern bee culture, with its “bait” sections of partly drawn combs, or the putting-on of extracting-supers at the opening of the season, then changing them for sections after a start has been made, has well nigh overcome the objection of the Italians clinging to the brood-nest, while much can be done by selection in breeding to overcome the trait of poor capping. In brief, if I were to engage in the production of either comb or extracted honey, I would adopt pure Italians; then, by selection in breeding, get rid of the undesirable traits, such as “watery” capping of the honey, inclination to build large quantities of brace-combs, undue swarming, etc. Every bee-keeper of experience, who has tried different strains of bees, knows that there is a great difference between different strains of even the same variety. A bee-keeper who is just starting in the business, or one already in the business who has not taken such a course, ought to get queens from several of the best breeders, then adopt some easily kept but comprehensive system of recording the traits and peculiarities of each colony. The card system which has been so successfully adopted in so many ways readily lends itself to this use. If the bees of any colony prove vindictive, requeen it. If the bees of another colony are poor comb-builders, or cap their honey poorly, destroy the queen and give them another. Do the same if they build large quantities of “brace-combs,” or if they are unduly given to swarming, or if they are poor honey-gatherers, or do not winter well. On the other hand, the desirable traits should be watched for and recorded, and queens reared from the queens of such colonies. Care ought also to be taken that no drones are reared, or allowed to fly, from undesirable stock, and pains taken to rear them in goodly numbers from the best stocks in the apiary. By pursuing this course, the bee-keeper will
eventually build up a strain of bees that will be peaceable, hardy, good honey-gatherers, and good comb-builders. Well-directed efforts at improving his stock, carefully watching and recording the traits of each colony, getting rid of poor queens and keeping the best, perhaps buying queens occasionally and comparing their progeny with the stock already on hand, always breeding from the best, such a course as this will prove the most profitable of any which a bee-keeper can pursue. The wonder is that it is so greatly neglected.
The Choice of a Hive

Early in every bee-keeper's life must come the choice of a hive—and a perplexing question it often proves. Probably there is no “best hive” for all persons, locations, and uses; in fact, a choice is usually more or less of a compromise—the relinquishing of certain advantages for the sake of securing others considered more desirable. The tastes of a bee-keeper, his system of management, the kind of honey produced, the method of wintering, the location, etc., all have a bearing upon the kind of hive that is most desirable; but the inducements must be great, indeed, that would lead a man to adopt an odd-sized hive or frame. As to size of frame, it is probable that the Langstroth is the most widely used, is well adapted to the production of both comb and extracted honey, and its choice can not be a serious mistake. With the choice of a frame, a decided step has been taken toward the choice of a hive: in fact, the most important question left to be settled is the number of frames to be used in the hive. In those parts of the country blessed with a long honey-flow, or if extracted honey is to be produced, hives holding ten Langstroth frames are desirable. If bees are to be managed in out-apiaries, or upon any plan where they are not to receive close and constant attention, large hives possess the advantage of containing sufficient stores to avoid danger from the bees starving in times of scarcity. The argument sometimes used in favor of large hives, that they give the queens more room to lay, is decidedly fallacious. We do not keep queens simply to “give them a chance to lay,” but to secure the prompt and thorough filling of the brood-combs with eggs, and this is more surely accomplished by using a hive of moderate size, one below rather than above the laying capacity of the average queen. It is true that larger yields per colony may be secured with large hives, but not any larger yields per comb. Where the honey-flow is short, or comb honey is produced, a smaller hive, one holding only eight Langstroth combs, has its advantages.

The hive body for holding the frames need be nothing more than simply a box with plain square corners, without top or bottom, having rabbets on the upper inner edges of the end-pieces, for supporting the frames. If a hive is nailed up with the heart side of the lumber out, it is less inclined to warp. A plain simple board, cleated at each end,
upon the under side, to prevent warping, with half-inch strips nailed along the two sides and back end, upon its upper surface to support the hive, is the equal of any bottom-board.

It may not be amiss to say that hives may be used with no bottom-board except the earth. The hive sits upon a rim made of rough cheap lumber, an entrance being furnished by making the front end-piece of the rim an inch narrower, and the rim filled with earth or sawdust to within an inch of the top. At first thought this seems like a very rough, primitive affair, as though using simply the earth for a bottom-board would not answer, but it is difficult to say why.

A cover after the same style, simply a plain board cleated at the ends to prevent warping, is a model of simplicity and desirability. If it is difficult to obtain boards wide enough for covers, they may be pieced, even made of narrow strips, then the upper surface covered with a piece of muslin while the paint is fresh, and another coat of paint applied over the muslin. If kept properly painted, such covers will not leak.

Much has been written about staples and projections on frames to make them self-spacing; but the objections greatly overshadow the advantages, which are that all the frames are kept exactly the same distance apart; in closing up the hive, or, rather, in arranging the frames
preparatory to closing the hive, they can all be shoved over in a body, by pressing against the outside one; and if the hives are to be moved, as from one apiary to another, the frames are held in position without any additional fastening. The moving of colonies from one location to another is something that occurs only occasionally, in many cases not at all, and it is better to fasten specially all of the frames once or even twice a year, should it become necessary, than to be continually annoyed by objectionable attachments. In closing up a hive there is some advantage in being able to shove the frames over without taking up any time in spacing them; but, so far as exactness is concerned, there is no necessity for self-spacing devices, as the combs may vary from 1 1/4 to 1 1/2 inches from center to center without any serious results. The eye and hand very soon become trained to sufficient exactness in the matter of spacing. The most serious objection to self-spacing is that it destroys the most valuable feature of hanging frames—the lateral movement. If frames hang free, it is an easy matter to press one over one way and another the other way, and then lift out the one that hung between them. Self-spacing prevents this. Before self-spaced frames can be moved, a division board, or "dummy," must be pulled out at one side of the hive, and sometimes this board is glued fast and more difficult to remove than would be an ordinary comb. Another objection to staples or other metal attachments is that the honey-knife is likely to strike them, and be dulled, when the honey is being uncapped; and they also give trouble by catching in the wire cloth forming the reel of the extractor. A few men have tried and been pleased with the plan of supporting frames upon nails driven into the centers of the ends of the top-bars. To illustrate: Take an ordinary Langstroth frame: saw off the projecting ends of the top-bar; then, into the center of each end of the top-bar, drive a six-penny nail at such a point that its lower side will occupy exactly the same point as the lower side of the wooden projection occupied before it was sawed off. The nail is, of course, driven in until it projects exactly as far as the former wooden projection extended beyond the end-bar. These nail-supporters may be used either with or without metal rabbets. In either case the points of contact are so slight that there is little opportunity for gluing them fast, and the frames can always be loosened with the fingers.

Closed-end frames, in common with other styles of self-spaced frames, possess the advantage that they need no fastening when the hives are moved from one part of the country to another; but, aside from this, the advantages are all with the loose (or hanging) free-swinging frame.

A divisible-brood-chamber hive, one having two sets of shallow frames, thus allowing the hive to be divided horizontally, possesses
some advantages. For instance, at the beginning of the season it is desirable to induce the bees to spread out and fill their combs as completely as possible with brood; and by dividing the brood-nest horizontally, transposing the sections, placing the lower one above and the upper one below, we bring together, in the center of the hive, the outside or spherical portions of the brood-nest, while the broad center surfaces are thrown to the outside. In their efforts to bring the brood-nest back to a spherical shape, the bees remove the honey from the center of the hive and replace it with brood, thereby increasing the amount of the latter. The transposition of the two sections of the brood-nest also throws a large surface of brood up close to the supers, which greatly hastens the beginning of work in the sections.

The use of this style of hive also allows of contraction of the brood-nest without reducing the supering surface or the bringing in of "dummies," as must be done with other styles of hive. Divisible-brood-chamber hives cost considerably more than other styles of hives, and, after using them for years by the side of the ordinary Langstroth hive, seeing them used by other persons in different locations, and considering the new features that have recently sprung up in bee-keeping, I have gradually come to the decision that if I were now starting in the bee business I would not use the horizontally divisible hive. In my opinion, its greatest point of superiority is in practicing contraction of the brood-nest; but so far as handling frames is concerned, there is no frame that approaches the plain all-wood hanging frame, and, in managing out- apiaries, in which case there is not time for using the bee-escape, this is a most decided advantage.

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; further 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 (but it does not come at a hurrying time of the year), 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 the chaff hives, while the advantage of having light single-walled hives during the working season, hives that can be picked up, handled, manipulated, tiered-up, carried, if advisable, to a distant or 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.

In brief, my choice of a hive for Michigan is a simple plain box with plain all-wood hanging frames—and I would winter the bees in the cellar.

Divisible-Brood-chamber Hive.
Queen-Excluders

A honey-board is easily made queen-excluding by simply cutting saw-kerfs in the edges of the slats, and slipping strips of perforated metal into the kerfs between the slats. Whole sheets of zinc have been used as honey-boards, but they are lacking in rigidity. They are likely to sag, 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 tops of the brood-frames. The wood-zinc honey-board is free from this defect.

In the production of comb honey there is little need for a queen-excluder over an old established colony; but when a swarm is hived in a contracted brood-chamber having starters only in the frames, and given the supers of partly finished sections from the old hive, a queen-excluder is almost a necessity. The queen, finding no combs in the brood-nest, at once invades the sections, where the bees soon clear out some of the cells for her to lay in, and, having begun her brood-nest there, she is quite likely to remain there until considerable comb has been built below.

In the production of extracted honey, queen-excluders are a great convenience, if not a necessity. If they are not used, the brood is almost certain to be scattered through the supers, or upper stories; and ripe honey, ripe as it ought to be when it is extracted, can not be thrown from the combs very rapidly or completely, without at the same time throwing out the brood. If brood is found in the upper story, it is, of course, sometimes possible to exchange such combs for the outside combs in the brood-nest, if such can be found without brood, but all this takes time. To conduct an apiary successfully, 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 producing extracted honey, and that is the freeing of the supers of bees by the use of bee-escapes. If the super

contains brood and, perhaps, the queen, the bees could not be induced to desert by the use of an escape. If they did leave the brood, then something would have to be done with the brood, as already mentioned. In short, advanced bee culture has divided the 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 thus to set a boundary beyond which the brood can not go.
Sections and Their Adjustment on the Hive

The standard size of sections is $4\frac{1}{4} \times 4\frac{1}{4}$ inches; at least, this has been the standard for many years, and I think is yet; but there is considerable effort to place upon the market and secure the adoption of a tall section—about $4 \times 5$ inches. Its chief advantage is in being more pleasing to the eye—possibly in conveying the impression that it contains more honey than a square form having the same amount of surface. Our windows, our books, our pictures, etc., are made oblong instead of square, because they are more pleasing to the eye, and, for the same reason, a tall section presents a more pleasing appearance than a square one, but I do not consider this point of sufficient importance to warrant a bee-keeper in changing his fixtures in order that he may use the tall section.

"Beeway" sections are those in which the bees gain access to them through insets, or "beeways," cut in the top and bottom bars of the sections; but of late there has been introduced a new style, called the "plain" section, in which there are no insets, it being the same width all the way around. Sections of this style are held bee-space apart, and the bees admitted, by the use of what are termed "fence" separators, from their resemblance to a board fence. A fence separator is formed of slats about $\frac{1}{2}$ of an inch in thickness, held a bee-space apart by cleats glued or nailed in an upright position to their sides. These cleats, or posts, are of such a thickness, and placed at such a distance apart, upon each side of the separator, that the edges of the side bars to the sections come against them, and are thus held out bee-space from the slats.

The principal advantage of plain sections and fence separators is that the freer communication thus allowed the bees induces them, from some reason, to build out the combs fuller around the edges and corners, and attach them more perfectly to the sections. This gives the finished product a more attractive appearance, and greatly lessens the danger of breakage in shipment. Another point, although it may be a minor one, is that a plain section is filled fuller of honey; that is, the edges of the wood do not stand out so far above the surface of the comb as they do in the beeway sections. A filled plain section has a plumper look than a beeway section, the latter having the appearance of being only partly filled. A tall plain section may not contain any more honey than a square
section of the beeway type, but it appears to contain more, and has, withal, a more attractive appearance. There is still another little point, and that is that a plain section offers special advantages in the matter of cleaning it of propolis, as there is no inset to work into with the scraping-knife. I do not, however, consider the advantages of the plain section sufficient to warrant any expensive change of fixtures in order that it may be adopted.

While I have produced tons of comb honey without the use of separators, and could do it again in this locality, I think I would use them were I again to engage in comb-honey production. I know of no objection to their use, except that of cost, and I certainly would advise their use by the great mass of bee-keepers. In many localities there are bee-keepers who can, without separators, produce sections of honey that are tolerably perfect, straight enough to be crated with a little care, but there is another end to the business—that of the retailer and his clumsy clerks who are not bee-keepers. Nothing discourages and disgusts a retailer more than a lot of dauby, dripping, damaged sections.

To sum up this chapter in a few words, my preference is for a tall plain section, used with fence separators.
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 fly over the heads of the passersby. 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 near the street. When it is necessary to handle the bees when no honey is coming in, and such handling is likely to irritate them, the work can be done just before dark, when the bees will not fly far from their 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 in an apiary. If it slopes gently to the south or east, so much the better. It should never be in such a location that the 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 hives, 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 quite serious objection that only part of the apiary can be
A Glimpse of One Corner of the Review Apiary at Flint.
This apiary stands just in the southern edge of a piece of oak woods, and is surrounded by a fence of poultry-netting, with a strand of barbed wire at the top.
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 house is at one side of the yard, the whole apiary can be taken in at a glance. Other things being equal, the south side of the apiary is preferable for the house. In looking for swarms the bee-keeper does not look toward 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 toward the apiary.

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 a southern corner of the building, and the walls made of some non-conductor of heat. Some even paint the side of the building a 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 unsealed or unripe honey, this high temperature causes evaporation and improvement. By keeping such a room warm with a stove in winter, comb 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 the rows radiate from the honey-house door, thus forming one-half of a large wheel, instead of the whole of a smaller one, as in the case of having the honey-house in the center. When the radiating rows are very long, they become far apart at the outer ends, or else very close together at the inner ends. To remedy this, shorter rows, or "spurs," may be put in between the long rows at their outer ends.

Another arrangement is that of placing the hives in a hexagonal manner, each hive being the center of six others. This is a pleasing arrangement to the eye, but it has been reported that the massing of the hives in such a regular manner has a tendency to lead the bees to enter the hives standing on the outside of (or edge of) the apiary, thereby weakening the colonies in the center of the yard.

Placing the hives in small groups is a most excellent arrangement. Mr. J. E. Crane, of Middlebury, Vermont, arranges his hives in groups of ten each, each group being arranged as follows: Two hives facing the north, three facing east, two the south, and three the west. Nine such groups, arranged in a square, three groups each way, furnish room for
ninety hives in a very compact body, yet each hive is given a most distinct individuality.

Still another arrangement is that of placing the hives in circles. The entrances of the hives in the inner row are toward the center, while those of the outer row face outward. 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 arranged in a quadrangle.

In nearly all of the large apiaries that I have visited, the hives were arranged in straight simple rows like the squares of a checkerboard, the entrances in some instances facing the same way, while hives were from six to eight feet apart. I should prefer to have the entrances of each alternate row turned toward the east, and the entrances of the hives in the other rows turned toward 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 should prefer to have the entrances to every hive face either east or
west, because I wish to shade each hive with a light board, 2 x 3 feet in
size, laid over each hive, and projecting toward the south, and this pro-
jecting 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 radi-
ating from a common center I always turn the entrance of each hive so
that it is either east or west.

There is no reason for 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 is from other hives as
they do by the 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 unhesi-
itatingly 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, yet each bee has no difficulty in distinguishing its own hive. In
a row of three or 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.

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 hive with a 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 can not be done,
the hives containing unfertile queens may be marked in some conspicuous
manner that will easily enable them to distinguish their own hives.

In queen-rearing it is important that the small hives, containing the
nuclei, be scattered about promiscuously: the greater the irregularity and
oddity of the 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 more practical 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.
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: Mr. H. R. Boardman, of Ohio, has a cart for carrying his 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 wheelbarrow with two wheels, 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 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. Then, again, Mr. J. A. Green, of Colorado, 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 them and secure them is often more work than to earn the money with which to buy them; but their possession often makes all of the difference between a season of pleasure and one bordering on drudgery, to say nothing of the bearing they may have upon the profits. 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 dependent upon that. When there is much shaking or brushing of bees to be done, I prefer to wear light calf-skin boots with the trousers tucked inside. If the grass is wet I wear rubbers over the boots. When shoes are worn, the trousers may be tucked inside the stockings. One fundamental principle about clothing to be worn in the bee-yard is that one garment laps closely over the other, leaving no opening into which a bee can crawl, and the lower garment should lap over the upper one, as bees almost invariably crawl upward and the clothing should be so arranged that a bee can crawl from a man's foot to his head without being led into any opening. Mr. Arthur C. Miller suggests 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. In the heat of the day, however, few bee-keepers, doing active work in the apiary need either coat or vest. The hat that approaches the nearest to perfection, in Mr. Miller's opinion, is the helmet. It has visors front and back, and a ventilator all around the rim and the inner band. It is light and cool, and protects both the eyes and the back of the 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 cyclists and others. Light-colored clothing is not only cooler, but saves the wearer from some stings, as the bees seem to have a decided aversion to dark or black objects. I know one bee-keeper who dresses in white duck from head to toe, and he is positive that it saves him from many attacks from the bees. In the heat of the working season I wear linen trousers, a white cotton shirt, and a straw hat. I have seen recommended the wearing of light woolen clothing, but have never tried it. Ernest R. Root mentions the comfort that
he has derived from the wearing of light underclothing. But he does not perspire freely, and his underclothing retains the perspiration, keeping the skin moist. With me it is the reverse. I perspire so freely the clothing is soon soaked through and through, and frequent changes are necessary. Perhaps each will be obliged to decide the matter by personal experience.

I never wish 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 off 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. And when it is necessary to wear a veil in hot weather, who has not wished that there was some way of holding it down, aside from that of tucking it inside the collar? When the neck is hot and sweaty, how uncomfortable it feels with a sort of muffler pressed close against it by the collar! Besides this, the veil is held suffocatingly close to the face—so close, too, that the bees often sting through it. All this may be avoided, and I'll tell you how. In a hem in the bottom of the veil run a string, leaving about a foot of the hem, right in front, unoccupied by the string. That is, let the string enter the hem at about six inches to the right of the center of the front; pass it around the back of the neck, bringing it out of the hem at a point about six inches to the left of the center of the front. The projecting ends of the string must be long enough to pass under the arms, cross at the back, and then be brought around and tied in front. The string holds the edge of the veil securely out upon the shoulders, while, if the right length of hem is left without a string in front, that part will be drawn snugly across the breast. To Mr. Porter, of bee-escape fame, belongs the honor of devising this unsurpassable way of holding down a bee-veil.

Gloves I have never worn, and doubt if I could be led to believe them a comfort. To use them would seem too much like a cat with
mittens on trying to catch mice. Perhaps a beginner might tolerate them until his timidity has worn off.

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 of 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 or a Root smoker; get

a barrel of planer shavings from dry pine, to use as a fuel, and then take comfort. If you have never used shavings as a fuel, you may have trouble in getting the fire to going. Don’t put in too many shavings at first. Leave off the cover and keep puffing until they have burned down to cinders before putting in more. A little kerosene oil, from an oil-can, as has been mentioned, is a great help in starting the fire. When through using the smoker, don’t throw out the fire, but stop up the nozzle with a wad of grass, thus smothering the fire, and the charred remains left in the bottom of the smoker will light very readily at the touch of
a blaze from a match—much more so than fresh fuel. Keep matches in a safe place near where the smoker is to be lighted. Never be pestered by having to run off somewhere after a match. Above all, don’t keep the smoker fuel and matches in the honey-house, as the danger from fire is too great. Rig up a box or a barrel or an old hive, with a rain-proof cover, and have it located some distance from the honey-house. I kept the fuel 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 smoker filled with green weeds or grass, and there is no danger of blowing sparks into the hives.

Have a wheelbarrow for carrying cases, hives of honey, and other heavy articles. In making a wheelbarrow, some bee-keepers have used a wheel from some old discarded bicycle, the pneumatic tire doing away with the jolts in carrying honey or hives of bees.

With such hives as I use, the cover can be turned up on edge and used as a seat. Where such is not the case, a seat of some kind ought to be provided. A light box $17 \times 12 \times 9$ gives a chance for having a seat with any one of these heights. It should be strong enough not to rack, and have hand-holes in the side for carrying it.

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 nearly twice the value of that taken in a standing or sitting posture.

For brushing bees off the combs I know of nothing more effectual or comfortable to both the operator and the bees than the so-called Coggshall brush, which is a sort of whisk-broom, with the strands thinned out, and longer than the ordinary whisk-broom, so as to enable the operator to give a soft, pliable, easy sweep of the combs. In using this brush it is not intended that the combs be brushed with the $cuds$ of the strands, as one would sweep a floor. Instead, the brush is laid flatwise against the comb, and given a quick, sharp, lateral sweep.

Let each bee-keeper look about his apiary and see if he is not doing some of his work in an awkward manner—one that might be avoided by providing a few comforts and conveniences.
A Well-shaded Hive.
Shade for Bees

Shall we shade our bees? If so, why, when, how? Some beekeepers 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 summer, when brood is being reared, is nearly 100 degrees. Until the temperature in the sun reaches this point, shade is no benefit; rather, it is 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 degrees, and begins to climb up to 110 degrees, 120 degrees, 130 degrees, then the effort on the part of the bees is to lower instead of raise the temperature of 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 are compelled thus to desert their hives to save their combs from destruction. I have always kept my hives shaded during hot weather, hence can not 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 can not escape fast enough? If this is 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 during the day, and gradually giving it up during the cool of the 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 then protect it from the sun's rays.

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 shone 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 it is needed, if it is needed, is 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, grapevines, 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 hive. 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 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 stone upon this board to keep it in place. Don’t imagine that hooks or something of that kind 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, they can be tacked together, forming packing-boxes in which to pack the bees for wintering.

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 out 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; but if the hives are dark in color, or the apiary 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 in the season, 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 the honey is uniform throughout the season, and no advantage is to be 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 ordinary 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 of 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 at the time of hiving a swarm that I have found contraction of the brood-nest advisable. Years ago some of the "big guns" in api-
culture 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 had been put on they would not have been occupied until the lower hive was filled; and by the time this was accomplished it often happened that the white-honey harvest had passed. If the old colony did not swarm again (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.

When the brood-nest is 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, thus left, by using "dummies." A "dummy" is simply a brood-frame with thin boards tacked upon each side. 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 the dummy touch the sides of the hive, then the bees can not glue it fast. How thick a dummy should be depends 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 flatness of the brood-nest, and the absence of any dummies under the outer sections, make the bees more inclined to work in the sections.

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 into 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 an extent, and too long continued, it certainly does. If a man wishes to turn bees into honey, so to speak, contraction of the brood-nest 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 consumptive, non-productive part of the year.
The Use and Abuse of Comb Foundation

That comb 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 to be allowed to build comb naturally.

Years ago I practiced hiving swarms upon 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" or polished 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 almost to a standstill. 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 advantage of full sheets of foundation over starters, or vice versa, was not so apparent, and, until the close of the season, an equal number of swarms were hived alternately upon full sheets of 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 starters only, in the brood-nest, 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 upon drawn 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,

Bees Secreting Wax and Building Comb.

the honey must, from necessity, be stored in the supers until the foundation in the brood-frames 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 for a vacuum than has a bee for an empty cell during a flow of honey; so, while 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 starters only, the first step is, necessarily, the building of comb. 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 in the super 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, while 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 quantities 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. 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 the bees begin hatching from its center before the bees have filled it with comb, and the queen returns to refill the cells being vacated by the hatching bees, the comb-builders are quite likely to change from worker to drone comb.

No fairer question could be asked than: "What are the advantages of this system?" In the first place, the cost of the foundation is saved; but, although 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 of 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 greatest objection to this plan is that it can not be depended upon to produce all perfect brood-combs. I think I am safe in saying that I have had thousands of combs built under this management, and
I think that at least eighty per cent of them were as perfect as it would be possible to secure by the use of full sheets of foundation. A much larger percentage was 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 commence their combs, so small that the swarm completely covered it. All of the combs were thus commenced at the same time. As a rule, they were nearly as perfect as possible, at least so far as straightness was concerned. When I came to using the 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 the bulging of some of the combs.

Sometimes drone comb will be built in spite of contracted brood-nests. Usually this is the result of old queens. But then, we can't always have young queens, hence I can only repeat that this method gives excellent results in the way of surplus, but can not be depended upon always to furnish perfect brood-combs. Some keep watch of the brood-combs while they are being built, cutting out crooked, bulged, or drone comb, and using it in the sections. I can not 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 contracting the brood-nests when hiving swarms, then uniting colonies at the end of the season, culling out the imperfect combs and rendering them into wax. I think all such combs are built at a profit.

If securing straight, all-worker combs is not the greatest advantage 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 inter-changeable 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 can not 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 of 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 did 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 in the supers.

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 cannot get perfect brood-combs, he certainly can allow the bees to build their own combs for the surplus comb honey. And, by the way, no comb built from foundation can ever equal the delicate flakiness of that built naturally by the bees. If the 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 necessarily be heavy. All foundation in brood-frames, upon which swarms are hived, should be wired to prevent sagging and breaking down.
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 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 the owners of out-apiaries; and while they may not be so particular about preventing increase, they do wish to prevent 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 in my apiary swarmed or else didn't swarm. One year I had seventy-five colonies. They were worked for comb honey. Forty of them swarmed; thirty-five of them 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 lead to swarming. The chit of the discussion 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 is well filled with brood, then for lack of 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 with the number 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 combs, is the most successful, practical method of controlling increase. In large apiaries, 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 some one 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 it is doubtful if there is a profitable method of preventing swarming, although, of late, the practice of what is termed "shook swarming" enables the bee-keeper to swarm a colony in a manner very nearly approaching natural swarming when he finds that preparations are being made for swarming. When he finds a colony building queen-cells he knows that within a few days, a week at the utmost, the colony will cast a swarm; and, instead of waiting, and allowing the colony to swarm when it has completed its first queen-cell, he takes the matter into his own hands by shaking off most of the bees and the queen into a new hive, treating this shaken swarm in exactly the same manner as he would treat a swarm that had issued naturally. In other words, the bee-keeper simply forestalls what would have occurred naturally, in a few days, if the colony had been left undisturbed. The advantage is that the bee-keeper can thus bring about the swarming when he is present to attend to it, instead of having it happen when no one is present. This plan enables him to visit out-apiaries at stated intervals, giving each colony an examination, and "shaking" those that are making preparations for swarming. A colony that is not building queen-cells is not likely to swarm inside of a week, and may be left undisturbed until the next weekly visit. Another minor advantage of shook swarming is that it does away with the uniting and mixing up of two or more swarms that may issue at the same time in a large apiary, where natural swarming is allowed. Failures in shook swarming result, as a rule, from doing the work too early in the season, before the colony has made preparations for swarming, and in not disturbing the bees sufficiently at the time, thus causing them to fill themselves with honey, as they do when swarming naturally. Before beginning the work, it is well to jar the hive, or pound upon it, until the bees are thoroughly frightened, and have filled themselves with honey. If it is desirable to have increase, the old hive can be given a new location and a laying queen, or a ripe queen-cell. If no increase is desired, the old hive can be set by the side of the new one, with its entrance turned slightly to one side; then, at the next visit, it may be shifted to the other side of the new hive, when the flying bees will enter the new hive. A week later it may be placed back upon the other side, and, at the next visit, three weeks from the swarming, the few remaining bees may be shaken out of the old hive. The shifting of the old hive, from side to side of the new hive, may be omitted, the old hive being left standing by the side of the new one until the three weeks have elapsed, when all of the bees may be shaken in with the new colony. The advantage of the former plan is that some of the hatching bees are sooner thrown into
the new hive, where their work will be to the greater advantage of the owner.

To avoid all danger from after-swarming, it is desirable to shake the combs quite clear of bees when making a "shook swarm," and this sometimes results in chilled or starved brood. There is a way, however, to avoid this difficulty. Set the new swarm a little to one side of the old stand. The flying bees return to the old stand and care for the brood. At night the hive containing the brood, and the flying bees that have returned and entered it, is picked up and carried to a new stand, and the "shook swarm" placed upon the old stand. Of course, the old bees that are carried to the new stand gradually come back to the old stand, and join the "shook swarm," but it is one or two days before they all get back, and, in the meantime, young bees are hatching out; and by the time the old bees have all returned, there are sufficient young bees hatched to protect and feed the brood.

When natural swarming is allowed to the extent of first swarms, it is an easy matter to prevent the issuing of after-swarms in a home-\-apiary where there can be daily attention. The plan is very similar to the one just mentioned for preventing increase when practicing shook swarming. 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 be at once resumed in the sections. Place the old hive by the side of the new one, 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 toward that of the new hive. At the end of the sixth day the two hives should stand side by side. Practically, the two hives are on one stand. True, the bees of each hive recognize and enter their own home; but, remove one 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 buoms 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 \textit{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; but, as a rule, this plan is
a success. If an after-swarm does come out, I open the hive, while the
swarm is clustering, cut out all of the queen-cells, return the swarm,
and that is the end of the swarming. If the bee-keeper desires no
increase, he can pursue the plan just given until it is time to remove
the old hive to a new location, when it may be shifted to the opposite
side of the new hive, with its entrance turned to one side; then gradually
worked back to the side of the new hive, as has been already explained.
then, at the end of the week, shifted back to the other side, where it
may stand another week, when all of the bees may be shaken out, and
the hive and combs removed. What little honey remains in the combs
may be extracted, or, if some of them are well filled with honey, they
may be saved to give any colony that is lacking in stores at the approach
of winter.

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, and the same may be said when
shook swarming is practiced; 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 much reduced in numbers for successful wintering,
when it may be united with the parent colony.

Quite a number of bee-keepers have succeeded to their entire satis-
faction in preventing after-swarming, also in preventing increase, while
only a few have succeeded in preventing swarming when working for
comb honey. 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 once during
this interval. Although a few good men practice this method, I never
could bring myself to adopt it—there is too much labor.

The man who is raising comb 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 the
old colony shall be again merged into one, depends upon the desirability
of increase.
The Hiving of Bees

Natural swarming, with its uncertainties, anxieties, and vexatious losses, is destined to become eventually a thing of the past. Methods of controlling increase, preventing it altogether, or else doing the work artificially, will reach such perfection that swarming will be eliminated. Many bee-keepers are already forestalling swarming by some artificial method of increase, notably that of shook swarming. No professional bee-keeper, worthy of the name, any longer allows natural swarming, uncontrolled, in a large apiary. The days have passed when we can afford to allow several swarms, issuing at the same time, to join forces and make merry in the top of some tall tree. Even if swarming is allowed, the queens are either clipped or else controlled by means of queen-traps in front of the entrances of the hives. Two or more swarms issuing at the same time may unite, and give trouble by attempting to enter one hive when they return, but there will be no loss of bees nor climbing of trees. The bees will stay in the yard, and can be brought under control.

When swarming is allowed, 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 their old location, which they will do when they find 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 into 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—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 a size that the workers can pass but not the queen. When a swarm issues, the queen attempts to follow, and, eventually, finds and passes through a cone-shaped opening in the upper part of the trap. Here she finds herself trapped in another apartment, as 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 wing, also
The Hiving of Bees

the 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 entrance of a hive containing a newly hived swarm will prevent loss if the swarm attempts to abscond.

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 old location, 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, even if several swarms have united, will return to their respective homes, but the majority will "follow my leader." It is impossible to give any set rules to be followed in such emergencies. If only two swarms have united, the bees may be allowed to enter the new hive until it is estimated that one-half the bees are in the hive, when it may be set out upon a new stand, and given one of the queens, then another hive set upon the old stand, and the rest of the bees be allowed to enter. It should not be forgotten that, as a rule, other things being equal, a bee is worth as much 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 where the bees are entering. As soon as the supers are full of bees they are returned to the hives whence they were taken. A colony made unusually strong by uniting swarms will store more 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 their old locations, 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 the 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, then the cluster divided up, and each division furnished a queen.

When natural swarming is allowed in a large apiary, and there is some one in constant attendance during the swarming season, I know of no more satisfactory method of managing than by the use of a swarm-catcher. With this arrangement there is no catching of queens, no climbing of trees, nor mixing of swarms—the control is perfect. The catcher is 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 small end. The outer end is closed with a removable door covered with wire cloth. The rest of the frame 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 extends beyond the small end, and forms a sort of flap that can be drawn over the mouth of the catcher, and fastened to keep the bees in after they have entered. In a large apiary there ought to 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 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 then shaken down in front of the hive that is to be their home, they march in with scarcely a bee taking wing. Where some one can be in attendance, the swarm-catcher reduces the hiving business to an exact system.

While I do not approve of old-fashioned swarming, with unclipped queens, in a large apiary, still, if a man will persist in following that plan, I will give him the best advice that I can; and, by the way, I can speak from experience, as I clung to that method until its disadvantages forced me to abandon it. When queens are allowed to accompany swarms, water is the great agent by which the bees can be controlled. Quite a number of pails filled with water should be kept standing in different parts of the apiary. There ought, also, to be three or four
The Hiving of Bees

barrels of water standing about the apiary. Waiting a quarter of a minute for water, sometimes means the loss of a swarm. For throwing the water, a hand force pump is the best. With this a stream of water can be thrown 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 a 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 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 the bees, and they begin looking for an alighting-place. If the operator once has a swarm well in hand, there is plenty of water, and he knows how to use it, it is well nigh impossible for a swarm to get away.

When queens are allowed to accompany swarms, there ought to be no tall trees near the apiary, as the swarms will cluster where it is difficult, even dangerous, to get them. It should be possible to reach the tops of all trees with a long light ladder. If the tops of the trees can all be reached from a step-ladder, so much the better. Besides the pails of water, the 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 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 then be given such a swarm, when, as by magic, the bees will change their behavior and go into the hive.
Cluster of Naturally Built Queen-cells from one of which a Queen has Hatched.
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 she 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 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 the center of 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 recaged for another trial. Right here a caution: Don't hold the smoker too near the ball of bees, as hot smoke seems to infuriate the bees into stinging the queen. Hold the smoker far enough away so that the smoke will become cooled before reaching the bees. Dropping the ball into a cup of water has been recommended to induce the bees to release the queen. To the inexperienced, this may be the better plan, as 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 is quite likely to injure her.

The Simmins method of introducing queens is an illustration of how great a part is played by the *attitude* of the queen toward the workers. He removes the reigning queen a few hours previous to liberating the new queen, and then, just at, dusk, so late that the bees are through flying, and too late for the queen to take wing, the queen is released at the top of the hive and allowed to run down among the combs. And here comes in the important point: For half an hour before the queen is released, she is kept away from the bees and away from food; hence when she comes in contact with the bees she is hungry, and at once asks for food, instead of racing about the combs. The bees begin to feed and caress her, and all goes well. I believe Mr. Simmins claims that this method is almost infallible; and I remember that I once introduced ten queens by this plan without the loss of one. It was during a honey-flow, however, and many plans that prove successful at such a time may miscarry at times when
no honey is coming in. The moral is, to feed when trying to introduce queens during a dearth of honey.

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, caged and sent it away, and then immediately taken a laying queen from a nucleus and placed her upon the spot upon the comb whence I had taken the other queen, and had the satisfaction of seeing her immediately 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 there would be a conflict in which the chances of the newcomer would be as good as those of the old queen.

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 often replaced one in the hive by dropping her upon the tops of the frames, when the bees would immediately pounce upon her as an intruder. A puff of smoke would cause the bees to "let up," when the queen would walk majestically down between the combs, and there she was not molested, because there was where the bees expected to find a 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, and as they are running into the hive I allow the queen to run in with them. At such times 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 tranquillity, the queen it 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 of the bees from one of the inside walls of the hive, and against this side of the hive I turn the side of the comb upon which is the queen. Then she is not immediately brought in contact with the excited, strange bees; but the bees intermingle, and, almost unconsciously, the whole colony accepts 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 laid any eggs in several days, and are in a
jaded condition. It would often be a saving in queens if such queens were first introduced to nuclei, and then, after they were nicely laying, introduce them to full colonies by uniting the nuclei with the full colonies, in the manner just described. It is much easier to introduce a queen to a nucleus than to a full colony. Take a frame of bees, brood, and honey from a colony; place it in a hive with an empty comb by the side of the comb of bees, and set all on a new stand, when, in 24 hours, all of the old bees, the ones that always make trouble with a new queen, have returned to the old stand, and the young bees that are left are almost certain to accept a queen.

When a queen comes to hand in a jaded condition it would be a great advantage if she could at once be released upon the combs; but this very jaded condition is against her acceptance. To meet these conditions it is an excellent plan to cage her against the side of a comb. A cage for this purpose is made from a piece of wire cloth seven or eight inches square. First cut out from each corner, a piece 1 1/2 inches square, then ravel out several strands from each side, after which bend up the sides at right angles, thus forming a sort of shallow box. The open side of this box is placed against the side of a comb where young bees are emerging, a few cells of honey also being included, the queen slipped under the edge of the cage, when the raveled-out strands of wires are thrust into the comb, clear up to the cross-wires. Before doing this work it is well to free the comb of bees. The young bees that hatch will treat her kindly, and in the mean time she will begin laying when, if the outside bees seem favorably disposed, the queen may be released by boring a hole through the comb with the point of a pocket-knife. The hole should be bored through from the side of the comb that is opposite to the cage, and, if the comb is simply broken up sufficiently, the bees will clean out the broken particles and thus allow the queen to pass through, which releases her at a time when the colony is in a normal condition, instead of under the excitement that accompanies the opening of the hive.

I just said that it would be well to release the queen if the bees were "favorably disposed" toward the queen. If they are "balling" the cage, clinging to its 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 they 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 toward the queen, and it is never safe to release a queen unless the bees show in this manner that they have practically accepted her.

Speaking of releasing the queen by boring a hole through the comb reminds me that there is probably no better way of releasing a queen. Let the cage be what it may, than that of stopping the entrance with a piece of broken-up comb honey, or with some kind of soft 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; and, as has just been mentioned, the queen is released quietly at a time when the colony is undisturbed. After a queen has been released the hive should be left undisturbed three or four days, or a week, until the queen has commenced laying and become fully established as queen of the colony. When a queen has been released only a short time, she is easily frightened, when she is likely to run and “squeal,” and the result is that the bees will at once ball her.

When a queen from a distance is to be introduced to a full colony, the condition of that colony is of the utmost importance. The most favorable condition is that it be hopelessly queenless. Let it build a batch of queen-cells, and remove them after all of the brood has been sealed, and the bees are almost certain to accept a queen if given to them in a proper manner. When I was engaged in queen-rearing I don’t know that I ever failed in trying to introduce a queen to a colony that had built a batch of cells. 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, than to release her after the cells were under way, unless I waited until the cells were sealed over and had been removed.

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

If the bees can, in some way, be placed in such a condition of mind (or body) as to let the queen alone until she has gathered the reins into her hands, so to speak, there is seldom any more trouble about her being accepted as their sovereign; and one excellent method of placing them in that condition is by the use of tobacco smoke. For
several years I guaranteed the safe introduction of queens that I sent out, and the tobacco-smoke method was the most successful of any that I ever asked my customers to try. The day before shipping the queen, I sent the following notice:

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, light your smoker. When it is well going, put in a pipeful of smoking tobacco, put on the cover, puff until you get an odor of tobacco, then blow 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 down the bees 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 then 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.

The tobacco smoke partly stupefies the bees; and by the time they have recovered, the queen is in full possession. By doing the work in the evening the bees are in condition to defend themselves by morning, should it be necessary.

There is, however, one method of introducing a queen that never fails. It is that of confining the queen in a hive with several combs of bees just hatching. Go over several hives and find 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, hang the combs in the hive, and close it up bee-tight. Allow the queen to run in at a small opening, closing it after her. This work should be done in the fore part of a warm day. In a few hours enough bees will have hatched to form quite a little cluster, with which the queen is absolutely safe. If the nights are cool, it might be well to carry the hive into the house for two or three nights. In five or six days the hive may be given a stand in the apiary, and the entrance opened sufficiently to allow the passage of a single bee. So much trouble as this is not advisable unless the queen is very valuable.

And now, in closing, a word of caution: When buying a queen from a distance, let out the bees and queen upon a window; catch the queen and put her into a clean cage; then kill all of the bees and throw them and mailing-cage into the stove. This is to guard against any possible chance of getting foul brood into the apiary from infected bees or honey. A queen has never been known to carry the contagion from one colony to the other—the only danger is that the food in the cage might have been made with honey infected with the germs of disease. Of course, the danger is very slight, even in this direction; but foul brood has been known to have been communicated in this manner, and there is no harm in exercising caution.
The Feeding of Bees

Bees are fed to prevent them from starving when they lack stores in the winter, or in times of scarcity during the summer or fall, to stimulate the rearing of brood in the spring, or at any other time when it is desirable to furnish them with winter stores when they are lacking in the fall; also to secure the completion of unfinished sections that may be left at the close of the honey harvest.

The feeding of bees for stimulating brood-rearing in early spring is now looked upon by many as of doubtful value. Especially is this true in the Northern States, where weeks of warm weather are often followed by a “freeze-up.” The average bee-keeper in the average locality will find it more satisfactory to feed liberally in the fall—enough, at least, so that there shall be sufficient stores until harvest. If the hives are well protected, and the bees well supplied with an abundance of sealed stores, natural brood-rearing will proceed with sufficient rapidity, early in the spring, without any artificial stimulus. The only time that spring feeding is advisable is where there is a dearth of nectar, after the early spring flow and before the coming of the main harvest. A few bee-keepers have found it very profitable to feed enough at this time to keep brood-rearing in progress; then, when the harvest comes on, the brood-combs are full of brood and food, and the honey must go into the super instead of being stored in the empty cells of the brood-nest. Not only this, but, as the result of uninterrupted brood-rearing, great armies of workers are brought upon the stage of action at the proper time to help in the securing of the harvest. There come to my mind now two notable examples of men who have made a great success of this kind of feeding. One is H. R. Boardman, of East Townsend, Ohio, and the other was the late Mr. E. W. Alexander, of Delanson, N. Y. Mr. Boardman uses a quart Mason jar with a perforated cover, the jar being inverted in a hole made in a shallow box that is placed in front of the entrance of the hive, the side of the box next the hive being open so that the bees can enter. The two side pieces of the box are made in such a way as to leave projections on their lower edges, on the ends next the hive, and these projections slip into the entrance, thus holding the feeder in place and making it more difficult for robbers to gain an entrance to the feeder.
Mr. Alexander, who, by the way, made a success of keeping as many as 700 colonies in one apiary, made a feeder out of a piece of 2 x 4 scantling about four inches longer than the width of the hive. With a cutter-head, or a saw set wabbling, grooves are cut in its upper surface to within half an inch of the ends. This feeder is placed underneath the back of the hive, its upper surface on a level with the bottom-board, the hive being shoved back on the bottom-board sufficiently to cover the feeder. The feed is poured into the end of the feeder that projects out beyond the side of the hive, after which a block four inches square is laid over the projecting end to keep out robbers. When there are sufficient stores in the hive it is not necessary to feed so very much honey, a small quantity of food brought into the hive each day encouraging the bees to keep on breeding, using their sealed stores for this purpose.

Before feeding a whole apiary in this manner, year after year, I would suggest that the bee-keeper make an experiment: Feed one-half the colonies; keep an accurate account of the cost of feeding, and also an account of the net profit from each lot. Such an experiment, continued a few years, will answer the question as to whether such feeding is profitable in that particular locality.

Do the best we can with most methods of management, there will always be more or less unfinished sections left at the end of the season. What shall be done with these is really a serious question. If their number is not too great, those nearly completed may be sold in the local market, while the honey may be extracted from the remainder, and the bees allowed to clean them up by stacking them up in supers, out of doors, and giving only a small entrance to the pile of filled supers, when they may be used the next spring as "bait" sections to induce the bees to make an early start in the supers. If bees in large numbers are allowed to reach the sections while still wet with honey, they will, in their eagerness, tear down the cells and spoil the combs. For this reason the entrance should allow only one or two bees to pass at a time.

When the local market is not sufficient to take the nearly completed sections, and there is a dearth of honey during the hot weather of August, it is possible to "feed back" extracted honey and secure the completion, at a profit, of all unfinished sections. I have fed back thousands of pounds of extracted honey for this purpose, and, for the benefit of those who wish to give the plan a trial, I will describe my methods.

As soon as I see that the white-honey harvest is drawing to a close, which, with me, is about the middle of July, I remove all of 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
Hive Arranged for Feeding with a Bottom Feeder.

A is the back end of the hive. B is the feeder in position. The dotted lines indicate the block used for covering that portion of the feeder where the feed is poured in.
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 of all. 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, simou-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 these points in view, 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 a 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, that 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. In feeding back, the feeder is usually placed above the supers, in which case the supply 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 half completed.

The feeder that I used is the Heddon, which is exactly the size of the top of the hive, and is placed above the sections. This 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 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 it with 100 pounds of honey; stir it up well, when it is ready for use. The first feeding should be done at dusk, 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 dusk 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 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 brood-nest, 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 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 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 continually strengthening the colonies upon which I am feeding back.

It is useless to expect the bees to finish up all of the sections upon a hive. Even though the feeding is continued, the sections will not 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 until the last moment, in order to make room for all 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 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, and still not have more than two cases upon one hive, and then upon each hive, above the two cases of nearly completed sections, I place a case of sections filled with comb foundation. The bees proceed at once to draw out the foundation and fill it with honey, and this additional storage room appears to bring about a feeling that there is no further necessity for holding cells open below, and they are sealed forthwith.

When the two lower cases are completed, the upper case (the one that was furnished with foundation) will, perhaps, be found to contain sections 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 aptitude 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 operation until all the sections were finally upon one hive, and had all of the sections completed except those in the case last added on 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, to 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 can not 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 hive, and the bees fed until all the combs were finished, feeding back would be no reason why separators should be used; but when the unfinished combs are put back in the cases, a great deal of judgment and patience are needed unless separators are used. Bees usually leave a space of about \( \frac{3}{8} \) of an inch between combs; and in putting back unfinished sections, where separators are not used, this fact must be kept in mind. When the space is less than this, no harm is done unless it is so small that a bee can not 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 \( \frac{3}{8} \), 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 botchy appearance. If the comb at one side of the space is sealed and the other not, the sealed comb will be undisturbed, while the unsealed cells upon the other side will be lengthened out until the space between the two combs is reduced to about \( \frac{3}{8} \). 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 further 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; and especially do I take pains to have sealed surfaces come next to the sides of the super, while combs that are furthest from completion are placed in the center. By this management, all of the combs are finished at about the same time. Unless some of the combs begin to show signs of travel-stain it is better to leave on the super until all or nearly all of the sections are completed; for, as the combs near completion, this matter of adjustment becomes more difficult. When separators are used, all of these troubles vanish.

When foundation is used, and comb honey produced "right from the stump," so to speak, by the feeding of extracted honey, we have none of this patching, bulging difficulty to contend with, as all of the combs grow alike; and some of the finest, straightest, plumpest and most handsome comb honey can thus be produced that the eye ever
The Feeding of Bees

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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 extracted 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 lack of flavor. This lack of fine flavor is not very pronounced, but it can be noticed by those who are experienced in the matter. It is possible that this taste comes from the thinning of the honey and the handling of it about in different vessels, as well as the continued use of a wooden feeder. The other objection to fed honey is that it will candy much quicker 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 these objections are not very serious. Fed honey ought to be sold early, and in a market where it will be consumed 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 from the feeding of five.

The advantages of feeding back honey can be stated in a few words: Comb honey is more salable, and 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.

I think that the feeding-back of extracted honey is on the wane, as bee-keepers are learning how to lessen greatly the number of unfinished sections at the end of the season; and my object in describing the practice is not to recommend it for general use, but to furnish the necessary instructions should circumstances arise making it desirable to follow them.

When bees require feeding in the fall, almost any kind of feeder will answer the purpose. If nothing better is at hand, a tin pan or any open dish may be set in an upper story, and a piece of burlap laid in the feed as a float for the bees to stand upon. A good-sized feeder, one that will hold from fifteen to twenty pounds, like the Heddon, for instance, greatly facilitates the work, however. Bees can be fed with the Heddon feeder when it is so late and cool that no other feeder would answer. Fill the feeder with syrup as hot as it can be and not burn the bees; then set the hive over the feeder, when the heat from the syrup will warm and rouse up the clustered bees, and they will come down and carry up the feed in short order.
The idea seems to prevail that all winter stores must be sealed. This is an error, and probably arose from the fact that late-gathered stores are often of poor quality—not because they may be left unsealed, but from the quality itself. A good thick syrup made from granulated sugar is an ideal winter food whether it is sealed over or not; in fact, bees in a warm cellar may be successfully wintered on sugar syrup supplied to them daily by means of a feeder. A large flat cake of candy laid over the cluster, and covered with enameled cloth, with packing of some kind over that, is a handier method of winter feeding; but, aside from that, it is not superior to the use of syrup when the bees are in a warm cellar, but it would be out of doors.

In closing let me caution the bee-keeper to beware whence comes the honey that he feeds. Let him be sure that it contains no germs of foul brood. To buy honey in the open market and feed it to the bees would be a most risky proceeding. For stimulative feeding, and for winter stores, better buy sugar. It is cheaper, safer, and better—especially so for winter stores.

Photographed by H. I. Hill.
The Production of Comb Honey

Having now considered some of the most important points in modern bee culture, such as locality, hives, supers, sections, increase, feeding, varieties of bees, use of comb foundation, etc., let us begin at the opening of the season, and go briefly over the ground, showing the relation of these different features to one another, as they are employed in the production of comb honey.

We will suppose that the early spring has passed; that the bees have received sufficient protection; been supplied with ample stores: and that the hives are now teeming with life as we stand upon the threshold of the main honey-flow. And right here let me say that unless the colonies are strong and populous, simply overflowing with bees, it is folly to expect a paying crop of comb honey. If there is any time when weak colonies may be united to advantage, it is at the opening of the main harvest, when comb honey is to be the product. Better gather together, into one hive, three-fourths or even all of the bees and brood from two, three, or even four hives, and thus have one rousing colony, than to attempt to secure a crop of comb honey with weaklings. A comb or two of brood and bees, and a queen, left in a hive at the beginning of the harvest, will build up into a good colony by fall, and possibly store some honey that may be extracted. No matter how it is accomplished, one thing is imperative; and that is, that the brood-nest be crowded with bees and brood at the opening of the honey harvest. This condition tends greatly to make the bees begin promptly to store honey in the supers. And this is important, as, otherwise, the bees are inclined to crowd the brood-nest with honey as the bees hatch out, also to "loaf," and develop the "swarming fever." If bees can be induced to begin working in the sections at the opening of the main honey-flow, it relieves the "pressure," so to speak, upon the brood-nest, which results in more brood, while the turning of the energies of the colony into the storing of honey does much to keep down the swarming fever. The greatest attraction that can be placed in the supers is that of drawn comb. Unfinished sections saved over from the previous season are excellent for this purpose. As has been explained in a previous chapter, the honey must be extracted, and the bees allowed to clean up the combs, when the latter must be packed away in supers where no
dust nor mice can get at them. I have given supers full of these partly drawn combs to colonies (one super to a colony) and had these combs filled and capped, and ready to come off, just as other colonies supplied with sections containing foundation only were only making their first start in the supers. In this case a super of partly drawn combs was worth as much as a case of finished honey. There is, however, a still better method of managing this part of the business. It is that of putting on an extracting-super first; and when this is filled and removed, the bees are always ready to go to work in the sections immediately. For this purpose, shallow supers are preferable; those containing frames half the depth of the regular brood-frame being the size that is usually employed for this purpose. The greatest objection to the use of the full-sized combs is that it requires so much honey to fill a super of them that it would materially reduce the crop of comb honey. The use of a shallow extracting-super removes this objection. Again, the beginning of the white-honey flow is sometimes mixed with an earlier, darker flow, and the taking of the first of the white flow in the extracted form insures the perfect whiteness of all honey stored in the sections. Still further, these half-depth extracting-supers can be used to fully as great advantage at the end of the harvest as at the beginning—perhaps to greater advantage. As the time approaches for the close of the harvest, instead of giving more sections simply set on top of the sections one of these half-depth extracting-supers. If more honey comes in than is needed to fill and complete the sections already on the hive, it will "overflow," so to speak, into the extracting-super that is on top; thus the honey that would otherwise go to the making of a lot of unfinished sections is secured in the extracted form. Getting extracted honey at the opening and closing of the season, as just explained, certainly has some very decided advantages. It leads the bees to begin work promptly in the supers at the opening of the season, keeps all "mixed" honey out of the sections, and practically does away with unfinished sections at the end of the season.

When the first case of sections placed on the hive at the beginning of the harvest 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 honey is coming in. I usually add another super 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 supers in height. As a rule, the upper super 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 it, bees and all, to some other colony having a less number of cases rather than tier
up four cases high. With any system in which the sections are finished close to the brood-nest, their removal is necessary soon after completion, to prevent their being soiled or "travel-stained" 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 can be removed at once. During a regular "honey-shower," such as we have sometimes, when the nectar all but drips from the fragrant golden blossoms of the linden, 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, yet scarcely a cell would be sealed. To give the bees another super next the hive is the work of only a moment. At such times it may be advisable to remove the upper case, after they have been tiered up three high, even if there are one or two unfinished sections in each corner; and, when crating, have an empty super at hand in which to put the unfinished sections; and when it is full, place it on a hive.

When a super is ready to come off, there is no easier or less troublesome method of freeing it from bees than by the use of a Porter bee-escape, which consists of a tin frame-work or box, inside of which are two delicate brass springs so nicely adjusted that a bee can easily squeeze out between their points, but cannot return. Openings in the upper and lower sides of the box allow the bees to pass through. The escape is fastened into an opening cut in the center of a thin board the size of the top of the hive, a \(\frac{3}{8}\) rim around its edge holding the super bee-space above the board. To use the escape, simply raise the upper super, lay the escape-board upon the top of the next lower super, replace the removed super upon the top of the escape-board, and the work is done so far as the bee-keeper is concerned. The bees, finding themselves shut off from the rest of the hive, become excited and make frantic efforts to escape. Finding one opening by means of which they can reach "home" they crowd through as fast as possible, when, in a few hours, the super is free of bees. If escapes are put on at evening, the supers above them will be free of bees in the morning.

If there is not time to use escapes, or if, for some reason, it is not desirable to use them, the supers can be freed of bees by other methods. My practice has been as follows: 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 combs at a lively rate, and before they have time to come back I have the super off the hive. The super is then tremulously shaken in front of the hive until most of the remaining 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
Sprig of Basswood in Bloom.
super and escape by way of the window, which should have wire cloth over it on the outside, letting it extend several inches above the window, and terminate in a small cone-like opening from which the bees can easily find their way out, but not be very likely to find their way back. 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 super may be leaned against the side of the hive, near the entrance, when the bees will desert the super for the hive. When robbers are troublesome the stragglers may be driven out with smoke and brushed off in front of the hive.

By shading the hives, allowing generous entrances, also abundance of room in the supers, swarming is greatly delayed, and often avoided entirely with many colonies. I have known seasons when, with this management, not more than one-half of my colonies swarmed, and I have frequently had seasons when not more than two-thirds of them swarmed. When a swarm does issue, I hive it in a contracted brood-nest, with starters only in the brood-frames, on the old stand; put on a queen-excluding honey-board and transfer the supers from the old to the new hive. In twenty minutes, at the outside, the bees are back at work in the sections that they recently deserted in such a hurry. The old colony is placed by the side of the new one for a week, when it is moved to a new stand, thus throwing all of its flying bees into the colony having the sections, and so depleting the old colony, just as the young queens are hatching, that there is seldom any after-swarming. If the swarming takes place early in the season, the old colony may do something in the way of storing surplus; but, as a rule, it simply becomes a most excellent colony, with a young queen, for carrying through the winter.

As the harvest draws to a close, an extracting-super is put on top of the sections, as has been already explained, or the unfinished sections may be finished up by feeding back extracted honey, or the sections nearest completion may be sold in the local market, and those not sufficiently finished for this purpose may be extracted, and cleaned up by the bees, when they will be ready to use as "baits" to induce the bees to make an early start in the supers the following spring.
Producir Good Extracted Honey

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 rich aroma. These are the qualities which make honey what it is—a luxury—and if we wish its use continued as a sweet sauce, we must learn to produce and care for it in such a manner as to preserve its ambrosial, palate-tickling qualities. Freshly gathered nectar is 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 air 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, and then sealed up from the air. Seldom do we find extracted honey equal to that dripping from and surrounding the section of comb honey that is being carried upon a plate. Many of those who produce extracted honey in large quantities, extracting it before it is thoroughly ripened, admit that such honey is inferior, as a table sauce, to that ripened by the bees, but they say they can not afford to produce the best article possible. The quantity of honey is not materially lessened by thoroughly ripening it; if larger crops are secured by extracting it “green,” it is the result of the stimulus given the bees by furnishing them such an abundance of empty combs. By the use of plenty of store-combs and supers, the same results, or nearly the same, may be obtained, and the ripening of the honey secured, by tiering up. The interest upon the cost of extra combs and supers is a small thing compared with the putting of unripe honey upon the market. By the use of plenty of combs, tiering them up, the work of extracting may be put off until the busy season is over. The great trouble is the lack of incentive for producing well-ripened honey for the general market. The production of extracted honey to be shipped away for some commission merchant to sell is much like making butter to be sold at a country store.
All brings the same price. White-clover honey brings so much, buck-wheat 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 the 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 produces a really superior article can hope to receive pay for his extra trouble is by selling direct to consumers or by establishing a reputation for his honey among dealers and their customers. The only secret in producing a superior grade of extracted honey—honey that will be the equal of that which drips from the delicate morsel of comb at the tea-table, is that of leaving it on the hive until it is sealed and thoroughly ripened. Leaving the honey on the hive a few weeks after it is sealed seems to give an added ripeness or richness. Here is the plan:

There must be an abundance of empty combs and supers—enough to hold all of a possible crop—so that the bee-keeper can put on supers of comb at any time with no hesitancy—just as though the supply were limitless. Of course, these combs and supers cost something; but they have to be bought only once, so that their real cost is only the interest on the money. There is no attempt whatever to extract the honey during the harvest. All of this hustle and bustle and hurry and worry to extract in time to give the bees room during the harvest is done away with. If a colony or a whole apiary needs more room, simply give more supers of comb. This is a quick operation. One man could look after five or six apiaries, even during the honey-flow, if all he had to do was to put on supers when they were needed, while one apiary would keep him busy if he had to extract the honey to give the bees room. If the hives, or some of them, become piled up too high, it is an easy matter to remove some of the top supers by the use of bee-escapes, and store the supers of honey in the bee-cellar—there is no need to extract at the time of removal unless there is plenty of time for doing the work.

After the harvest is over, comes the work of extracting; but there is no hurry about it; there are probably two months in which to do the work. The honey is all on the hives unless some of it has been removed, as suggested, when that which has been removed should be extracted first. That which is on the hives is not only safe but daily improving in quality. Without the invention of the bee-escape this plan would not be feasible. It is not practical to remove honey and brush off the bees after the close of the harvest; but by the proper use of the bee-escape the whole crop can be taken off with no commotion, no stinging, no robbing, and safely landed in the honey-house without a bee in the yard fairly realizing what has been taking place.
The bee-escape is an important link in this chain; but there is another one equally important, and that is, the use of artificial heat in warming honey so that it can be extracted when taken off late in the season by the use of escapes. Honey left on the hive all the season becomes well ripened and thick, and the cool weather makes it still thicker and stiffer; and it would be difficult to extract if the work were done immediately upon its removal. If taken off in large quantities by the use of escapes it would be simply impossible to extract it without warming it up. When it is properly warmed up to the right degree it can be extracted more readily, easier, and cleaner than when taken right from the bees in hot weather. As such honey is thoroughly ripened, there is no necessity for any settling-tanks; the honey can be run right from the strainer into the cans or barrels.

Perhaps this system of management might be called the gentleman's system. It certainly is an easy, pleasurable, leisurely way of producing large quantities of first-class honey at a low cost. There is no hurry, hurry, hurry to get the honey extracted because the bees are needing more room; and there is no shaking and brushing of angry bees out in the boiling sun.

**ONE DRAWBACK TO THE PLAN.**

There is just one kind of locality where this plan will not work out so satisfactorily, and that is where the white-honey harvest is followed by a dark flow. We have one apiary in such a location—one where the flow from buckwheat is likely to start in before that from the berries is finished, and we have to watch it very closely and hustle off the white honey the very day that the bees show a tendency to begin work on the buckwheat. It does not take very much dark honey to give some color to a whole lot of white honey. Work it the best we can, there will always be some berry honey not ready to extract, and we are compelled to leave it on the hives to go in with the buckwheat. A fall flow of honey, even if dark, is considered a great advantage, and usually it is, but I am not certain but I should prefer a locality without the fall flow, simply because it would allow me to put in practice my system of management whereby I could take care of so many more apiaries than with the management that requires the removal of the white honey before the close of the harvest.

Having gone briefly over the plan, and shown that the principal features of the combination are plenty of combs and supers, and the use of bee-escapes and artificial heat in extracting, let's go back to the beginning of the season and take up the work, step by step, and give the more important details.
Produce Good Comb Honey

Securing Workers for the Harvest.

When taken from the cellar, the stores of the colonies are equalized and the hives protected by being wrapped in tarred felt. No more attention is required until it is warm enough to remove the tarred felt. More equalization of stores may be needed, or, if there is a general shortage, some feeding; and it is almost certain that there must be more or less equalization of brood before the opening of the harvest. In a home apiary this equalizing of the brood might not be necessary, but in an out-apiary it goes a long way toward preventing swarming too early, by some of the colonies, and helps to make all of the colonies ready for the same treatment at the same time—a most important factor in out-apiary management.

When all of the hives are comfortingly full of bees, brood, and stores, upper stories of combs are added, one on each colony strong enough to need it. No queen-excluder is used at this time. The queen is allowed full swing in both stories, and this abundance of room at this time has a great tendency to forestall the swarming fever. Once the main harvest is on, and the bees at work in two or three stories, the great danger of swarming is past. In an apiary of 150 colonies, managed last year on this plan, only seven cast swarms.

When the upper story is nicely filled, or nearly filled, with bees, brood, and stores, and the main harvest has fairly begun, a queen-excluder is placed between the two stories. No time is spent in hunting up the queens. We simply wait four or five days, when freshly laid eggs disclose the presence of the queen. As a rule she will be found in the upper story; if so, we simply transpose the two stories, putting the upper one below and the queen-excluder on top, and then set on top what was formerly the lower story. Usually, at this visit most of the colonies will be ready for the third story.

This plan gives the greatest opportunity for the production of a lot of bees previous to the harvest, then curtails the rearing of brood after the harvest has opened, when the production of brood is at the expense of the surplus. As the bees hatch from the combs above the queen-excluder, the cells are at once filled with honey. Many of the colonies will build queen-cells in the supers above the queen-excluder. I have taken pains to go through the supers and tear out these cells, and I have paid no attention to them and allowed the queens to go on and hatch, and I could not see that any harm resulted from either course—that is, there did not seem to be any difference.

As the season advances I keep on tiering up, adding the empty supers at the bottom, next to the brood-nest. I have often tiered them up three supers high, and, in a few instances, four supers high, with ten-frame Langstroth hives.
One object in adding the empty combs at the bottom, and keeping the oldest, ripest honey at the top, is that, if it should be desirable at any time to remove any of the supers of honey, either to extract the honey at once, or because the hive was becoming piled too high, the oldest honey would always be on top, where it could be removed the most readily by the use of bee-escapes.

When ten-frame Langstroth hives are piled up four and five high, the putting-in of the escape-boards is no light task, especially for one man; and I have tried to plan all of my work so that one man can go to an outyard, all alone, go on a wheel or in a trolley car, or in some such manner, and go on and do the work to advantage without any assistance. I would have a honey-house and full complement of tools and appliances at each yard; then, during the working season, all that has to be carried from one yard to another is simply the man himself.

After the escape-boards are in place I go over every hive carefully, carefully, carefully, to see that there are no cracks that will let bees into the super after the inmates have gone down through the escape. One who has never used escapes will be surprised how small a crack will let in a bee. The best of any thing that I have ever found to stop up these cracks in soft clay. Find some stiff clay, just about such as would be used for making bricks; moisten it, stir it, and work it until it is of just about the consistency of putty. Take a ball of this in the hands and go around and examine all the hives, plastering some of the clay putty into every crack. I never knew the bees to try to dig out the mud, and it soon hardens down as hard as a marble.

At each one of our apiaries we have a place to sleep and cook, even if it is only a tent, and we can go the day before we are to begin extracting, and put a bee-escape under the top super of every hive. The next morning most of the supers will be free from bees, and we can begin taking them off and putting the escapes in under the next story. As we begin taking off the honey we also begin warming it up, and, when warm enough, we begin extracting. You will notice that there are really four operations: Putting the escapes in place; wheeling the honey into the honey-house; warming up the honey and then extracting it; and, once the work is begun, it is easy to follow out a sort of routine in the work.

WARMING UP THE HONEY.

The first year we warmed up the honey with a base-burner hard-coal stove. This gives a very even, steady, desirable heat; but it is too expensive, and not very practical, to have a hard-coal stove at each apiary in the woods of Northern Michigan; so, last year, we used a Perfection oil-heater, costing about $5.00, capable of burning a gallon
of oil in about eight hours, although much less can be burned. This is the first oil-burning stove, using a wick, that I ever saw that could not be made to smoke. It has a cylindrical wick, and just above the wick is a round plate of iron called the "flame-spreader," and the wick is turned up until it strikes this spreader, when it can go no higher, and it won't smoke, and can't be made to do so.

One end of the honey-house or cellar is partitioned off, making an "oven," as we call it, large enough to hold fifty or sixty supers. We fill this up at night, for instance; light the stove before we go to bed, turning the wick up part way so that the temperature in the upper part of the room will stand at about 100 degrees. In the morning we refill the stove, turn it on full blast, and go to extracting, taking the first supers from the top of the room. As some of the piles are lowered, more supers are taken from other piles and added to these, thus bringing more honey up into the heated "zone." As fast as there is vacant room, more supers are brought in; and a sort of routine is followed whereby one always has hot honey to work on while more is heating.

UNCAPPING BARRELS AND TANKS.

A cheap cracker barrel set down into a tub makes an excellent uncapping outfit. Some grocers give the barrels away, if you are a customer; some ask five cents apiece for them, and I never paid over ten cents. The cappings can be allowed to stand and drain for weeks and weeks—no hurry about the barrel; simply pay ten cents for another one.

I bore three or four holes in the bottom of the barrel for the honey to run out. This may not be necessary, as such barrels are not watertight; but it is a wise precaution to be sure there is a place for the honey to get out. Then I nail a wooden cross-piece just inside the top of the barrel; but before nailing the cross-piece in place I drive through it a ten-penny nail; and when putting the cross-piece in place I turn the point of the nail upward.

In uncapping a comb the end of the frame is rested upon this nailpoint, which comes as near being a universal joint as any thing with which I am acquainted. The frame can be turned "every which way," and it will not slip about. The barrel is supported over the tub, or slightly below the top, by means of double hooks made of heavy wire. In the accompanying engraving one of these hooks is hung outside, upon one of the handles, to show its shape and make-up. Four hooks are used, placed equidistant around the edge of the tub, and the barrel lowered down upon them, the hooks catching just inside the "chime." There is still another plan of supporting the barrel that has the advantage of furnishing handles with which to lift the barrel, and that
Cracker-barrel for an Uncapping-can.

After a barrel is full it can be set to one side, over a tub, or two or three barrels can be stacked up, one on top of the other, and allowed to drain for weeks. The cappings can be brought home, or even shipped by freight, right in barrels.

Lamp Stove that Keeps the Uncapping-knife Hot.

Honey extracted in hot weather, soon after it is gathered, may not require a hot knife for its uncapping; but to uncap in the cool weather of the fall, honey that has been on the hives all the season, a hot knife is almost a necessity.
is to nail two slats of wood to the sides of the barrel, about four inches from the lower end. The slats are nailed to opposite sides of the barrel, at right angles to the staves, and are long enough so that the ends rest upon the upper edge of the tub. The only objection to this plan is that the ends project out slightly beyond the edges of the tub, and are just a little in the way.

A much better uncapping arrangement is the McIntyre uncapping box as modified by E. D. Townsend. He describes it as follows:

This is a stock-watering tank, made of galvanized steel. It is two feet deep, twenty-two inches wide, and six feet long, with a gate near the bottom at one end. A slatted bottom provides for the drainage of the cappings. This slatted bottom of the uncapping-tank is built of ¾-inch-square pieces of white-pine lumber, 21½ inches long, spaced ¾-inch apart, nailed to two longitudinal pieces of the same material, 2½ inches wide, and a half-inch less in length than the inside length of the tank. The aforesaid ¾-inch-square pieces are nailed on the edges of the longitudinal strips, thus forming a 2½-inch reservoir under the frame, to catch the drip from the cappings.

A COMB-RACK AT THE TOP OF THE TANK.

A frame of ¾-inch-thick lumber, 2½ inches wide, composed of two longitudinal pieces one inch longer than the tank, and two transverse pieces of the same material, cut ¾-inch less in length than the inside width of the tank. To assemble: Place the two short pieces of material parallel with each other, the distance apart of the inside length of the tank, less ¾ inch, standing on edge. Transverse these, and parallel with each other, 18¾ inches apart at their inside edges, nail the two longitudinal pieces.

Built this way, the two cross-pieces of the frame are on the under side, and drop down into the tub, and hold the frame in place. Some of our later tanks have corner-braces at the top; this necessitates placing the cross-pieces in from the end of the tank. The illustration will show this style of tank.

The longitudinal pieces of the frame, being placed 18¾ inches apart, are the same width as the inside length of the Langstroth hive, and are built this width to accommodate the frame after being uncapped. Although this width will allow of the frame of honey being placed down in the same position as if in the hive, it is rarely used this way, for it is much more handy to allow but one end of the frame to go down into place, the other end resting on the bottom-bar.

A rest for the frame of honey while uncapping is made of two pieces of this same ¾-inch material, and a 20d spike cut off 1½ inches long and sharpened. The main cross-piece for the rest is cut 22 inches long. This cross-piece is tacked on with only a small nail at each end, as, when in use, it is placed at different positions over the tank, at the option of the operator. The other piece is cut three inches long, and is to hold the sharpened spike that the frame rests upon while uncapping. This pivot that the frame turns on when uncapping is driven through from the under side, near one edge. The pivot-block is nailed on permanently, at the upper place; then, when the uncapping is to be done from the opposite side of the tank, the whole cross-piece is tacked on the other end too.
Implements Used by E. D. Townsend in His Latest Methods of Extracting.
Some of the advantages this uncapping-tank has over the cracker-barrel tank, placed over a wash-tub, as we have been using in years back, are, first, the greater capacity; second, larger drainage surface, thus leaving a less per cent of honey in the cappings; third, sanitary, as the honey as it drains from the cappings is enclosed, and away from the bees, etc., except as it runs out into the pail under the gate; fourth, convenience. One of the most disagreeable and "sticky" manipulations about the harvesting of a crop of extracted honey, where cracker-barrels are used for uncapping-tanks, is the lifting of the tanks, heavy with honey and cappings; then, each night, sometimes oftener, the emptying of large tubs heavy with honey.

**UNCAPPING.**

After the honey is off the hives, and warmed up, the biggest part of the remaining work is that of uncapping the combs. If they are thick and "bulging," they can be uncapped much more easily. If only eight combs are used in a ten-frame super they will be of this class, when, by cutting deeply, so as to leave the combs only about one inch thick, each side can be uncapped with one "fell swoop." It was hard for me to get over the feeling that I ought to uncap as thinly as possible—that thick cappings were like thick parings from a potato—but it really makes little difference whether the honey goes through the extractor or drains from the cappings.

Very new combs or very old ones do not uncap as easily as those that are between the extremes. An old comb that has recently been drawn out thick—that is, the bees have lengthened the cells, partly with new wax and partly with wax taken from the old comb, is about the nicest comb to uncap. The lower part of the comb has a stiffness or stability, while the upper part has sufficient softness to make it cut easily. A man can afford to go to a lot of pains and expense to get exactly the right kind of combs to use in his supers—old combs spread wide out—as the saving of time in uncapping is very important.

To uncap a comb, rest one end upon the nail-point of the cross-piece over the tank. Stand the comb in a nearly upright position. Hold it with the left hand, grasping it near the upper end. Begin at the lower end to uncap, giving the knife a sort of slanting, shaving movement, such as a barber gives his razor, drawing it back and forth as it cuts its way upward, at the same time slanting the comb slightly forward (toward the knife) so that the cappings, as they break off, will drop into the barrel instead of upon the surface of the comb.

To do the best work when uncapping, the knife ought to be sharp, hot, and wet. Only the man who has tried it can realize the difference between such a knife and one that is cold, dull, and dry. I formerly used a little two-burner oil-stove standing upon a barrel at my elbow, and upon the stove a tin or pail filled with water. When through un-
capping a comb I simply laid the knife in the hot water, as it is just as easy as to lay it down somewhere else. When I begin uncaping the next comb, the knife was hot and wet.

**THE STEAM HEATED UNCAPPING KNIFE A GREAT INVENTION.**

But I much prefer the steam heated uncaping knife that keeps hot continuously. No bee-keeper who has much uncaping to do can afford to be without one. Many bee-keepers know how a knife will slip through the comb when the knife is first taken from hot water, while it is still hot, but they know that the knife soon cools, and must be again returned to the hot water in order to regain its efficiency; well, the steam-heated knife is hot all of the time; it stays hot—just as hot as steam can make it—and it does the work quickly, easily and perfectly. The steam is generated in a tin can. The size does not matter. We used a gallon can with a screw cap, having a long; slim tube soldered over a hole made in the top of the cap. Over this tube is slipped a piece of small rubber hose, the opposite end being slipped over a tube near the shank of the knife. The knife is hollow. The steam enters the tube near the shank and spurs out of a small opening near the point. A single-burner, blue-flame oil stove, or a single-burner gasoline stove, or an oil burning lamp stove with two wicks, may be used to generate the steam. The water must boil considerably so that a good, generous supply of live steam is constantly passing through the knife. You have no idea how easily it cuts; then the cappings don't stick to the knife. About how long will a piece of butter stick to a hot knife? Just about as long as cappings will stick to a steam-heated knife. How can they stick when the knife is just as hot as steam can make it? One man with a steam-heated knife can uncap honey faster than another can extract it with a four-frame, automatic extractor. I tried uncaping for a while, and my nephew couldn't keep up with me. Then I tried running the extractor, and he soon had a lot of combs ahead of me. I think one man could uncap the honey and take away the full cans and box them up and put empty cans under the strainer gate, as fast as one man could extract the honey. The steam-heated knife is a practical, efficient tool, and leaves nothing to be desired in the way of an uncaping machine. If one man can uncap as fast as the extractor can handle it, what more is needed?

**WHAT SHALL WE DO WITH THE Cappings?**

After the combs are uncaped, the next serious problem is what to do with the cappings. Until very recently we have uncaped into
barrels, and allowed the cappings to drain for weeks, or until they would drain no more. One objection to this plan is the room occupied by the barrels, but more serious still is the loss of the honey that does not drain out. The bees can be allowed to dig out this honey, and carry it home, but it would be more profitable to sell this honey at market prices, and feed the bees sugar if they needed feeding. Besides, if there is any possibility of there being a case or two of foul brood in the apiary, there is then a possibility of sowing the seeds of the disease throughout the apiary. For every ton of honey extracted, about fifty pounds of honey will remain in the cappings after they have drained, and I know of no method of getting it out in marketable condition. When the wax is rendered the honey is ruined except for the making of vinegar or for use in feeding the bees.

EXTRACTING THE HONEY.

In Northern Michigan we have, or did have, three four-frame Root automatic honey-extractors. In the past our idea has been to have a complete outfit at each yard. As we use a two-horse team in going to the out-apiaries, we have been considering the plan of having an eight-frame extractor driven by a gasoline engine. Where only one or two supers to the hive are employed, and the honey extracted before the harvest is ended, to give room for more honey, thus calling for expeditious work, I can see where the power-driven extractor of large capacity would be of great help. Where men must be hired to help in the work it might be used to advantage.

The most of our extracting would be done in the fall or after the hottest weather had passed, and I doubt if the honey would be so warm as we make it in our warming ovens. I think much more honey would be left in the combs than when the honey is heated up artificially. Now then, it is just possible, yes, probable, that the power-driven extractor might clean out those combs cleaner, even if the honey is not warmed up artificially, than they could be cleaned by hand when the honey is warmed. If the honey is extracted without warming, I think it is safe to assume that the power-driven extractor would secure at least two ounces more of honey from a Langstroth comb. To be safe, let us put it at one pound from a ten-frame super. If we get 40 pounds of honey from a ten-frame super we do well. In producing 20,000 pounds of honey, our usual crop, we extract 500 supers. If my estimates are correct, the use of power would save us 500 pounds of honey; thus an engine would about pay for itself in one year. The expense of running the engine would probably be not far different from that of warming the honey.
Another question follows on: Is the honey that is left in the combs lost or wasted? I know that most producers of extracted honey have these combs cleaned up by the bees—either by putting them out in the open air, or allowing the bees to have access to the honey-house, or by placing the combs on the hives. I question if any of these steps are taken at a profit. It is a lot of work to carry out hundreds of supers and put them on the hives, then free the combs of bees, and get the combs off the hives, and back into the honey-house. If the bees are allowed to have access to the combs out of doors, or in the honey-house, there is excitement, commotion, and demoralization in the apiary at a time when the bees ought to be settling down for winter. Perhaps the excitement causes the consumption of as much more honey as is secured. Yes, I know that the honey will candy unless it is removed; and, in the spring, the bees will consume very little of it. They will dig it out and kick it out of the hive. The honey left in the extracting combs is practically lost. As I look at it, the use of a power extractor would enable us to dispense with the warming of the honey, and leave the combs cleaner than when we did warm it and extract it by hand power.

If I were to adopt the eight-comb and power, I would get only one extractor and one engine, and then move them from one yard to another, as the work was completed at each yard. This, of course, would
require a team, while I am trying to work out a system in which there is no transportation from one yard to another during the entire season, except that of the man who does the work.

The manner in which the extractor is set up to do the work will depend upon the surroundings. We have three extractors, and each is set up in a way different from the others. Where we extract in the cellar the extractor is set nearly a foot above the floor, and then a hole, or pit, nearly two feet deep is dug, in which to set the strainer-tub and cans to be filled. Of course, the sides of this pit are boarded up. At another apiary the honey-house is built over the cellar, and here the extractor stands directly upon the floor, the gate being placed over the hatchway, the straining and canning of the honey being done in the cellar. The honey runs out of the gate, falls down through the hatchway, and drops upon the strainer below. At the other yard a solid platform, nearly three feet high, is built in one corner of the honey-house. This platform is large enough for the extractor, for the man to stand who turns the crank, also for one or two supers of combs to stand, side by side. An extractor at this height from the floor allows room for the strainer, and for a man to stand upon the scales below the honey-gate of the strainer-tub.

Cheese-cloth Strainer on Top of a Tub.

This tub is set under the honey-gate of the honey-extractor, and the cans are filled from the honey-gate in the side of the tub. Extracting, straining, and canning are all in operation at the same time.

STRAINING THE HONEY.

An extractor with a strainer in the bottom probably possesses some advantages. One is, that it can be set at a less height from the floor,
as no space has to be used for the strainer-tub. We have always used an ordinary galvanized wash-tub, with a honey-gate in one side near the bottom, and the top covered with cheese-cloth sewed to a wire hoop slightly larger than the top of the tub. We have several of these cheese-cloth strainers; and when one becomes so filled up or covered with pieces of wax that it strains slowly we remove it and lay it over another tub, or a barrel of cappings, until the honey has all drained through, when the accumulation of cappings and thick honey is scraped off with the honey-knife. I have been told that it would be better to have the cloth strainer more in the nature of a sack, nearly large enough to fill the tub and rest upon its bottom; then the sides of the sack would remain free from cappings; and act as a strainer without becoming clogged. In a horizontal strainer, such as we have been using, the trouble is that the cappings settle upon the strainer and soon clog it, while the sides of a sack, being perpendicular, remain free from cappings, and do not clog in a long time.

After the honey has been thoroughly ripened, 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; and the sooner this is done (after the particles of wax and scum have raised to the top) the less the escape of aroma. My preference is a round jacketed tin can with a flat top and a large screw-cap in the top. A five-gallon can of this kind, holding 60 pounds of honey, can be bought for about thirty cents. This style of package can be rolled on the floor. A barrel is really the cheapest package for storing or shipping honey; and when we know that honey is to be shipped to some manufactory, there is no objection to the use of barrels if they are well made.

Upon the approach of cool weather, most honey will candy; and, if sealed up tight and put away in a cool place, it will remain in that condition for years; and when brought slowly and carefully back to its liquid state it will be found to have retained its original "flavor, aroma, and bouquet." Too much stress can not be placed upon the care necessary in liquefying candied honey. Many think if honey does not boil it can not be injured. The temperature of boiling water will ruin the flavor of honey. When a can of candied honey is placed over a stove, or in any other hot place, the outside of the cake of honey soon melts, and this may become very hot before the rest of the cake has dissolved. In a tank of hot water is the best place to liquefy a can of honey; but the temperature should never go above 160 or 170 degrees; and, by the way, when melting the honey, don't loosen the screw-cap and leave it open, as it only allows the escape of the aroma.
FILLING THE CANS.

Honey produced according to the plans described in the previous pages, is ready to go directly from the extractor into the cans or barrels; in fact, it is better that it should be canned up at once, as there is less loss of flavor or aroma. There is also a saving of time, as it is only necessary to remove a full can and put under an empty one while doing the work of extracting. To know when a can was full, without standing by watching it, was one of the problems that I had to solve, and I did it by using an electric alarm, on the principle of an electric door-bell; in fact, I used the identical outfit that is used for a door-bell.

The Electric Door-bell Alarm to Indicate When the Can Is Nearly Full.

Almost every one is familiar with this arrangement that rings a bell when a current of electricity is sent through its mechanism. When the button in the door is pressed, an electric circuit is completed, and, as a result, the bell rings out in the kitchen, or wherever it is placed. If the complete filling of a can or barrel could be made to complete an electric circuit within which is an electric bell, then an alarm would be given. I solved the problem by so arranging matters that the raising of the brass beam of a pair of platform scales closed the circuit. The battery used is one of the ordinary dry-cell batteries, such as are used
for telephones, door-bells, or for furnishing a spark for a gasoline-engine. Be sure to get a good battery. If you can get only the cheapest kind, better get two cells and connect them, as the connections upon the scale-beam are not as close as are usually made upon a door-bell, and it requires a good strong current to overcome these imperfect connections and ring the bell. It won't answer to depend upon a bell that does not always ring—better not have any bell at all. As soon as the requisite amount of honey has run in, the beam will rise and touch the end of the wire above it, thus completing the circuit and ringing the bell. The scales may be set a pound or two short, and then set at the correct weight after the alarm has been given, and the filling completed.
The Marketing of Honey

To raise a good crop of honey cheaply, and to sell it to the best advantage, are two quite different processes, requiring greatly varying qualifications. Seldom do we find all of these qualifications in the highest degree in one person. I believe that the majority of bee-keepers are better bee-keepers than they are business men; or, perhaps, salesmen is more properly the 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 the securing of a great crop. Having secured it, many a bee-keeper is actually puzzled how to put it on the market in the best shape, or how or where to sell.

Of course, the first step in the marketing of honey is its preparation for the market. About all the preparation needed for comb honey is to clean the sections of propolis and pack them in shipping-cases having corrugated paper in the bottoms, and glass fronts. If it is to be sent to a distant market, and the shipment is less than a car load, the cases should be packed in crates—not boxes, as these would hide the honey, but crates with slats on the side that will allow a view of the honey. A crate may be made to hold nine, twelve, or sixteen cases. A little straw in the bottom helps to break the force of jars. 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 it can’t be “dumped” without dumping it upon 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. When honey is shipped by freight it is quite important that the combs stand parallel with the track. If they are crosswise of the track, the bumping-together of the cars breaks the combs much easier than when the combs are parallel with the track. For this reason it is well to have a large label pasted upon the top of the crate, with a large hand pointing lengthwise of the combs, 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.”
Much, both wise and otherwise, 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. The best honey-producing fields are often far distant from the best markets. The best place in which to produce honey is not always the best in which to sell it. Such being the case, there is not much encouragement in trying to build up a home market, particularly for the finer grades of comb honey, and especially if the home 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. Many bee-keepers have been able to sell to advantage, in the home markets, unfinished sections and lower grades of honey.

In many local markets, such grades of honey will sell for as much as the choicest honey put up in gilt-edge style, while the commission markets of a large city are a poor place in which to sell off grades of honey. To many grocers, in country towns, honey is honey, much the same as butter is butter. In selling honey to retail dealers they must be visited regularly, and kept supplied with honey. In short, they must be followed up and looked after as carefully as commercial travelers look after their customers. Grocers must be educated to know that honey can't be sold unless it is kept in sight—and it should be kept under glass to protect it from flies and dust. A handsome display in a front window is a drawing card.

The putting-up of extracted honey for the market calls for a large amount of thought, care, and skill. Mr. McKnight, of Canada, once said, "The product of no other industry is put upon the market in such a cumbersome, uncouth and slovenly form." This may seem a little overdrawn, but it is worth thinking of. The majority of people prefer extracted honey in the liquid form, although this is largely a matter of education. There is probably no more attractive form in which it can be put up for the retail trade than in the liquid form in bottles of clear flint glass, with tin-foil caps and dainty labels. A much cheaper package is that of tin; but it hides the beauty of the honey. The friction-top cans are the best tin package. They do not leak, yet they can be easily opened and the honey examined. The lack of attractiveness in the package must be made up in the label, as is the case with all goods put up in tin cans. Quite a little candied honey has been
Aikin's Paper-bag Honey-package for Candied Honey.
sold in *paper sacks*. The sacks are made of heavy manila paper, paraffined, the honey put in while in the liquid state, and then allowed to granulate. The sacks can be set into small boxes, 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 sack and melt up the honey if he prefers it in that state. The cost of the package is only about *one-tenth* that of tin. Every package of liquid extracted honey intended for the retail trade should have an explanatory label stating that honey will candy upon the approach of cool weather, and all packages of extracted honey, whether liquid or candied, should bear labels explaining how to liquefy the honey without injury. Right in this line let me say that candied extracted honey can be put up in a very attractive package. Let it candy in the square 60-pound tin cans, or it may be bought in these cans already candied; cut off the tin can with a pair of tinner’s snips, then cut up the cube of honey into blocks of one pound each; wrap them in paraffin paper to prevent soaking; put a sheet of parchment paper of this to prevent breaking; over this slip a paper carton, and, last of all, a wrapping of white paper printed in gilt letters, raised or embossed. The A. I. Root Co., of Medina, Ohio, has been the leader in putting up honey in this *de luxe* style. For cutting up the honey into blocks they use an ordinary butter-cutter such as is used in the dairy trade. Thousands of pounds of honey put up in this style have been sold at retail in Cleveland at 25 cts. a pound. The beauty and novelty of the package and its contents, combined with judicious but generous advertising, made the product sell like the proverbial “hot cakes.”

Many men have made large wages selling honey direct to consumers. They systematically canvass a city, or portion of a city, carry-
The Marketing of Honey

ing honey with them, giving “tastes,” or small samples, taking orders and having regular days of delivery.

Of course, all men are not adapted to the retailing of honey. Mr. M. A. Gill, of Colorado, who produces about two carloads annually of comb honey, says he prefers to sell it in a lump to some man who wishes to retail it, while he will turn his attention to the production of another crop of honey. But even if a man does not retail his crop of honey, there is no reason why he should not use care and good judgment in selling it at wholesale. If the honey is to be sold on commission, the most important point of all is that the commission merchant be reliable. If in doubt, consult the editors of bee journals. Of course, they may sometimes make mistakes, but usually they are quite well informed regarding the reliability of the principal dealers in honey. After all, an out-and-out sale of the entire crop, at the end of the season, is the most satisfactory, although so high a price is not usually realized as when the crop is sold on commission. Some beekeepers make a business of wholesaling their own honey, that is, selling it to the same class of buyers as patronize the commission men. It requires some little time to work up such a trade; but, once secured, it is easily held. The first thing is to get a list of those men who use large quantities of honey. A local druggist can usually furnish the names of many of the manufacturing druggists; the grocer can give names of the bakers; and an advertisement in the journals will probably reach all of the bottlers of honey. These lists of names should be arranged systematically. Probably the card system would be as good a form to have them in as any that could be found. Samples of honey and prices should be mailed out to these lists; and to those who inquire for samples. Where a man has the time and ability to look after the matter this is really a very satisfactory method of disposing of large crops of honey, year after year, at a substantial advance over what would be secured were the honey consigned to commission merchants.
Developing a Mail Order Trade for Honey

SELLING TWENTY THOUSAND POUNDS OF HONEY AT THREE CENTS ABOVE THE MARKET PRICE.

The first year that my brother and myself produced honey in Northern Michigan we sold it to bottlers and consumers at 8½ cents a pound. This was about two cents above the market price. The advance was secured because the raspberry honey was something of a novelty, of superior quality, and was extensively advertised.

The next year a short crop, combined with a general upward tendency in the price of most commodities, enabled us to sell our crop of honey to the same class of customers at an advance to 10 cents a pound.

FINDING THE RIGHT CUSTOMERS THE FIRST STEP.

In 1908 there was a fair if not a bountiful crop of honey, and many bottlers who really preferred our honey found it impossible to pay 10 cents a pound for it. Honey nearly or quite as good could be bought at from six to seven cents per pound. We advertised our honey at ten cents, but orders were few and small; and we were not long in deciding that some change must be made. Either the price must be lowered or a different class of customers secured. Once a man has tasted the joys of ten cents a pound, they are relinquished with reluctance; besides, we felt sure there were men (actual consumers) to whom the honey would be cheap at ten cents; but the difficulty was in finding such men who would buy in large quantities. Heretofore our advertising had been confined to the bee-journals; but we now decided to venture into a new field, such as might be reached by advertising in the Saturday Evening Post. When the cost is nearly $4.00 a line, the story must be exceedingly short, and the whole effort was aimed at inducing the reader to send for a sample of honey. Here is the advertisement that cost us nearly $25.00 for one insertion in that paper.

HONEY gathered from the blossoms of the wild red raspberry, in Northern Michigan, has a raspberry flavor; shipped in tin cans, securely boxed, at ten cents a pound. Particulars and a generous sample by mail, ten cents.

IMPORTANCE OF THE RIGHT KIND OF ADVERTISING.

Let's analyze it. First, the word "Honey" is printed in large type to catch the eye. Next, there is the reference to honey from the "wild red raspberry of Northern Michigan." Here is something of a novelty, with a tinge of romance. "Northern Michigan" alone calls up a picture of vine-wound thickets, mossy carpets, and "the cedar's dim cathedral;" the "wild red raspberry" gives an additional touch to the picture; then to have offered honey gathered from this source, honey with a "raspberry flavor," there is conjured up a taste and a longing that can be satisfied only by actually tasting the honey. "A generous sample will be sent for only ten cents;" but before sending for a sample the prospective customer would like to know the price and how the honey is put up for shipment; and this information is given in the advertisement.

It may seem that undue importance is attached to this little advertisement, but it must be borne in mind that this is the foundation of the whole scheme. Once a reader's interest is sufficiently aroused to lead him to send ten cents for a sample, the right kind of after-management will often lead to a sale.

GETTING PAY FOR SAMPLES.

By the way, the first two years that we were trying to build up a mail-order trade in honey we offered to send samples free; but this is a great country when things are "free," and we probably gave away hundreds of samples to people who had no intention whatever of buying. Last year we asked ten cents for a sample, which just about covers the cost, but offered to allow the ten cents to apply on the first order. Each sample sent out was accompanied by a slip printed like this:

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This slip is good for ten cents in payment for
honey ordered of
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This, too, may seem like a small point; but the spirit of fairness and generosity thus betokened arouses in the prospective customer a feeling of friendship, or good will; makes him feel like saying, "That's the kind of man I like to patronize," and it may even be the turning-point that brings the order.

NEW CUSTOMERS MUST BE EDUCATED.

It must be remembered that the majority of the readers of the Saturday Evening Post, the public in general, know very little about bees or honey. Outside of the bee-keeping ranks, probably not more than one
person in ten knows about extracted honey—how it is secured and how it differs from strained honey. To sell to this class to the best advantage, all this must be explained in such a way as to be readily understood. In short, the getting of an order from a man of this class, one who has sent for a sample, depends largely upon the kind of reading-matter that accompanies the sample. We sent out a circular in which were used illustrations of our bee-yard, of a honey extractor, etc.

THE RASPBERRY HONEY OF NORTHERN MICHIGAN.

Northern Michigan, the home of the huckleberry and the speckled trout; where the wild deer drinks deep from little sparkling lakes with pebbly beaches; where forests of magnificent beech and maple stretch away for miles unbroken; where still lingers some of nature's wildness—here is a region fast becoming a veritable paradise for the bee-keeper. As the lumberman cuts away the grand old forests, the wild red raspberries spring up in myriads, the blossoms of which furnish bee pasture that is simply incomparable. The honey is thick and heavy, white in color, and has a delicious flavor all its own—a flavor that smacks of the wild raspberry of the woods.

A brother and myself have five apiaries in this region, he devoting his entire time to the business, and we are making a specialty of producing the finest table honey that it is possible to obtain. The honey is not taken off the hives until it is thoroughly ripened and all sealed over, thus securing a product that is thick, rich, and delicious—as far superior to ordinary honey as ripe fruit is more palatable than green.

EXTRACTED HONEY.

This honey is not sold in the comb, but in the liquid form—"extracted honey" it is called, because it is thrown out of the comb with a machine called a honey-extractor, herewith shown. To those who are not bee-keepers I would explain that large frames filled with combs of honey are taken from the bee-hives, the cappings of wax all shaved off with a long sharp knife, then the uncapped combs are hung in wire-cloth baskets that are made to revolve quite rapidly inside of a large tin can. Centrifugal force throws the honey from the sides of the combs on the outside, next to the walls of the can, where it runs down to the bottom, and is drawn off through a faucet. When the combs have been emptied on one side the baskets are reversed, bringing the other sides out, when the motion is again applied, thus leaving the combs entirely empty, to be returned to the hives, where they are refilled by the bees. As the bees have no combs to build, they can store more honey; hence it can be sold at a lower price. Extracted honey must not be confounded with the old-fashioned "strained" honey, in which the combs (bee-bread and all) were mashed up, and hung in a muslin bag before the fire to drain or "strain." Extracted honey is simply the pure honey thrown out of the combs, as has been explained, and is free from impurities.

This honey is put up in five-gallon square tin cans containing 60 pounds, and boxed, either one or two in a case. The two-can cases are iron-bound at the ends, and we guarantee all shipments to reach their desti-
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nation in perfect condition. We are often asked if we do not furnish smaller packages. Small packages are all right for a retail trade near home; but it would cost too much in proportion to their value to ship them long distances. Freight on 25 pounds would be as much as on 200 pounds. If a customer does not care for as much as 60 pounds, an excellent plan is to get some acquaintance or friend to join in and take part of it.


References, Citizens' Commercial and Savings Bank.

The foregoing circular was printed upon the finest cameo plate paper, of a sepia tint.

There was some little hesitation as to the advisability of using my portrait; but there is quite a little satisfaction in seeing what kind of looking person you are patronizing. It helps to remove that feeling of dealing with a stranger, and replaces it with confidence and a feeling of acquaintanceship.

APEALING TO THE "FANCY."

A picture was given of one of the beautiful little lakes of Northern Michigan, of the magnificent forests of maple that are made to give place to the raspberries, also of one of the apiaries in the northern wilds. These illustrations and the accompanying reading-matter help to strengthen in the reader's mind the romantic picture that he has already formed of Northern Michigan and her honey resources. This, too, may seem like a small point; but we are all more or less influenced in our purchases by what might be termed "fanciful reasons." Honey from the wild red raspberries of Northern Michigan is quite different from just ordinary "honey." But, friends, it would be possible to take clover honey, or basswood, or any first-class honey, and by illustration and description hold it up to the purchaser in a very attractive light.

Then by word and picture the production of extracted honey was made clear, and the manner of packing it for shipment was treated in a similar manner.

As prices are likely to fluctuate, they were not given in the descriptive circular, but printed separately on a small slip, and enclosed with the circular.

There is one more point that it might have been well to mention in the circular; but we wished to avoid confusing customers at first with too many details, and that is the candying of honey; but here is what we did: Attached to each package is the following sticker:

In short, every effort was made to please customers—not only from a desire to please, but that these customers might return year after year.
MORE PROFIT IN A MAIL-ORDER TRADE THAN IN SELLING TO JOBBERS.

We had about 20,000 pounds of honey, and at least half of it was sold as the result of this one advertisement, and the proper handling of the replies that came in response.

TAKE NOTICE! This honey will candy, or become white and hard, as soon as it becomes cool, or cool weather begins, and this candying is, in fact, the best proof of its purity. To restore it to the liquid form, set it in hot water (not hotter than you can bear your hand in). To overheat or boil the honey spoils the flavor. When melted, remove and cork or cover again. If sealed up while quite hot with a cork dipped in melted wax (or with the inside of the cover waxed), it will usually not candy again. When putting the bottles in hot water, place them on strips of wood to prevent breaking.

The rest of the honey was sold mostly to old customers, who used it largely on their own tables; in short, it might be said that we sold most of our honey at wholesale to actual consumers. In other words, we took such a course as to find customers who were able and willing to buy honey in large quantities for their own use; in fact, it was noticeable that the orders came largely from bank cashiers, superintendents of factories and other men occupying positions that enabled them to buy honey in large quantities if they so desired.

SMALLER PACKAGES NEEDED.

If a scheme does not turn out so well as expected, it may be worth while to find out why. The knowledge thus gained may be worth all that it costs to try the scheme; so we took pains to find out why men sent for samples of honey and then did not send in an order. It was as we expected. There were various reasons given, but none worth mentioning, except that of the size of the package. Sixty pounds is too large a package for the trade to which we were catering; or, rather, there ought to be smaller packages. It is all right to have two sixty-pound cans in a case; also one in a case; but there ought to be varying sizes of smaller packages with prices according to the size—the smaller the package, the higher, relatively, the price.

Quite a number have written, and several at the Detroit convention said, "Hutchinson may get ten cents for his honey, but when he comes to figure up his cost of advertising I doubt if his honey will net him more than if he had sold to a jobber at seven cents." All of the cost of
Developing a Mail-order Trade for Honey

advertising, including periodical, circular, postage, etc., was less than $200. A difference of three cents a pound on 20,000 pounds amounts to $600. In other words, the honey netted us nine cents a pound. There is one more point in this connection that is worthy of consideration; and that is, that our selling our honey at ten cents helped, at least in a small degree, to hold up the price. When some man objected to the price that was asked, it was not within its effect to say, "Why, Hutchinson is selling his honey right along at ten cents!"

A NEW FIELD READY FOR THE HARVEST.

We are satisfied that we have broken into a field that, with careful cultivation, will yield bountiful profits—a mail-order trade in honey direct to consumers. If our little advertisement of half a dozen lines, inserted once in a single publication, led to the sale of more than 10,000 pounds of honey at ten cents, when put up in sixty-pound packages, what couldn't be done with extensive advertising and honey put up in packages suitable for this trade? The field is white for the harvest.
Migratory Bee-keeping

It is seldom that one locality abounds in all of the honey-producing plants that may be found by making short journeys in different directions. A locality unequalled for early bloom may be sadly deficient in the clover and basswood blossoming so profusely at mid-summer only a few miles distant, while a few miles further on may be a swamp or river bottom that is of little value as a bee pasture until gorgeous with the purple and gold of autumn flowers. It will be readily seen why some bee-keepers occasionally find it profitable to move their apiaries once or twice during the season. Some notable successes in this line have been made in Florida, where the honey from the orange-blossom comes in March; then a move of perhaps fifty miles allows the bees to enjoy the bloom of the saw-palmetto, and, later, another crop may be secured by moving to the mangrove region. After the harvest of sage honey is over in California, and vegetation in the mountain canyons has turned dry and brown, a move of twenty or thirty miles will, in some localities, place the bees among thousands of acres of blooming bean-fields from which may be gathered a white honey of fine flavor. In Canada several bee-keepers make a good profit each fall by moving their bees to buckwheat regions. In Europe bee-keepers move their bees to the heather-fields, and then, later, to the buckwheat; in fact, so many move their bees to the buckwheat that a train is sometimes made up expressly for carrying the bees to these pastures. Several years ago a younger brother of mine, who had not left home, came to my place early in August and carried home with him twenty colonies of my bees, as there was an abundance of goldenrod, boneset, and willow-herb in his locality and none in mine. 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 about 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 need no feeding for winter, while the bees kept at home stored no surplus, and each colony required feeding, on the average, about fifteen pounds.

Had buckwheat yielded well, which, in this locality, happens about once in a dozen years, nothing would have been gained by the move.
Willow Herb (Epilobium) in Full Bloom.
The inability to foretell the honey-flow in any locality is the greatest obstacle in the way of successful migratory bee-keeping. Local showers sometimes cause a great difference in the yields of honey in localities only a few miles apart; but migratory bee-keeping does not allow us to take advantage of this, as, by the time we have moved to the locality that is furnishing honey, the flow there may be over, and, possibly, started up in the home yard. There is nothing to be gained by changing one possibility for another of equal value. But moving to another location which promises well at a time when we know nothing will be gathered if the bees are kept at home, is a far different thing. For instance, only forty miles from here, on a direct line of railroad, is a locality where it is nothing unusual for 100 pounds of comb honey per colony to be secured, yet nothing is in bloom here at that time. The expense of moving to and from a locality no further away than this need not be so very great. From thirty to forty colonies can be moved on a hay-rack; or a special rack might be made which would accommodate fifty colonies. An apiarist who is going to practice moving his bees to secure better pasturage must have hives, fixtures, and other arrangements suitable for that purpose. The arrangements ought to be such that three or four minutes would be sufficient for preparing a hive for moving. One of the greatest advantages of fixed or self-spaced frames is that they need no fastening when the apiary is to be moved. Of course, bees moved in hot weather must have abundant ventilation; but this alone will not save the brood if they are long confined. To save the brood the bees must have plenty of water.

Some localities are blessed with an almost continuous flow—spring flowers, white clover, basswood, and fall flowers; and, by the way, a 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 relatives living near, and prefer not to seek a new location, even if the profits would be thereby increased. Then, again, it is difficult to find a first-class locality for clover and 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.

There is no question but that many bee-keepers can secure a bountiful crop of fall honey by moving their bees at the right time; but a word of caution may not be out of place right here. Some fall honey, that from aster, for instance, is sadly unfit for winter stores. So disastrous has fall honey proved for winter stores, in some localities, that the bee-keepers there have given up trying to winter their bees unless they substituted early gathered stores, or fed sugar. I know of one bee-keeper in such a locality who secured bountiful crops of fall honey from the surrounding swamps, but was utterly unable to winter his bees, prepare them as he
Moving to Better Pastures.
might, and he finally fell to shaking them off the combs at the close of the season (thus saving the honey), and restocking his apiary in the spring with bees from the South. So I say, beware when you move your bees to fall pastures of asters and swamp flowers.

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” the entire summer. The difficulties to be overcome are largely 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 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 Mr. 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 are 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, the plan might be made a success. Mr. Byron Walker, who has had much experience in moving bees from the South, greatly favors the Mississippi plan of migratory bee-keeping. He would not put the bees on a barge and tow them with a tug, but would load them upon a regular steamer running up the river, setting them off at some desirable point, and then shipping them by another boat to another point further up the river, as the flow begins to wane. In the fall he would take the bees back south for the winter.

Right here a hypothetical question comes to mind. Suppose an apiary moving up the Mississippi secures as much as six ordinary 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 out-apiary it is because he thinks his home yard overstocked; that he will get enough more honey for 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 a considerable extent by overstocking ere the establishment of an out-apiary would be a profitable move. At times of great honey-flows it is probably practically impossible to overstock a locality. The overstocking occurs during the lighter yields. There is occasionally a man, notably Mr. E. W. Alexander, of New York, who made a success of keeping a very large number of colonies in one apiary by feeding during times of scarcity. Mr. Alexander secured as high as 75 pounds of extracted honey per colony from 700 colonies in one yard. This question of how many colonies will justify the starting of an out-apiary is one that must be settled according to the circumstances of each individual case, and can never be decided with more than approximate correctness.

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 expenses attending the establishing and management of out-apiaries. Land must be bought or hired; some sort of building or shelter secured; and a conveyance of some kind will be needed for carrying bees, tools, and supplies. Then in the Northern States 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 it is finally decided to start an out-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 should be no encroachment. But it must be remem-
bered that the pasture ground of each apiary is somewhat circular in form, hence they might be moved toward each other to a considerable extent without one encroaching very much upon the other. Dr. Miller has given a very happily illustration: Lay two silver dollars side by side. Lift the edge of one and slide it over the edge of the other. Notice how far it may be pushed over without covering a very large portion of the other. Notwithstanding all this, those who have had experience in the matter are not inclined to place out-apiaries nearer together than four miles, and prefer to have them five or 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 can not always secure the exact spot desired for the location of an out-apiary, and it would probably be well to go a little further than really necessary, rather than to crowd some other apiary.

The mode of travel to and from out-apiaries will depend upon circumstances. Some men have a honey-house, with extractor and kit of tools at each apiary, and ride a bicycle to and from the work, storing the honey at or near the apiary, and hauling it home at their leisure. A few men have been fortunate enough to be able to locate out-apiaries near some trolley line by means of which they can go and come any hour of the day. Probably the majority find horses the most desirable means of travel, in which case one set of tools will answer for several apiaries. It is even possible to dispense with honey-houses at the apiaries, a tent being carried, and slipped over a light framework kept standing at each yard. A covered wagon is sometimes made to answer as an extracting-room.

After locating an out-apiary, and deciding upon the mode of travel to and from it, the matter of management brings up several questions. Shall comb honey be produced, or shall the honey be taken in the extracted form? Shall it be managed upon the visiting plan, or shall a man be kept there during swarming time? I believe that, in the majority of cases, extracted honey is produced in out-apiaries, as by this plan swarming can be nearly controlled, and the apiaries visited only at intervals. Mr. E. D. Townsend, of Michigan, has successfully managed an apiary for extracted honey by visiting it only four times a year. The bees were in ten-frame Langstroth hives. At the approach of the white-clover flow he visited them to remove the packing and put on two upper stories of combs. He visited them twice to extract and again to pack them up for winter. His profits averaged $150 for each visit. He approves of visiting an apiary oftener than this, but his experience shows what can be done. The reason for not visiting this apiary oftener was that it was fifty miles from home. And this brings up another point in connection with out-apiaries: If they are widely scattered, with varying kinds of pas-
turage, there is almost a certainty of securing a crop each year from some of them.

The difficulty in the past in managing out-apiaries for comb honey has been that of controlling swarming; but the discovery of "shook swarming" changed all this, and gave a wonderful impetus to the establishment of out-apiaries. By visiting an apiary once a week, and "shaking" every colony that has started queen-cells, there will be little if any swarming. A few bee-keepers succeed in preventing swarming by removing the queens at the beginning of the swarming season, but the practice has never been generally adopted.

As many colonies ought to be placed in an out-apiary as the location will bear—certainly enough to make a day's work at each visit during the busy season, as it would be unprofitable to drive off five or six miles to do only part of a day's work.

In those parts of the country where outdoor wintering is uniformly successful there need be no question as to how bees shall be wintered at an out-apiary; but where cellar wintering must be depended upon, a choice must be made between building a cellar at each apiary and that of carting the bees home in the fall and out again in the spring. If the bee-keeper knows positively that an apiary is permanently located it may be worth while to consider the construction of a cellar on the ground; but usually there is more or less shifting about of out-apiaries, and, unless too far from home, I should be inclined to follow Mr. P. H. Elwood, of New York, in bringing them home in the fall and carrying them out in the spring. Mr. Elwood sometimes has as many of 1,000 colonies in one cellar. Mr. E. D. Townsend, whose out-apiaries are widely scattered, buries his bees or puts them in "clamps," as it is called; and where the soil and location are suitable this is an excellent method of wintering bees.
Out-apiary in Raspberry Region of Northern Michigan.

The logs "banked" just beyond the apiary are hard-wood timber, and where this is cut off the wild red raspberries spring up and furnish great quantities of nectar.
House-Apiaries

A house-apiary, as indicated by its name, is an apiary kept in a house, the bees passing out through openings in the walls. Formerly the hives were built permanently in the house, the shelf upon which they set forming the bottoms, the walls of the building forming one side, and each division-board between any two colonies forming one wall for both colonies. Eventually it was discovered that building the hives into the building in this stationary manner curtailed or complicated many of the manipulations. For instance, if a colony swarmed and it was desirable to hive the swarm upon the old stand, moving the parent colony to a new stand, it could be accomplished only by removing the combs one by one and carrying them to a new location. When the ordinary hives are used, any colony can be picked up and carried to any location. A swarm can be hived out of doors, then the hive picked up and carried into the house. Still another point: Some bee-keepers like a house-apiary for summer, but find it a very poor place in which to winter bees, hence they build a cellar under the house and winter the bees in the latter, this course being possible only when the hives are movable.

It will be seen that, although we have a house-apiary, we also need the regular hives, just the same as though they were to be kept out of doors, with this exception, that, if they are to be used exclusively in the house, they may be made of cheap lumber and left unpainted. The same may be said of the supers or upper stories. If we must have regular hives, why have a house-apiary? Well, here are some of the advantages: The house can be locked against thieves; the colonies, apiarist, and his tools are brought close together, and under shelter; and this latter point is very important, especially in the management of a series of out-apisaries that are to be visited periodically. Rain puts an end to bee-work in the open air, and three or four days of rainy weather sadly demoralizes the plan of visiting an apiary once a week when there is an apiary for each day in the week. In a house-apiary the work can be continued regardless of the rain. Of course, there would be the traveling to and fro in the rain, but rubber coats and blankets overcome that difficulty. Shelter from the hot sun is often a great comfort. In taking off honey there is never any trouble from robber bees. Bees are more peaceable, that is, less inclined to sting, when handled in a house. In short, the advantages,
with one exception, are nearly all with the house-apiary, and this exception is the cost of the building. Formerly there was the objection that the removal of the surplus liberated many bees inside the building, where they were a great annoyance upon the windows and under foot. The introduction of the honey-house bee-escape has removed this most serious objection. By means of the escapes surplus can be removed with scarcely a bee entering the building, and these few find their way out through the escapes with which the doors and windows are provided at the top.

General View of Mr. Ludington’s House Apiaries.
(Honey-House in the Center—Shop in the Background)

Probably the only really serious objection to the house-apiary, aside from its cost, is the great likelihood of queens being lost while on their wedding flight; that is, of their entering the wrong hive upon their return. The trouble arises from the greater number, similarity, and regularity of the entrances. To help to overcome this difficulty, different portions of the house are often painted different colors, and different designs are placed about the entrances. Some bee-keepers have found it desirable to rear their queens outside of the house and introduce them when needed.

Mr. A. A. Ludington, of Verona Mills, Michigan, uses small house-apiaries made of cheap lumber, and winters his bees in a cellar. Instead of setting his hives upon shelves he hangs them up against the walls by means of heavy wire loops. The bottoms to his hives are hinged so that they can be let down. This allows of an easy examination of the lower edges of the brood-combs where the bees are almost certain to build queen-cells if preparing for swarming; thus he is able to foretell swarm-
ing very quickly without so much as opening a hive. The bees can easily be driven up among the combs by the means of smoke, when, by using a hand mirror, if necessary, a view can be obtained that extends up quite a distance between the combs. If the light is insufficient, some one can stand out of doors with another mirror and throw a flood of sunshine under the hive that is being examined.


Perhaps few can understand the longing there is in the heart of the author of this book to build himself a real log cabin, with stone fireplace and chimney, on the shore of some one of the beautiful little inland lakes of Northern Michigan, establish an apiary hard by, right in the woods, and pass at least a portion of each summer in that sylvan retreat. What a place to take bee-keeping friends in the autumn, when the evenings could be spent around a fire, of blazing pine knots in the fireplace!
Foul Brood

Foul brood is a bacterial disease of the larvae or brood of bees. Once a single spore of the disease comes in contact with a larva, or is fed to it, it begins to increase with wonderful rapidity, the bacteria feeding upon the larva as maggots feed upon the carcass of a dead animal. The larva soon dies and turns a dull brown, something about the color of coffee after milk has been added and it is ready for drinking. The dead larvae soon lose their shape, and settle down into ropy, gluey masses having an odor somewhat similar to a poor quality of glue when it is warming on the stove, being made ready for use. In the earlier stages this odor is seldom noticeable; but as the disease increases this odor becomes quite pronounced. If a match or a wooden toothpick, or something of this nature, be thrust into a dead larva, and then withdrawn, the dead matter will adhere to the stick, and draw out in a ropy string, perhaps an inch in length, when it will break and fly back. The dead larva finally dries down into a thin brown scale upon the lower side of the cell. A large share of the larvae reach that stage where the bees seal it over, but, for some reason, the cappings often become sunken, and sometimes contain holes. Of course, the healthy brood hatches while the diseased brood does not, and soon the combs present a peculiar speckled appearance from part of the cells being empty, while others are sealed with dark ragged cappings. When the bees attempt to rear another larva in a cell where a larva has died of foul brood, it is certain to be a failure. This larva, too, dies of the disease. If honey is stored in the cell it becomes contaminated with the germs of the disease; and if fed to larvae, it infects them with the disease. The combs finally become so contaminated with the disease that scarcely any brood can be reared. The old bees die off from natural causes, and, there being no young bees reared to take their places, the colony dwindles away until it becomes a prey to robber bees who carry home the honey, and thus start the infection in their own hives. In this way the disease is spread from hive to hive and from apiary to apiary.

Such, in brief, is foul brood; and as there is no apiary in which there is not a possibility that it may appear, 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 have formed exaggerated ideas regarding the appearance of foul brood, especially 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 away to mere handfuls. The possession of these exaggerated ideas by bee-keepers has allowed foul brood to gain a strong foothold in many an apiary long before the unfortunate owner ever dreamed of its presence. At first, only a few diseased cells will be found. Of course, it is not advisable that a bee-keeper be continually opening brood-nests, and critically examining combs for foul brood, but there are certain danger-signals that it is well to bear in mind. If a colony shows signs of listlessness; or many dead bees are found in front of the hive; or if a peculiar, unpleasant odor is noticed, it would be wise to make an examination. Whenever handling combs of brood it is well to glance understandingly at the brood. Notice if the "pearly field" of unsealed larvae is unbroken. If there are desolate patches, and the sealed brood is scattering and in patches instead of in solid sheets, examine more critically. If some of the larvae are discolored, shapeless, ropy, ill-smelling; some of the cappings sunken, perhaps perforated, foul brood is present. The one sure symptom of foul brood is the ropiness of the larvae. If a splinter be thrust into a dead larva, and withdrawn, the matter will adhere to the splinter, and "string out," perhaps an inch or more, then break, and the two ends fly back to the points of attachment. Without this viscosity there is no foul brood—with it there is always foul brood.

Right here it might be well to say that all dead brood found in the combs is not foul brood. There is chilled brood, starved or neglected brood, "pickled" brood that comes and goes, from what cause no one yet knows; but in all of these the ropiness is lacking. In the majority of cases the outer skin of the larva does not seem to decay, and enables the operator to draw the whole larva from the cell. Then there is black brood, that has caused so much havoc in New York. In this the dead larva is more of a gelatinous nature than anything else. It may sometimes string out a quarter of an inch, but never more than that, while foul brood will string out at least an inch, and sometimes much further. Black brood, also called European foul brood, turns slightly yellow, then a dark brown, and finally becomes black, hence the name. It does not emit that gluey or "old" smell that comes from foul brood. There is scarcely any odor, and what little there is might be called a sour or fermenting smell, like that from decaying fruit. Black brood is very similar to foul brood. It spreads in the same manner, and treatment is the same as that for foul brood. I shall have more to say about this disease later on.

To come back to old foul brood once more. The symptoms enumerated above will be seen only during the breeding season. In a strong
An Advanced Stage of Old-fashioned Foul Brood.
colony, after the breeding season is over, the cappings are all cleared away, and the dead brood is entirely dried up—mere scales almost the color of old comb itself, lying fast to the lower sides of the cells, and drawn back more or less from the mouths of the cells. There is probably no symptom of foul brood that is more difficult for the novice to detect than these dried-down scales, and, as just explained, except in the breeding season, they are the only evidence that can be found of the disease. Here are the instructions given by Mr. N. E. France, Inspector for Wisconsin, for finding these scales: "Bring a brood-comb up from the hive to the level of your chin; then tip the top of the comb toward you, so your view strikes the lower side walls (not the bottom) of the brood-cells about one-third distant from the front end of the cells. Then turn so that the rays of bright light will come over your shoulder, and shine where your eye is looking. Gas or electric light will not take the place of good daylight. On the lower side wall, a little back from the front end of the infected cell, will be seen the dead larva bee, nearly black, with a sharp-pointed head, often turned up a little, the back portion of the bee flattened to a mere lining of the cell, often no thicker than the wax in the wall of the comb. The base, or bottom of the cell, likely looks clean; also all of the other side walls of the cell."

Honey is the means by which the disease is usually carried from one hive to another. Mr. Frank Cheshire says that the mature bees, the queen, and even the eggs, are infected in a diseased colony, but our best authorities now believe that this is a mistake. Be this as it may, where the bees of an infected colony swarm, or are shaken from their combs into a new or clean hive, and given no combs in which they can store the infected honey that they have brought with them, the brood hatched afterward in this newly formed colony remains free from disease. Foul brood is often brought into an apiary by the bees robbing some diseased colony in a neighboring apiary, and bringing home the honey. The buying of second-hand honey-cans often brings foul brood into an apiary. If the bees gain access to them they soon lick up any honey that may have dripped upon the outside of the cans; or the bee-keeper may rinse out the cans and throw out the water upon the ground where the bees will come and suck it up. I have known a bee-keeper to clean out a lot of second-hand cans and feed the honey directly to the bees, with the result that foul brood developed in every colony that was fed. In rare instances the buying of queens from a distance has introduced foul brood into an apiary. The queens themselves had nothing to do with disseminating the disease, but the bees and honey that accompanied them brought with them the germs of the disease. It is a safe plan to put the new queen into a clean cage and destroy the accompanying bees and cage. After foul
Looking for the Dried-down Scales of Foul Brood.
The white line shows the angle of vision, and at which the light should fall.
brood is once introduced into the apiary, it is disseminated by robbing, by the careless exposure of infected honey, by changing combs from hive to hive, or by extracting honey from infected combs, thus contaminating the extractor and other combs that may be brought in contact with it.

When foul brood is discovered in an apiary, what shall be done? In the first place, don’t “lose your head,” as the saying is. Don’t be in such haste to be rid of the pest that a crop of honey is lost, and the work of eradication imperfectly performed. Curative operations can be carried on only during a successful 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 year.

The entrances of all weak colonies should be contracted, and any colony too weak to make the proper defense, or so weak that it is not likely to pass the winter, had better be destroyed at once.

The spraying of the combs with acids, the fumigating of them with formalin gas, the feeding of the bees with medicated honey, are all of little avail. Weak colonies had better be united, but there must be caution in doing the work, gradually bringing them together that the bees may not be scattered into other hives until they are side by side before the union is made.

Finally, the main honey-flow comes on. With us this is the last of May or fore part of June. Now is the time for treating the diseased colonies. Any colony that is strong, and almost or nearly in a condition to cast a swarm, may be treated as follows: Set the colony just back of its old stand, and upon the stand place a hive the frames of which are furnished either with full sheets of comb foundation or with starters of the same. Remove the combs from the old hive and shake off most of the bees in front of the new hive. Nothing more need be done to the colony in the new hive. Ere it can rear brood it will have consumed any infected honey that the bees may have brought with them. Don’t use drawn combs instead of starters or foundation, because the bees might store some of the infected honey in the comb, where it might remain until brood was being reared, when, if this honey should be fed to the brood, the disease would be again started. I have never found it necessary to give the bees a second set of frames and a second shaking, as is practiced by some. Neither have I found it necessary to boil or otherwise disinfect the hives. The old hive, with the combs of brood, is placed upon a new stand. Sometimes two sets of combs from which the bees have been shaken are united. In ten days a young queen or a ripe queen-cell may be given the old colony. In twenty-one days from the time the bees were shaken off, just as all of the healthy brood has hatched, and the young queen is beginning to lay, the colony may be again
treated exactly as it was at the first shaking, when the result will be another healthy colony, while the old combs will be entirely free from brood, and should be taken to some place of safety (where no bees can gain access to them) and eventually treated as may seem best.

Colonies not populous enough to make a good colony each, when shaken, may be treated in "pairs." We select the first pair, set one of them aside, as was done with the strong colony, and put a hive containing frames, furnished with foundation, in its place. We now shake out the bees into the new hive, as before, only we get all of the bees, as well as the queen. We next put the old hive with the brood on the stand of the other hive of the "pair," bringing the latter to the location where the first "shaking" took place, and shake out the bees and queen in front of the hive into which the bees from the first hive were shaken, the combs of brood being taken back to their old location and united with the combs of brood from the first-shaken colony. We thus get only one "shook swarm" from two colonies, but it is stronger for that reason. The united colonies of brood will be given a young queen in ten days, and then shaken upon a new set of frames in twenty-one days, as was done with the populous colony first described.

There is still another method of treating foul-broody colonies in which there is no shaking-off of the bees; and it has always been a wonder to me that it has not come into more general use. The plan originated with Mr. M. M. Baldridge, of St. Charles, Illinois, and is called the Baldridge method. It is based upon the fact that, when a bee leaves a hive naturally, in quest of honey, its sac is free from honey, and it might enter a healthy colony without infecting it with disease. Of course, when it returns with a load of newly gathered nectar it is still in that harmless condition. Here is the method of management: Close the entrance and then bore a hole in the front of the hive, just above the entrance, and near the side of the hive. Over this opening fasten a bee-escape in such a position that bees can pass out of the hive through the escape, but can not return. Next cage the queen of the colony, laying the cage on top of the frames. The following morning go to some healthy colony and select a comb of sealed brood, either with or without the adhering bees; place it in an empty hive, filling out the hive with frames filled with foundation, and set the hive thus prepared upon the stand of the diseased colony, setting the latter to one side, so that the two hives will stand side by side, close together, and fronting in the same direction. Have the bee-escape as near as possible to the entrance of the new hive that is on the old stand. It will be seen that all flying bees will return and enter the new hive on the old stand; and, as fast as the bees leave the old
hive by means of the escape, they will return and join the newly formed colony upon the old stand, as it will be impossible for them to enter the old hive. At sundown of the first day after setting the old hive upon a new stand, open the hive carefully, take away the caged queen, being careful to take no bees with her, and let her run into the entrance of the new hive. All of this work of closing the entrance of the old hive, setting it upon a new stand and removing the caged queen, should be done as carefully as possible so as not to disturb the bees and induce them to fill themselves with honey. Nothing more need be done for about a month, by which time the brood will all have hatched and the bees have left the hive and joined the new colony. The hive should be opened in some close room from which no bees can escape; and, should a few stragglers remain in the hive, they should be destroyed. The combs are now free from bees and healthy brood, and ready to be treated as seems best, while there is a healthy colony in the apiary where once stood the one diseased with foul brood.

When freed from bees and healthy brood, no matter what the method employed, the combs may be emptied of honey with the extractor, and then melted into wax. Of course, an extractor thus used must be most thoroughly cleansed before it is again used for extracting combs of honey from healthy colonies. For disinfecting the extractor I would use a strong solution of salicylic acid, pouring it on boiling hot from the spout of a tea kettle. The matter of cleaning the extractor is one about which one can not be too thorough. Honey from such combs ought not to be placed upon the general market, as consumers are liable to throw out an empty package where neighboring bees will come and clean it up. Some bee-keepers ship such honey to bakers where the heat used in baking will destroy any germs that may be in the honey. Thorough boiling of the honey will kill the germs and make it safe for use in feeding the bees; but before the honey is boiled it must be mixed with an equal quantity of water. Some advise boiling the hives, or burning them out on the inside by painting them over with kerosene and setting it on fire, but I have seen so many hives used without taking any such precautions that I have come to doubt their necessity. Mr. McEvoy, inspector of apiaries for Ontario, says that he has cured thousands of cases of foul brood without any such disinfecting, and considers it wholly unnecessary. Some have advocated the burning of the combs with no attempts 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 honey and wax may be saved. Whoever undertakes such a job must
remember, however, that eternal vigilance is the price of success. One drop of the infected honey secured by a robber bee means disease once more in the hive to which it is carried. It has been 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 were flying. There is really no necessity of 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 in some parts 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 from 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 robbing 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, and perhaps the combs of two or more colonies are put together upon one stand. Perhaps it ought to be mentioned that the combs are not shaken entirely free of bees, some being left to care for the unsealed brood; and caution is exercised that the work be not done too early in the season when there would be danger of chilled brood or from robbers. At the end of three weeks the brood has all hatched, when the combs are shaken entirely free of bees, the latter, of course, going back into the hives and building new combs, thus establishing colonies that are free from the disease. The honey is then extracted from the old combs, and the latter rendered into wax. It is asserted that the wax will pay for the labor, while the new combs are built at a profit. I believe that this plan can be successfully followed in the East as in the West; although, of course, the Western harvest is much longer than ours.

Having given the treatments that are applicable for either European or American foul brood, it will now be in order to give a treatment that applies to European foul brood (black brood) only. This has the advantage that neither brood nor combs need be destroyed. While the late E. W. Alexander was the first to bring it before the public, Mr. S. D. House is one of the most successful users of the
plan. I can do no better than to insert a recent article of his right here:

There is a vast difference between black brood (European foul brood) and American foul brood; the former being more virulent and destructive, yet yielding to milder treatment. What I have to say in this article will have reference to European foul brood.

About four years ago I discovered some diseased brood in a colony that had been purchased the previous autumn. The same day that I made the discovery, one of the inspectors called, pronounced it "very suspicious," and advised treatment by the shaking method. That evening, hoping to prevent any spread of the disease, the whole colony, bees, brood, combs and hive, was buried deep in the earth. But I was doomed to disappointment, as, during the season, eight more colonies showed the disease in a mild form.

The next spring my troubles began in real earnest. By June 15th there were 160 diseased colonies in my home-apiary. I sent for Inspector Mortimer Stevens, and he came, accompanied by Inspector Chas. Stewart. They pronounced it black brood in its worst form, and advised shaking off the bees, stacking up the brood to let what there would of it hatch, burning out the inside of the hives, and the melting up of the combs. They also advised Italianizing.

Having three out-apiaries, with no one to help me, the item of labor was an important factor; so I decided to give the Alexander plan a trial on part of them. I dequeened 40 colonies, and, 10 days later, gave each a ripe queen cell from healthy Italian stock. I did the work carefully, and was full of hope, but the disease appeared again with the second filling of the combs. I then shook the greater part of them and doubled them up. A few were dequeened and given the Alexander treatment* the second time, and those colonies cleaned up and stayed cured.

Later experience has taught me that it was not the second treatment that effected the permanent cure, but the presence of Italian bees that were hatching out. If I had given them more time they would have cleaned up without the second shaking. The rest of the colonies in this apiary were shaken, the combs melted and the frames burned, but the disease reappeared, that same season, in some of the colonies.

The following season the disease appeared in one of my out-apiaries; also in a good many of the colonies at the home-apiary; even among those that had been shaken the previous year but not requeued. Upon studying over the situation, I noticed that it was the hybrid and black colonies that did not stay cured, no matter what kind of treatment was given. There were some pure Italian colonies in all of the apiaries, and, with a single exception,

*Go to every diseased colony you have and build it up either by giving frames of maturing brood or uniting two or more until you have them fairly strong. After this, go over every one and remove the queen; then in nine days go over them again, and be sure to destroy every maturing queen-cell, or virgin if any have hatched. Then go to your breeding-queen and take enough of her newly hatched larvae to rear enough queen-cells from to supply each one of your diseased queenless colonies with a ripe queen-cell or virgin just hatched. These are to be introduced to your diseased colonies on the twentieth day after you have removed their old queen, and not one hour sooner, for upon this very point your whole success depends; for your young queen must not commence to lay until three or four days after the last of the old brood is hatched, or 27 days from the time you remove the old queen. In regard to those old queens that were formerly in your old hives, I think it best to kill them when you first take them from their colonies—not that the queen is responsible for the disease, for I am sure she is not; but a young Italian queen that has been reared from a choice honey-gathering strain is worth so much more to you that I can not advise saving these old queens.
not a single diseased cell had been found in them, even with diseased colonies all about them. This exception came from the giving of a comb from a supposed healthy colony that afterwards proved to be diseased. As a test, this colony was left undisturbed, and it cleaned up during the season, and has remained healthy since. I have witnessed several instances where a single colony of Italians has survived without care or treatment, in some farmer's small apiary; not even shown a trace of the disease, when the rest of the apiary of blacks or hybrids died with black brood.

WHY THE ALEXANDER PLAN HAS FAILED.

There has been much discredit given the Alexander plan of treating black brood, but I believe the failures have arisen not so much in the treatment as in the race of bees. Let me give an illustration: Mr. Howard Mills, of Syracuse, had an apiary of 100 colonies of blacks. When the disease appeared in his apiary, he called in the inspector, who instructed him to shake off the bees, destroy the combs, etc., which was done at considerable expense, yet, the same season, the colonies became so badly diseased, again, that Mr. Mills destroyed all of them in the fall, and went out of the business.

Again: Mr. Irving Kinyon, of Fairmount, bought an apiary of black bees that were badly diseased. In the fall he dequeen and doubled up about 25 colonies, expecting to introduce Italian queens, but the dealer of whom the queens were ordered failed to furnish them, as the season became so far advanced that it was not safe to ship them. As a result, these colonies went through the winter queenless. In the spring the Italian queens were introduced, and those colonies freed themselves of the disease. A few colonies showed traces of the disease in the second hatching of bees, but the Italian bees soon cleaned out the dead larvae, and the disease disappeared entirely. I could mention many similar cases showing that there is more in the strain of bees (Italian) in combating the disease, than in any method of treatment.

There is one more point: Don't be alarmed if a few diseased larvae show in the second filling of the combs after introducing an Italian queen. Give the Italians time, and they will clean these out.

METHODS OF TREATMENT VARY WITH THE SEASON.

As to the most desirable treatment, much depends upon the time of the year. Those that show the disease in the spring, I would dequeen at once, on the Alexander plan. If the disease does not show until just prior to the honey harvest, then I would shake the colony.

I have shaken colonies during the honey flow, tiered up the brood, destroyed the queen cells at the tenth day, given a ripe cell from healthy, Italian stock, then, later, selected the section that the bees were occupying the strongest, placing it, with the queen, at the bottom, with an excluder over it, and the other chambers above. The bees would clean out the combs, and later use of the combs, both as extracting combs and as brood combs, failed to resurrect the disease.

FORESTALLING THE DISEASE.

My bees have now passed through one season free from European (black) foul brood, and experience leads me to say to bee-keepers, thoroughly Italianize your stock before the disease appears in your territory; you then have very little to fear from the disease. As one of the inspectors puts it: "Black brood is a blessing in disguise. It does away with the careless bee-keeper and the old box hive."

Camillus, N. Y., March 7, 1910.
Apiarian Exhibits at Fairs

For fifteen years I did not miss making an annual exhibit of bees and honey at our State fair; and for three or four years I also made exhibits at the State fairs of Indiana, Wisconsin, Illinois, and Missouri. It will not pay to travel from State to State with an exhibit unless the exhibit is unusually large and attractive—enough so as to win the lion’s share of the premiums. On the other hand, it will not pay to get up a large, expensive exhibit unless it is to be exhibited at several fairs. In order thus to make a “circuit” of several State fairs it is necessary to charter a freight car and travel with the exhibit. In no other way is it possible to avoid fatal delays at transfer points. The work is terribly hard. There is the packing-up at night, and traveling nights in a freight-car; the “hurrah boys” of getting upon the grounds and the exhibit set up in time, and the friendly rivalry with competitors; but there is a fascination about it that, to an old exhibitor, is almost irresistible.

There has been, in times past, some opposition to these apiarian exhibits on the ground that they were often 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 the experience that I have had, I am thoroughly convinced that nothing of the kind occurs; in fact, the exhibition 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 can not be picked up and learned in a day by some Tom, Dick, or 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, can not
help benefiting the exhibitor as well as the pursuit. Honey to be sold at fairs ought to be put up in small packages. It may be difficult to put it up in packages so small as to be sold at five cents each, but I believe it has been done, while there is no difficulty in putting honey in packages that may be sold for 10 or 25 cents each. People at fairs don't wish to be burdened with heavy or bulky packages, and the honey must be put up in such shape that it can be eaten on the grounds or else carried in the pocket or hand-bag with no 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. One year, at the Detroit Exposition, at least 1500 pounds of "honey jumbles" were sold at a cent apiece, by three exhibitors in the bee and honey department. These jumbles are made with honey instead of sugar, and, for this reason, retain the desired amount of moisture for a long time. In selling them at a fair, a box of them is opened, placed on the counter, and tipped slightly outward so that visitors can easily look into it. The cakes are round, with a hole in the middle, and the upper side is of a golden yellow,* with a sort of granular appearance that is very inviting. This side of the cakes is turned uppermost. Paper sacks are filled with cakes, putting five in a sack, and a neat placard announces: "Honey Jumbles, Made with Honey Instead of Sugar. Five in a Sack, and Five Cents a Sack." Another thing that may be sold at an apiarian exhibit with even greater profit than the honey jumbles is honey lemonade—if the weather is hot; if it isn't, there is no use of attempting its sale. Here is the way to make it: Into 12 quarts of water squeeze the juice of 12 lemons; add 2 pounds of basswood honey and a teaspoonful of sugar. Basswood honey, being of such a strong flavor, gives more of a honey flavor. Keep the lemonade cool with ice in some large vessel. I used a stoneware churn. Keep on the counter a glass pitcher filled with lemonade, putting in small pieces of ice, also a few slices of lemon. Then have a placard read: "Honey Lemonade. Most Delicious Drink on the Grounds. Only Five Cents a Glass." I have sold as high as $20 worth of this in one hot afternoon, and the profits are at least three-fourths. Such exhibitions and sales certainly do the pursuit of bee-keeping no harm, while they bring a profit to the exhibitor.

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 one day set apart as "Bee-keepers' Day," giving the date in advance in all of the bee journals, then all bee-keepers will be pres-
ent 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 if the exhibition of bees at fairs is any great advantage to the pursuit. The most that can be said in its favor is that they attract attention. There is certainly no necessity of exhibiting full colonies unless it might be at some permanent exhibition that is to last several months, when the bees can be allowed to fly, a la house-apiary, provided the apiarian department is on the second floor. 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 planning and putting up an apiarian display, as circumstances vary greatly, but here are a few hints: Extracted honey should be shown in glass—not common green glass, but in white flint glass. Have tin-foil 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 dull or muddy appearance. I know of nothing better, or more appropriate for this purpose, or as a background for any apiarian display, than honey-producing plants pressed and mounted on white card-boards, and the cards tacked upon the wall back of the exhibit. 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. For several years I exhibited honey built up into a circular pyramid. First there was made a stout board wheel, perhaps eight feet in diameter. This was placed perhaps
two feet from the floor, being supported by blocks or boxes. Attached to the edge of this wheel, and hanging down, for all the world, like a woman's skirt, was a sort of valance made of thin blue cambric ornamented with some neat design of gilt paper fastened on with paste. Around the edge of the wheel, upon its upper surface, was set a row of shipping-cases of comb honey, with glass sides turned out. On top of this row was set another row, the cases of this row breaking joints with the one below. Perhaps four rows were placed in this manner, then the cases were turned so the long way of the cases faced outward, a fewer number of cases making a row that was slightly smaller than the others. Perhaps four rows were put up in this style, then they were again changed so that the narrow ends were outward, which again reduced the size of the circle. In this manner the size of the circles was gradually diminished as the pyramid increased in height, until its top was only two feet across. That these cases might not be jarred out of place they were fastened to one another by means of small wire nails. Upon the top of this pyramid was set a large number of two-pound square bottles of honey. On top of the bottles was laid a platform of glass made by putting together two sheets of double-strength glass, bound together at the edges with cloth pasted on and covered with gilt paper. Upon the glass platform were set more bottles, then another sheet of glass a little smaller than the first one, and so on up, until a pyramid of extracted honey was constructed upon the top of the pyramid of comb honey, the former being surmounted by a huge bouquet of goldenrod. I remember building one such pyramid that was 16 feet in height. The spaces between the outer ends of the cases in the comb-honey part of the pyramid were filled with small "dime" bottles of honey. By thus combining the comb and extracted honey display, one "sets off" the other; in fact, my competitors sometimes complained of this, but it was their privilege to have taken advantage of this fact had they so chosen. Mr. M. H. Hunt one year had a castle in which the pillars were cases of comb honey piled up, and the balustrade was formed from panels of beautifully molded bees-wax.

There is seldom a fairground 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 the package. Wax should be molded into fanciful shapes—statues, or something of that sort, if the exhibitor has the skill to make them. Fruits, vegetables, ears of corn, and the like, may be made of wax by first making molds, of plaster of Paris, from the objects themselves. It is not necessary that the articles be solid wax. First soak the molds in water, then pour in a small quantity of melted wax; close the molds, and then immediately shake them vig-
orously while the wax is cooling, thus coating the inside of the molds with wax. When the wax is cool it will come out all in one piece.

Let the beginner not try to show a multitude of things, but let what he does show be as good as it is possible for him to make it. Competition is so very keen, at least where the premiums are liberal, that it is folly to expect premiums upon second-class articles.

Now that I have reached the subject of premiums, it may be well to give what I would call a "model" premium list. I may have placed the premiums at higher figures than most societies would care to use, but the amounts can be easily reduced, preserving the proportions.

<table>
<thead>
<tr>
<th>Premium Description</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
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<tbody>
<tr>
<td>Most attractive display of comb honey</td>
<td>$35</td>
<td>$20</td>
<td>$10</td>
</tr>
<tr>
<td>Specimen of comb honey, not less than ten pounds, quality and manner of putting up</td>
<td>10</td>
<td>5</td>
<td></td>
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<tr>
<td>for market to be considered</td>
<td></td>
<td></td>
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<tr>
<td>Specimen of comb honey, not less than ten pounds, quality and manner of putting up</td>
<td>35</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>for market to be considered</td>
<td></td>
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<tr>
<td>Most attractive display of extracted honey</td>
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<tr>
<td>Specimen of comb honey, not less than ten pounds, quality and manner of putting up</td>
<td>10</td>
<td>5</td>
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<tr>
<td>for market to be considered</td>
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<td></td>
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<tr>
<td>Most attractive display of beeswax</td>
<td>20</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Specimen of beeswax, not less than ten pounds, soft, bright-yellow wax to be given</td>
<td>6</td>
<td>3</td>
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<tr>
<td>the preference</td>
<td></td>
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<tr>
<td>Single-comb nucleus Italian bees</td>
<td>10</td>
<td>5</td>
<td></td>
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<tr>
<td>Single-comb nucleus black bees</td>
<td>10</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Single-comb nucleus Carniolan bees</td>
<td>10</td>
<td>5</td>
<td></td>
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<tr>
<td>Single-comb nucleus Caucasian bees</td>
<td>10</td>
<td>5</td>
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SWEEPSTAKES ON BEES.

<table>
<thead>
<tr>
<th>Premium Description</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display, in single-comb nuclei, of the greatest variety of the different races of</td>
<td>10</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>bees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection of queen bees of different varieties</td>
<td>16</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Honey vinegar, not less than one gallon, shown in glass</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Assortment of honey candies</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Pastry made with honey instead of sugar</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>The best specimens of honey-producing plants, pressed and mounted, not to exceed 25</td>
<td>15</td>
<td>8</td>
<td></td>
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<tr>
<td>varieties</td>
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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 the offering of premiums on such things, 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 exhibit; 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 have been lived up to or not.

In my experience, one man to award the premiums, and he an expert, has given better satisfaction than three judges. It is difficult and expensive to get three men who 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.

There is only one way to judge honey satisfactorily, and that is by a scale of points, the same as butter or cheese is judged. One sample may be of good body, but lacking in flavor or in color; another sample may be of excellent flavor but lacking in body; and the man who attempts to carry all these points in his mind will surely be all at sea.

In judging extracted honey there are three characteristics to be considered: flavor, body and color. Let flavor represent 50 points, body 30 points, and color 20 points in a possible 100 points. Gather the samples in front of you, giving each a number, then decide, by tasting, which has the finest flavor, and give this sample 50 points on flavor. Then decide which has the next best flavor—possibly 45 points. By continued tasting decide how many points may be assigned to each sample, as compared with the one given 50 points. Deciding in regard to the flavor is really the most difficult point to decide in judging honey. After tasting of different samples of honey, for a while, one seems to lose the power of discrimination to a large extent. Where there are several grades of honey to be judged, and the number of entries large, I have found it advisable to judge of only one grade at a time, then work at something else for an hour or two, when the taste will regain its normal condition to a large degree. I at one time spent two days in awarding the premiums at the Toronto Industrial Fair, and the time was largely used in deciding in regard to the honey, there being many grades and a large number of entries in each grade.

To decide in regard to the body, take a bottle or jar of honey in each hand, invert the vessels, and note in which the bubble of air rises the slower. Retain this one, and pick up another bottle, and test these two, retaining the one in which the bubble is the slower in rising. Continue in this manner to test all of the samples, and give 30 points to the one having the slowest bubble of all. Then compare each sample with this one as a standard, giving each the appropriate number of points, as compared with the best.

The decision in regard to color is made in a manner similar to that of deciding the points of body or flavor. Select the sample having
the most desirable color, give it 20 points, then give the next best 18 points, or 16, or whatever you think it deserves, and so on through the whole lot.

No one, not even the judge, will know which sample will receive the first prize, until the scores are added up, when the one receiving the greatest number of points is awarded the first prize; the one with the next greatest number of points is given the second prize, etc.

In judging comb honey there are several more points to be considered than in judging extracted honey. Here are the different characteristics, and the points that I would allow for each. Completeness of filling of the sections, 20 points; flavor, 15; freedom from travel stain or propolis, 15; straightness of the combs, 10; uniformity, 10; neatness of the sections (the wood) and of the case, 10.

The deciding of all these fine points is sometimes very difficult, as two specimens may be so nearly alike on some point that there is practically no difference— they may differ, however, on other points.

If a bee-keeper is going to make an exhibit of apiarian products, it often happens that he can also make exhibits in other departments of the fair. I have exhibited photographs in the art department, canned fruit in the fruit department, and the wife and children have sent things to their respective departments. In addition to this, when making a “circuit” of the fairs I used to write them up for the Country Gentleman, getting paid for the work. Fairs come in the fall, after the busy season is over with the bees; and if a man has the time, taste, and ability for this kind of work, going from one State to another, as I have done, he can probably clear $10 a day for five or six weeks in the fall. It is scarcely worth while to prepare for the work, however, unless there is some expectation of following it for several years.

Just a few parting words to the beginner: If you make an exhibit at a fair, don’t get excited. Keep cool and have patience. Many unpleasant things may occur, but don’t worry over them; and, above all, don’t let the loss of expected 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 quickly and easily unpacked. I used to pack the square bottles of honey in boxes furnished with partitions of cellular board, a la egg crate, and to pack the bottles it was only necessary to drop them into the openings and nail down the cover. If the package does not indicate its contents, then mark it in some way. Never be compelled to open box after box in an exasperating hunt for something that must be had at once. And when fair is over, don’t go crazy to get off the grounds the next minute. I have known of men sitting up all night, swearing and sweating and
fuming because "their car didn't come," or something of that sort, and we all went out on the same train the next morning. At the close of a large fair, an immense amount of goods are on the grounds; they have been several days accumulating, and it is impossible to move them all in an hour's time.
The Rendering of Beeswax

In nearly every apiary there are more or less odds and ends of combs which are well worth saving to be made into wax. When an apiary is run for extracted honey the wax from the cappings is no small part of the income. If there are many combs to be rendered, as is often the case when foul brood gets into an apiary, the manner of doing the work becomes an important question. The small bee-keeper who has only a few scraps to melt up may resort to almost any make-shift; and, by the way, here is one such primitive plan: Take an old dripping-pan or any large flat metal dish that is of little value, and punch a hole in one corner. Set the dish in an ordinary stove oven, letting the end with the hole in it project from the oven. Put the scraps of comb into the pan, where they will melt, and the wax will run out of the hole, where it may be caught in a dish set upon the floor. If the scraps are of nearly pure wax, like cappings or new comb, this plan will answer quite well for rendering wax upon a small scale; but if the combs are old, the cocoons will absorb so much of the wax that a large portion will thus be lost. A plan that will secure a larger percentage of wax from old combs, but requiring some more labor to put into operation, is that of crowding the combs into a sack made of cheese-cloth or burlap, tying up the mouth of the sack, and immersing it in a boiler of water set upon a stove, and then bringing it to the boiling-point. While the water and the sack and its contents are still hot, the sack should be thoroughly turned and pressed with something like a garden-hoe, thus stirring up the contents and pressing out the wax. The water will largely take the place of the wax, which, being lighter than the water, will rise to the top, where it may be taken off in a solid cake after it has cooled. A weight of some kind, like a big stone or some bricks, must be laid upon the sack to hold it at the bottom of the boiler while the wax is cooling, otherwise the sack will be embedded in the wax when it is cooled. This plan may be employed upon a large scale, even to the extent of using a large kettle out of doors, and the use of the sacks may be dispensed with by making a sort of pail or basket out of fine wire cloth, setting it down in the melted wax, inside the kettle, and then dipping off the wax with a dipper by dipping inside the wire-cloth basket, the wire cloth straining
out the coarser impurities. This method of rendering wax by the use of boiling water will probably get out as much of the wax as it is possible to secure without the use of pressure upon the residue, or "slum-gum," as it is called. Old combs are largely made up of cocoons—more cocoons than wax—and they absorb and retain the melted wax, much as a sponge will hold water, and pressure is the only thing that will cause them to give up the golden treasure.

Another plan particularly feasible for melting cappings, new combs, or scraps that are nearly pure wax, is by the use of the solar wax-extractor, which is simply a shallow box painted black inside and out, and furnished with a false bottom of sheet iron a few inches above the real bottom, a cover of glass completing the arrangement. The box is placed in a slanting position, facing the sun, and the refuse combs, etc., placed upon the false bottom of iron, or in a sort of basket arranged at the upper end for the reception of the cappings, scraps, etc. The direct rays of the sun, aided, sometimes, by the reflected rays from the cover, to which is fastened a sheet of bright tin, melt the wax, and it runs down to the lower end of the metal shute, where it drops off into a vessel set there to catch it. A small solar wax-extractor standing in an apiary is an excellent thing, as into it may be thrown all scraps of comb that would otherwise be thrown away, or perhaps be thrown into a box or barrel to stand around until destroyed by the bee-moth larvae.

All of these plans of rendering wax fall short of perfection, however, as too much wax is left in the residue. Pressure of some sort must be used or a large part of the wax is lost.

**RENDERING OLD COMBS INTO WAX, WITH GREAT EASE, SPEED AND PERFECTION.**

Mr. W. J. Manley of Sandusky, Michigan, has perfected a method of wax making that I would recommend in preference to those already mentioned. The characteristic features of the plan are that of pressing only a small amount of material at one time, doing it very thoroughly, yet with such a system that one batch can follow another in rapid succession, pressing the slum gum under water that is boiling hot; releasing and re-applying the pressure, getting the wax up on top of the water, away from the slum gum and the burlap packing; then pouring the wax and hot water off into a cooling tank; and, last, but not least, drawing off the hot water from under the wax, in the cooling tank, and using this hot water over again for melting the next batch, thus saving the heating of another boiler of water.

First, let's describe the implements, or utensils. For heating the water he uses a common, six-griddle cook-stove, with a reservoir. The
Implements used by W. J. Manley in Rendering Beeswax.
old combs are melted in two common wash-boilers. The one thing that must be built with the greatest care is the press. He first tried presses sent out by manufacturers, only to meet with disappointment. They couldn’t “stand the pressure.” The outside jacket is 15 inches in diameter, 18 inches deep, and made of heavy, galvanized iron. Around the top, inside of the can, is bolted, very solidly, an iron hoop an inch and a half wide, and ¼ inch thick. Bolted to opposite sides of the can, at its upper edge, the bolts passing through the iron hoop just mentioned, are two strips of iron, ¾ inch thick, about 4 inches long, having one end turned outwards and formed into a hook that will receive a bolt ¾ inch in diameter. The cross-piece, above the can, through which passes the screw, is about 4 inches wide, and 2½ inches thick, of hard wood, and reinforced by a piece of wagon tire iron ½ inch thick and as wide as the piece of wood. Mr. Manley says that only the man who has been through the mill can realize the necessity for making everything very strong. The pressure that can be exerted with a screw is something tremendous. In each end of the cross-piece is a ¾ bolt with a heavy nut on the lower end. When the cross-piece is put in place and swung around in the right direction, these bolts slip into the hooks already mentioned, the nuts catching below the hooks and holding down the cross-piece.

The next most important feature of the press is what Mr. Manley calls a “spider,” which is put in an inch or two from the bottom of the can. The name is very appropriate, as it certainly resembles a huge spider with its legs fastened to the sides of the can. It is made of pieces of iron about 3-16 thick and one inch wide, bolted together at the center, and the ends bolted to an iron hoop that just fits inside the can and is bolted to its sides. This iron hoop is of the same size and weight as the one at the top of the can. Don’t think that it will answer to rivet these hoops to the can. It won’t. They will pull off. Use bolts, with washers on the outside, and have the washers thoroughly fastened to the can with solder. Even when all this care has been taken, Mr. Manley says that the screw-power must be used with discretion.

Fastened to the bottom of the screw is a plunger, or follower, made of heavy cast iron, and reinforced on the lower side with two layers of bars of wood; these layers crossing each other at right angles. Aside from the added strength, there is an advantage in having two layers of bars crossing each other. If the slum gum in its covering of burlap is forced up between the bars of the lower tier, there are still openings in the upper tier through which the wax can escape.

Perhaps half an inch less in diameter than the can, is an inner basket of perforated iron. Inside of this basket is used a sack of burlap
for holding the slum gum. This, I believe, completes the description of the press, and I think I now better go back and tell how the wax is melted and pressed, and bring the process up to the point where the wax leaves the press, before going further with any description.

First, the combs are all cut out of the frames, and the frames scraped clean, before any wax rendering operations are begun. After steam is up, and work begun, there is no time for cutting out combs. They are all cut out and thrown in a huge pile in one corner of the room, from whence they can be readily scooped up with a shovel and thrown into the boilers as needed. We will suppose that the combs are cut out, a good fire in the stove, and the two boilers and the reservoir full of hot water. The equivalent of about eight Langstroth combs is put into the boiler that sits upon the hottest part of the stove. As the combs melt they are stirred and thoroughly broken up with a large stick. When the wax has thoroughly melted, the perforated metal basket is set inside the press, the burlap sack hung inside the basket, and the contents of the boiler dipped with a gallon dipper into the burlap sack. That is, it is dipped at first, until the operator is able to pick up the boiler and pour out the rest of its contents into the burlap sack. After the melted combs and hot water are all in the press, the burlap sack is grasped with both hands, at its upper edge, lifted up somewhat, and twisted about, until the bulk of its contents has been reduced so that the top of the sack can be folded down upon the body of the sack. The screw and follower is then put in place and screwed down upon the sack. While this batch is pressing, the boiler is filled with combs and set to melting upon the stove. The screw is then loosened, and the water allowed to enter the slum gum, when pressure is again applied *a la* Hershiser. Before the follower is screwed down the second time, it is turned around part way, by means of an iron rod thrust down upon its upper surface. The bars upon the lower surface do not then go back into the same old grooves in the sack of slum gum. This loosening of the screw, and re-applying of the pressure, may be repeated as often as thought advisable. It will be noticed that the pressure is applied under boiling hot water; that the wax rises to the top of the water as fast as it escapes from the slum gum; that it is not entangled nor retained by the burlap.

We will suppose that we have secured all of the wax possible by pressure. The slum gum is in the sack; the press is full of hot water, with the wax floating on top; Mr. Manley then pours off this hot water and wax into what might be called a cooling, or separating tank. The screw is then loosened and removed, the sack of slum gum taken out, and the slum gum shaken out into some old box or barrel. There is
no wax, propolis, nor stickiness about the sack after it is emptied—just as nice and clean as when first put into the press.

This cooling, or separating tank, will probably hold a barrel. It is perhaps two feet high, and a trifle more than that in diameter. It is made of galvanized iron, with a gate or faucet at the bottom, and another perhaps six inches from the top. There is also a glass gauge in its side, through which can be seen the line of demarcation between the water and the wax. It will be seen that, from the lower faucet, hot water may be drawn from beneath the wax, leaving the wax in the tank, and using the water for melting the next batch of wax. This is one of the biggest points of the system, that of using the same water over and over again before it cools. Keep dumping the melted wax and hot water into this tank, and keep drawing off the hot water from beneath the wax, as the water is needed. Some water will be lost by evaporation and some will be absorbed by the slum gum, hence the necessity of hot water in the reservoir to replenish the loss. The upper faucet is used to draw off the melted wax if the tank becomes too full, or at the end of the "run." A look through the glass gauge will show when the body of wax is at the right height to be drawn off. The lower surface of the wax ought to be a short distance below the faucet, so that little or no sediment will be drawn out through the faucet. If it is not quite high enough, boiling water can be added until the body of wax is at exactly the proper height. At the end of the day, or of the "run," the wax can be drawn off in this manner, simply leaving a little wax below the faucet. This thin sheet of wax can be allowed to cool in the tank; and, by this plan, all of the sediment for the whole day's work will be in this one place, under this one thin cake of wax.

For thoroughness, rapidity, and ease of operation, I doubt if any system of wax-rendering can compare with this plan of Mr. Manley's. He says that he can render from 150 to 200 pounds in a day, depending upon the character of the old combs. While cost is not of so very great importance, the outfit is simple and inexpensive. Except the press, nearly everything can be bought at an ordinary hardware, and the press can be made by a tinsmith. Mr. Manley says that his cost him about $50.

For cleaning any utensils that are daubed up with wax, use a cloth saturated with benzine. Benzine will dissolve wax much as water will dissolve sugar.

For some mysterious reason, sulphuric acid will cleanse or clarify beeswax that is brown or black, or almost any color, bringing it back to a nice bright yellow. The bee-keeper who renders his wax according to the methods here described will probably have no need for using acids; but those who buy wax for making into foundation find the use
The Rendering of Beeswax.

of the acid almost indispensable. A kettle or some other vessel is filled perhaps one-third full of water, and then filled up with cakes of wax. By the use of steam, or by setting the vessel on a stove, the wax is melted, when acid is added at the rate of about one pint of acid to twelve gallons of water. Soon after the acid is poured in, the wax will be seen to change to a lighter hue, when the heat may be stopped and the sediment allowed to settle, after which the pure wax can be dipped off the top. If a metal vessel is used, it must be thoroughly washed after use; and it would be well to rub it over with grease to prevent any further action of the acid.
Automatic Transferring

Years ago Mr. James Heddon used a method of transferring bees from box hives that he called "Modern Transferring." It consisted in drumming the bees out of the box hive, and hiving them in a hive furnished with wired foundation. He then set the old hive by the side of the new one, where it was left for three weeks, or until all of the brood had hatched, when he again drummed the bees from the old hive and united them with those in the new hive. The old hive was now free from brood and bees, and the combs could be cut out at one's leisure, and rendered into wax.

There is another "modern" plan that does away with the drumming out of the bees. Turn the box hive upside down, set a hive of combs over it, and the bees and queen will soon go up into this hive of combs and start to rearing brood. This action on the part of the bees and queen can be hastened by placing a comb of brood in the upper hive. They will go up without the brood, but probably not quite so soon. When the queen is found above, place a queen-excluding honey-board beneath the upper hive, between that and the old box hive. This will prevent the queen from returning to the old hive, and, as the brood hatches in the box hive, the young bees will join those in the upper hive, until, at the end of three weeks, all of the brood will have hatched.

An inverted bee escape-board (containing a bee-escape) can now be placed between the two hives, when all of the bees will soon find their way up into the upper hive, and the old box will be entirely free from brood and bees and can be removed to the honey-house, and the combs made into wax. Of course, the queen-excluder and the bee-escape will be removed from under the new hive, which will now sit in the place occupied by the old box hive.
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 is meant that 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-packed hives, or their equivalent, 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 can be gained by substituting something else. 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 nutshell is just this: The loss of bees in winter, aside from that caused by diarrhea, is not worth mentioning. It is diarrhea that kills our bees. What causes it? An overloading of the intestines, with no opportunity of emptying 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. A moment’s reflection will make it clear that the character of the food consumed has an effect upon the accumulation in the intestines. In the digestion of cane sugar there is scarcely any residue. Honey is usually quite free from nitrogenous matter, being well supplied with oxygen, and, when practically free from floating grains of pollen, is generally a very good and safe winter food, although not as good as properly prepared sugar syrup, which never contains nitrogen, but possesses 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 which they consume, either as grains of pollen floating in the honey or by eating the bee-bread itself. Repeated experiments have proved beyond a doubt that, as a winter food for bees, 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 42 degrees, they are all but certain to winter successfully. This being the case, the question naturally follows, "Why not take away the honey in the fall, and feed the bees sugar?" One objection to the use of sugar as a winter food is that every pound of sugar so used puts one more pound of honey on the market. Another objection is that the bee-keeper is thereby compelled to pay out money for sugar while he may have on hand a crop of honey that is meeting with slow sale. Some object to its use on the ground that it lends color to the cry of "adulteration." Perhaps the greatest objection is the labor of extracting the honey and feeding the sugar.

Let's consider these objections. The use of sugar as a winter food for bees unquestionably does put 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 if the summer management has been conducted with a view to feeding sugar in the fall. By contraction of the brood-nest, nearly all of the honey may be forced into the supers, leaving the brood-combs nearly empty at the end of the season. It only remains to feed the bees, and, with proper feeders (the Heddon, for instance), tin cans, and oil-stoves for making the syrup, feeding is neither a long nor a tedious task. What little honey remains in the corners of the combs is not likely to be consumed until spring, when frequent flights will prevent all troubles that might arise from its consumption. In regard to causing the public 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 it will be believed. As in regard to the increased amount of honey that the use of sugar as winter stores puts upon the market, so any possible talk about adulteration is over-balanced by the certainty of carrying the bees through the winter.

If the feeding is done early enough so that the bees will have time to work the honey over and ripen it, no heat will be needed in making the syrup. Simply stir into cold water all of the sugar that it will dissolve; feed it to the bees, and they will reduce it to the proper consistency; and, by the addition of their secretions, change the cane sugar into grape sugar, thus practically making it into honey. If fed too late, something may be necessary to prevent the granulation of the syrup.
Relation of Food to Wintering of Bees.

For this purpose I never found anything better than honey—from 10 to 20 per cent is sufficient. September is early enough to feed; but 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 into the feeder, it may be managed, as explained in the chapter on feeding, 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 can not or may not wish to use sugar for winter stores, and many do not need to use sugar to insure the successful wintering of their bees. There is a great difference in localities regarding the character of the honey. 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 can not or will not use sugar? Possibly he can so manage that his winter stores are secured from a different source. Mr. O. O. Poppleton takes the ground that the best winter stores come from the most bountiful fields. It is possible that there is something in this. Bountiful yields of any crop are usually of fine quality; but I know of at least one locality where the fall flow of honey 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 attempt to winter them on this honey by any method.

But bee-keepers can do this: Notice if any particular kind of honey is more likely to cause trouble, and then avoid its use as winter stores. Part of the bees may be protected upon the 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 of Bees

WINTERING BEES IN THE OPEN AIR.

In a warm climate there is no reason for wintering bees elsewhere than in the open air; and that, too, without special protection. As we come north, say to the latitude of Cincinnati, the open air is still a desirable place in which to winter bees, but some protection is a decided advantage. As we come further north, say to the south line of Michigan, it is about an even thing as to whether to put the bees in the cellar or to protect them upon their summer stands. In New York, Ontario, Wisconsin, Minnesota, yes, and in the New England States, the advantages are with the cellar. And this is not saying that bees can not be wintered out of doors in these higher latitudes. They can, but it is expensive both in the matter of protection and in the extra stores consumed. In spite of this, there are advantages in out-door wintering; if there comes a warm day the bees have an opportunity to fly, and out-door-wintered bees usually get to breeding earlier in the spring. The hard, disagreeable work of carrying them into and out of the cellar is avoided. Sometimes the soil and "lay of the land" are not suitable for the building of a desirable bee cellar, and the wintering of the bees in the open air becomes almost a necessity.

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 or management, are able to 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, there is much to be said in favor of outdoor wintering. Let me give one or two instances of success: Ira D. Bartlett, of East Jordan, Michigan, which is away in the northern portion of the lower peninsula, began keeping bees when only fourteen years of age—began with only one colony—and when twenty-one years
of age he had 150 colonies, and had never lost a colony wintering them out of doors. His method of protection was very thorough. He packed four colonies in one box, putting packing not only at the sides and on top, but also below the hives. The packing was fine dry sawdust, and the roof of the box had eaves that extended over like the eaves of a railroad station, which allowed the roof to be raised up a short distance above the box, for ventilation; yet the snow would not get in to any great extent. There was a sort of vestibule in front of the entrances, and this vestibule was kept closed by means of a board, it being removed only when there came a day warm enough for the bees to fly—something that rarely occurred in the winter. So warm and comfortable were the bees when so snugly housed that they even brought the dead bees out and dropped them in the vestibule. I suspect that the thorough protection, combined with the perfect ventilation, allowing no accumulation of moisture, is the secret of this wonderful success.

Another instance was that of two ladies who began bee-keeping in Northern Michigan before the iron horse had invaded that region, and who were uniformly successful, for a long series of years, in wintering their bees out of doors, packed in chaff. Like Mr. Bartlett, they furnished abundant upward ventilation, above the packing. An opening a foot square was cut in the top of the box containing chaff that was placed over the colony, and this opening was covered with wire cloth to keep out mice; and then, over all, to keep out the storms, was a large roof. So successful were these ladies, that, from first to last, I have paid them nearly $1000 for bees.

It does not seem as though the question of whether bees should be protected here in the North need receive any consideration whatever; yet it has been objected to on the ground 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 a bee-keeper thinks, however, that bees in a chaff hive ought to fly on a warm day, and they
The Old Home of Two Lady Pioneer Bee-keepers.
don't fly, he has only to remove the covering over the bees and allow them to fly from the top of the hive.

For several winters I left a few colonies unprotected; and 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 fair 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, but it remains comparatively dry underneath. With a good strong colony of bees, and ventilation above the packing, I have never known trouble from moisture.

In the giving of protection, chaff hives have the advantage of always being 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 to unpack them again 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 can be made up in quantity. And this brings up the point of the proper thickness of 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 sawdust or chaff is used. I presume that packing has been condemned when it was not more than half done—that is, when not enough material is used. I don't appreciate the arguments of those who advocate the use of thin packing. I don't believe that the benefit of the heat from the sun during
an occasional bright day can compensate for the lack of protection during months of extreme cold.

Hollow walls with no packing have had their advocates; and it has been asked if these dead-air (?) spaces were not 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 lumber. If there is lack of room for storing them in summer they can be made so 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 the material used for packing. With this method the packing ought to be postponed until it is so late that the bees are not likely to fly again until they have forgotten their old location's, else some of the bees will be lost or some of the colonies get more than their share of bees. When they have a "cleasing flight" in winter there is also a likelihood of some bees returning to the wrong hive. Then when the bees are unpacked in the spring 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 as much in one hive as in another. If there is any difference in the strength of 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 are not likely to fly again until some time in the winter, reminds me that advantages have been claimed for early packing: that 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 condition for winter when it comes. It is possible that 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 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 molding between the combs, but if there is an entrance
cut in the upper edge of the rim there will be no possibility of its becom-
ing clogged. This empty space under the combs seems to have a
wonderful influence in bringing the bees through in fine condition, and
I am not certain why.

Weak colonies can seldom be wintered successfully out of doors.
They can not generate sufficient heat. In the cellar, where the temper-
ature seldom goes below 40 degrees, quite weak colonies can be success-
fully wintered.

As I understand it, this whole matter of outdoor 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.
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-cellars? 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. II’ McLain. Referring to this statement, Mr. Frank Cheshire says: “The reason being that the water has an enormous capacity for heat (specific heat) whether in the liquid or vaporous form, the latter abstracts heat from the bees and intensifies 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 where 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, as 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 bee-keepers have not sufficiently considered.

We have many reports of the successful wintering of bees at such a degree of temperature, but nothing is ever 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 thing 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 be, of course, evaporation from the wick surrounding the bulb. Evaporation causes a loss of heat; hence, the drier the air the greater the evaporation, the greater the loss of heat, and the lower will go the mercury in the wet-bulb thermometer. The greater the difference in the readings of the wet and the dry bulb thermometers, the drier the air. In the open air there is sometimes a difference of 26 degrees; but this is unusual. When it is raining the air is then saturated. There is then no evaporation, and both thermometers show the same degree of temperature. In the cellar in which I used the wet-bulb thermometer the difference in the readings of the two
thermometers was usually about three or four degrees, with the wet-bulb instrument standing at about 36 degrees; but this difference could be increased two or three degrees by warming the air with an oil-stove. If the mercury in the wet-bulb thermometer stands at 36 or 40 degrees, and that in the dry-bulb as much as four degrees higher, I think there need be no worry about moisture; but if the difference is only two degrees or less, either the temperature ought to be raised or the air dried in some manner.

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 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 the cellar, and deposits moisture upon objects therein, it is evident that the in-coming air is warm and moisture-laden—warmer than the cellar and its contents.

Mold 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 mold does not develop, viz., one of moisture and cold. A very damp cellar ought to be warm enough for the development of mold. 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 by 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 28 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, moldless cellars, and know that the results will be harmless.

Some bee-keepers have asserted that cellars dug in clay or hard pan are more difficult to keep dry than when dug in a sandy soil. Mr. J. H. Martin, when living in New York, said that a cellar in hard pan, or even in clay, could be much improved by digging down two or three feet, filling in with stones, then with gravel, and finishing up with a covering of cement.
The Influence of Temperature in Wintering Bees

Prof. Atwater says that the production of heat in the human body is so great that, if there were no way for it to escape, there would sufficient accumulate, in an average well-fed man, to heat his body to the boiling-point in 36 hours. This heat is gradually passing off by radiation. To prevent too rapid radiation, we cover our bodies with clothing. 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 bees in a cellar or special repository.

The ordinary house-cellar, where the temperature remains above freezing, is usually a good place in which to winter bees. Men who are engaged extensively in bee-keeping where cellars are needed for the wintering of bees, usually find it to their advantage, perhaps a necessity, to build a special repository. The more completely the cellar is below the surface of the earth, the more perfectly can the temperature be controlled. It should be remembered that not only is there the winter’s cold with which to contend, but the warmer days of late winter may arouse the bees and make them uneasy before it is time to remove them from the cellar, unless the cellar is deep in the ground beyond the influence of outside temperatures. The walls of a cellar are usually laid up with brick or stone, but there are other methods of making a cellar. Mr. T. F. Bingham, of Farwell, Michigan, has a cellar that has been compared to a cistern. The walls are made sloping, and then plastered over very heavily with cement, after the manner in which cisterns are sometimes made. Over the cellar is laid a floor covered several inches with dry sawdust, while a roof keeps all dry. Mr. Bingham is a believer in having fresh air for the bees, even though they use only a small amount, and he has a ventilator 17 inches square running up through the ceiling and roof. He also finds this ventilation of great help in keeping the bees quiet during the first warm days of spring, before he considers it late enough for their removal.
Some parts of the country are too low and level to allow the building of a cellar below the surface of the earth, when some sort of structure above ground is the only resort. Some of these above-ground cellars have double walls built of brick, others have walls of stone, and still others are made of cedar or pine logs after the manner of a log house, and the whole structure then covered with earth. A cellar thus surrounded by earth is almost as thoroughly proof against the changes of temperature as though built under ground.

BUILDING A CHEAP CELLAR THAT MAY BE MADE PERMANENT.

We built three out-of-door cellars in the fall of 1906, in Northern Michigan, and I'll tell you how they were built. Each location had a sandy hillside near the bees—the location was chosen with this end in view. In two of the locations we were able to use a team and scraper for doing most of the excavating. If the soil is loose and sandy, one day's work with a good team and scraper will scoop out pretty nearly all of the earth that needs to come out of a 14 x 16 cellar. It may need a little trimming up at the corners, but not much.

WALLS OF POSTS AND CHEAP LUMBER.

After making the excavation, the next step was to set up some eight-foot cedar fence-posts, selecting nice, straight, round posts about eight inches in diameter at the large end. These were set in the ground about one foot deep and three feet apart, and each "pair" of posts connected by a 2 x 6 14-ft. scantling, being spiked on their sides level with their tops. A 16-ft. 2 x 6 scantling was then laid along on top of the row of posts at the sides, and spiked fast, thus forming a place for the support of the rafters.

A hatchway was built at the end of the cellar opening out upon the hillside, and a door put in at both the outer and inner ends of the hatchway. Cull hemlock lumber was then nailed to the outside of posts, thus forming a support for the earth in banking up the walls; most of the banking being done with a team and scraper. Some of the same kind of lumber was nailed to the under side of the joists, and then this floor was covered with sawdust to the depth of perhaps 15 to 18 inches.

A hatchway, probably two feet square, was left for ventilation up through the floor and sawdust. The gable ends were single-boarded, of cull lumber, and the roof was of the same kind of lumber laid two thicknesses. There was no ventilator placed in the roof, as we thought that the cracks in the gable ends and in the roof-boards would be sufficient, and, so far as I am able to judge, the ventilation was sufficient. At the Morey yard we placed our honey-house right over the cellar, and allowed the moisture from the cellar to come up into it, just
An Outdoor Bee-cellar, Costing Only Fifty Dollars.
as we did with the other cellars. It was all right, so far as the bees were concerned, but it caused the combs to mold that were stored in the house, and we shall put in a ventilator this coming fall to carry the moisture up through the roof.

These cellars, costing only $50.00 each, were built in the cheapest manner possible, because we were yet undecided as to whether we should continue to keep the apiaries in exactly those localities. If we should decide to move them, it would not be very much work to pull off and out the lumber and posts that we had put into the cellars, while, if we decide to remain permanently at these locations, we could simply board up on the inside of the posts and fill the space between the outside and inside walls with cement, when we would have permanent walls at very little additional cost.

**USING A CELLAR FOR AN EXTRACTING-ROOM.**

We used one of these cellars as an extracting-room, and the most serious objection is that the bees gather about the door, when we are extracting after the close of the season. We could use a glass door instead of one of wire cloth, only it would shut off the ventilation. The
bees gather about the door, and rush in when it is opened. We made a big smudge and set it in the doorway, and it enabled us to work with very few bees getting in; but when the wind blew toward the cellar we had to give it up. Then we took the honey off after the bees had stopped flying at night and stacked it up in the cellar; then there was so little going in and out that we managed it.

Covering Floor with Sawdust Before Putting on Roof.

HOW THE BEES "SLEEP" IN SUCH A CELLAR.

Come with me to my bee-cellar, up in the edge of the woods. What's the temperature outside? Twelve degrees above zero. I'll unlock the little door in the gable end of the roof. We crawl in, but can't stand upright, as the roof is too low. The dry, planer shavings and sawdust that cover the ceiling to the cellar, a foot and a half deep, come clear up and meet the roof and lap on it a foot or more down at the eaves. The roof overhead, and the boards of the gable ends are covered with frost from the moisture that has come up through the hatchway that opens down into the cellar below. We'll crawl along to that hatchway. What a whiff of warm air comes up through it. Listen. Not a sound comes up from below. There's a pile of hives of combs just below this opening, and, by dropping down upon them we get into the cellar:
but, before going down, let's light this candle. A candle is safer and better than a lamp. The light is not so bright and does not seem to disturb the bees in the least. They will not leave the cluster and fly at it as they will at a bright lamp light. Now we are down in the cellar. Listen again. Yes, there is a faint murmur; like a cataract miles and miles away—like the soft winds at night blowing through the tops of tall pines. First, let's look at the thermometer. Dry bulb 45 degrees, wet bulb, 42. That's good. There was only one degree difference when the bees were first put in the cellar, but a barrel of lime put into eight or ten pails and set around in different parts of the cellar soon dried out the air.

No, there are no bottom boards on the hive, nor any covers. The tops of the frames are covered with two thicknesses of old carpet. Let's turn up the corners of some of these pieces of carpet. See the little yellow fellows tucked away there so snug, row after row between the white combs. See how quiet they are, how slim, how clean. If they stir at all it simply is to raise slowly a wing, or a leg or the point of the abdomen. Let's look under a hive. Is there any sight in bee-keeping more beautiful than that? See that great, golden-brown cluster of bees hanging down beneath the combs until it actually touches the covering of the hive two inches below. Let's watch them. Do you see a bee move? My little grandson was up here with me a few days ago, and he said, "Grandpa, your bees are all dead." I asked him what made him think so. "Why, they don't stir," was his reply. His previous experiences with bees had been with those that "stirred."

Can you doubt for one moment that bees in this condition are wintering perfectly? When I wake in the night there is actually a comfortable feeling comes over me when I think of those bees snuggled away there, sleeping away the winter with their heads pillowed on snowy combs of sweetness. Some people talk about the cruelty of wintering bees in a dark, dismal cellar. Of course, there are many cellars which are not fit for the wintering of bees, but, with conditions ideal, there is no more comfortable place in winter for bees than in a cellar, and no manner of wintering them in which their energies are more perfectly conserved for the coming of spring.

**TEMPERATURE.**

Having briefly considered cellars, let us come back to the subject of temperature; and, by the way, I am certain that I can do no better than to quote a few paragraphs upon this subject from an article contributed by Mr. R. L. Taylor to one of the early numbers of the Beekeepers' Review. Among other things, Mr. Taylor said:

I think it a truth not to be forgotten that no one can determine, except approximately, the best temperature for bees in another's repository. The
Cellar Built of Logs, and Covered with Earth.
Influence of Temperature in Wintering Bees.

condition of the bees as to numbers, the warmth and ventilation of the hive, the character of the 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 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 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 bees. 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 alone. 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 when 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 either of 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 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—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 need scarcely add anything more upon this part of the subject, and shall only say further, that, in my own cellars, where the air is neither very moist nor very dry, and where there are no drafts, I consider a temperature of 40 to 44 degrees the best for good colonies in hives from which the bottom-boards are entirely removed. If the bottom-boards are not removed I think that five degrees 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 outside changes. This is, I think, secured far more 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 a 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 would of itself have a tendency in this direction. If there are only a few colonies, artificial means of raising the temperature are sometimes employed. Some have used oil-stoves in the hatchway of the cellar; others have warmed the air with wood or coal stoves. If an oil-stove is used, there ought to be a metal hood over it, and a pipe connecting with a stovepipe in the room above, or else with the open air. Of course, an oil-stove can be used without such an arrangement, but it overloads the air with the gases of combustion. I mention these make-shifts with something akin to reluctance, as I feel that the proper way to do is to have a cellar so constructed that there will be no necessity for their use.

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. If he ever finds it necessary to resort to artificial heat he warms the air in the ante-room, and then admits it to the 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 may be apprehended from cold if in a frost-proof cellar.

WINTERING IN CLAMPS.

There is still another method of securing the proper temperature for wintering bees, aside from that of packing them in chaff, or putting them in the cellar, and that is that of burying them in "clamps," as they are called, the same as potatoes and apples are buried in pits. A long trench is first dug a little wider and deeper than a hive. In the bottom is placed a layer of straw, then two pieces of scantling upon which to set the hives. Rails, fence-posts, or any kind of supports, are then laid over the hives, and covered with straw upon which the earth is thrown to a sufficient depth to exclude the frost. Sometimes ventilation is given these clamps, but it does not seem to make any material difference whether they are ventilated or not. It does make a difference, however, in regard to the soil and situation. In a sandy or gravelly
Influence of Temperature in Wintering Bees.

Wintering Bees in a "Clamp."

knoll, where the water will never stand, the successful wintering of the bees is almost assured. In heavy clay, the loss of the bees is equally certain. I say this from numerous experiments. Bees in a clamp, in the right kind of soil, in a good condition, winter as well as in a cellar; sometimes it seems as though they winter better, and the only possible objections to this method are the labor and untidiness.
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 depredation by mice, bees require almost no care in winter.

No bee-keeper worthy the name will allow his bees to go into winter quarters short of stores. They ought to have at least enough to last them until the first warm days of spring, when they may be handled upon their summer stands, and fed if necessary.

However, if, by any hook or crook, bees have gone into winter quarters short of stores, and there are fears that some of them may be starving, it is better that they be examined and fed if needed, even though the task may be 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 a colony of bees in winter is to give them a frame of honey. If no honey is available, and some of the colonies must be fed, the best substitute is candy made from 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 stove, 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 containing it to the back of the stove, where the heat is less. Watch it carefully and try it frequently. As soon as it is sufficiently hard, remove it from the stove and pour it 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 a colony of bees, and then the whole top of the hive covered with a piece of enameled cloth, 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 the 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 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 first waiting for it to
cool 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 nails just long enough to hold the frame down nicely, but not long enough to make it difficult of removal. If a frame full of candy is more than a colony needs, a less amount may be given by tacking a crossbar in the frame, part way up from the bottom, and filling the upper space only with candy.

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 $\frac{1}{4}$ 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 doors. Simply contract the entrance until it is only $\frac{1}{4}$ 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 hive. When bees are wintered in the cellar, many bee-keepers practice raising the hive about two inches from the bottom-board; others remove the bottom-board entirely. This allows plenty of ventilation with 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 docs 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 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. The remedy is to trap the mice, or poison them. 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 toward spring, when brood-rearing may have commenced. From 35 to 45 degrees may answer until toward spring, when it ought not to be allowed to go below 40 degrees, and may with safety go as high as 48 or 50. So long as the bees remain quiet I would not disturb them with 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 ice or snow, 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. Rapid breeding late in winter, or very early in the spring, is decidedly objectionable: 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. Therefore, don't allow a warm day or two in the winter to tempt you to the removal of the bees from the cellar. Wait until the snow is gone, and there is occasionally a day warm enough for bees to fly, then take them out to remain permanently. On the other hand, nothing is gained, and much may be lost, by leaving the bees in the cellar until late in the spring. Many claim superior advantages for outdoor wintering, asserting that the colonies build up earlier in the season. They won't if

Colony of Bees Protected with Building-paper.
the bees are taken from the cellar early enough; and certainly it requires no argument to show that bees successfully wintered in the cellar are better able to bear the rough weather of spring than bees that have endured all of the rigors of the entire winter out of doors. In most of our Northern States the main honey harvest comes early in the season; and to secure this harvest there must be a goodly number of field workers at the right time, and the eggs from which these workers are produced must be laid several weeks previous to the opening of the harvest; hence the element of time is an important factor, and nothing stimulates a colony in a healthy manner, and sets it to brood-rearing, as does a flight in the open air, even if nothing is brought in. Hence it will be seen that early removal from the cellar gives the bees largely the advantages of both outdoor and indoor wintering.

There is no danger of the cold injuring the bees when they are first removed from the cellar. The trouble comes from late freezes coming after two or three weeks of fine weather. At this time the combs are filled with brood, the cold drives the bees into a compact cluster in the center of the hive, and all of the brood outside of this perishes. All of this loss may be avoided by giving the bees some sort of protection after taking them from the cellar. First see that each colony has a queen and plenty of stores, and then protect it. This spring protection need not be an elaborate affair. A sheet of tarred building-paper folded down over the hive, and fastened at the lower edges by tacking on strips of lath, will answer every purpose, while it costs only three cents, and can be put in place in less than five minutes. This makes a covering that is both wind and waterproof, and will absorb every particle of the sun’s heat; but, more important than all this, it will save the loss of brood and weak colonies if there comes a “squaw winter” in the month of May.

If spring protection is so important that it is advisable to give it after taking the bees from the cellar, it may be asked, “Why not practice outdoor 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 more 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.

Carrying the bees from the cellar is not a very agreeable task, and most of bee-keepers make it much worse by attempting it upon such a warm day as to set the bees fairly crazy the moment the outdoor air
strikes them. It comes into the cellar and sets the bees to flying, and often there is a general mix-up in the yard by the bees of one colony joining with those of another in full flight and following them into their hive. To avoid these troubles, some bee-keepers carry their bees out in the night, when the indications are that the following day will be fair. If the bees have wintered perfectly, and are quiet, all of these annoyances and losses may be avoided by carrying out the bees upon a day so cool that the bees will not think of flying. This idea that bees must fly the moment that they are taken from the cellar is one of those old notions that is a notion, and that is all. If bees have to wait even a week or two after being placed upon their summer stands, before having a flight, no harm will come as the result, providing they have not wintered poorly, and are so anxious for a flight as to leave their hives when the weather is so cool that they will never return.
Miscellaneous Sparklets

In picking out recent editorials from the pages of the Bee-keepers' Review to graft on old matter, as explained in the Preface, I ran across certain items that could not be well “hitched on” without destroying the general connection. As they were too good to lose I have grouped them here under the head of “Miscellaneous Sparklets,” at the close of the general matter.

E. R. ROOT.

Look out for yourself, or you won’t see very much.

Back of every successful business or enterprise are somebody’s bright brains.

No other man’s experience is as good for you as your own. Some one else can only point the way. You must travel it yourself to really know.

Stings near the eye are always the most painful, also the most difficult to remove by the one who receives them, unless he has access to a mirror; for this reason I always carry a small mirror that can be slipped into the vest pocket.

Two wheelbarrows used for wheeling honey into the honey-house for extracting allows one of them to remain in the house while the other is being filled in the yard, thus the saving of unloading each time the “outside man” comes in with a load.

Honey strainers are not needed if the honey can stand in large tanks until the pieces of wax, etc., rise to the top. If a bee-keeper had two 50-gallon tanks, so that he could run the honey into one while that in the other was “settling,” he would need no strainer.

Scraping the honey knife across the rack to clean it of cappings is not necessary when uncapping honey. I have frequently watched bee-keepers when uncapping honey, and some of them will stop and scrape the knife clean between each stroke. This is simply so much time wasted, as each succeeding stroke will force from the knife its load of cappings. By the way, the cappings never adhere in this manner to a steam-heated knife.
The successful man is the one who succeeds in spite of difficulties. How many times I think of this. As some unpleasant, discouraging feature comes up, the first thought is: “If only things were different, I would be all right;” then comes up the thought: “The successful man succeeds in spite of these difficulties. He overcomes them. Don’t give up; instead, set your wits to work, summon up your courage and go at your troubles like a thousand of brick.”

The odor in a bee cellar is one indication of how the bees are wintering. In a cellar where the bees are suffering from dysentery, or bees in large numbers are leaving the hives and dying on the cellar bottom, the stench is decidedly unpleasant and characteristic. The air in the cellar here at Flint is on the damp order, but is kept dry with lime. The bees are wintering perfectly; scarcely any are leaving the hives, and the air is as sweet and wholesome as a June morning.

Honey knives, whether they shall be hot or cold, are discussed by H. E. Crowther in Gleanings. For honey recently gathered, and uncapped directly as taken from the hives, he prefers a cold knife, but for extra thick honey, especially if it is not as warm as it should be, he prefers a hot knife. There is then a clearer, smoother cut, and the smoothness of this job has much to do with the quality of work done by the extractor, and the quantity of honey that will be left sticking to the combs.

**HOW THEY TALK.**

I doubt if any class of people can talk longer or with more enthusiasm than bee-keepers. To illustrate: Upon my recent visit to the hospitable home of Mr. S. D. House, a neighbor-boy of three summers dropped in, as was his frequent habit; after hanging around Mr. House and myself for a while he finally went into the next room and said to Mrs. House: “Auntie, how much longer are they going to talk?”

**ITALIAN BEES AND BLACK BROOD.**

If there was any one point brought out with more emphasis than another at the New York conventions, it was the importance of having Italian bees in combating black brood. One inspector after another got up and stated with emphasis that it was simply impossible to cure black brood with black bees. The first step in getting rid of black brood is to introduce Italian queens to every colony.

**DON’T EXTRACT UNRIPE HONEY.**

What would we think of a fruit grower who would put half-ripe strawberries on the market? Half-ripe honey is no better. I know it
Miscellaneous Sparklets.

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is sacrilegious, but I do sometimes feel like exclaiming: "For God's sake, don't extract green honey!"

Where a white honey harvest is immediately followed by a dark flow, the temptation is great to extract unripe white honey to get it out of the way of the dark flow that is to follow, but I would allow the white honey to go over and mix with the dark before I would extract unripe honey. It is the bane of our business.

PREVENTING SWARMING BY CHANGING BROOD-COMBS AND UNCAPPING DRONE BROOD.

A Canadian bee-keeper says, in a private letter, that, for six years, he has practically prevented swarming, and secured large crops of comb honey, by transposing the brood combs in the brood nest, putting the middle combs of solid brood next to the outside, uncappping the honey in the outside combs, and placing them in the center, at the same time uncapping all drone brood, with an occasional patch of worker brood. He has had as few as three swarms from 83 colonies. He is now establishing out-yards; expects to run 500 colonies the coming season for comb honey, and he says that this plan of management will save all trouble from swarming. I don't give his name, as there is no permission in his letter that I may print it.

HOW TO LIGHT A SMOKER.

Lighting a smoker when planer shavings are used for fuel is a slow job unless you know how to do it. You may think it is well to going, and yet, unless there is a little bed of live cinders in the bottom, it is almost sure to go out when set down. I have used kerosene oil to start the fire—squirt it on the shavings from a spring-bottom oil can, such as is used to oil machinery. This works very well, but it leaves an odor of kerosene about the fire for a while. Recently I have been starting the fire by wadding up a piece of newspaper, lighting it, dropping it down in the smoker, then sprinkling on a few shavings, puffing the smoker meanwhile. Sprinkle on a few at first, then, as these take fire, a few more, and so on until I have a good fire going. I like it the best of any plan I have yet tried. After a shavings fire is once well under way, there is no trouble from its going out.

PREVENTING FOUNDATION FROM STRETCHING.

At one of the conventions of the National Association of Bee-keepers, several members mentioned the use of a new, or not very well-known, method of treating foundation in brood frames, so that it will not sag, and that without the use of wires. The process is simplicity itself, and consists in painting the upper half of the sheet, on both sides,
with a thin coating of wax. The wax is put on hot with a wide, flat paint brush. Just dip the brush into melted wax and apply it to foundation as one would apply paint to a board. Of course, it adds to the thickness of the foundation, and it is this feature, mainly, that prevents the sagging. The added wax is of a different character—softer and more brittle—and is very easily drawn out.

**KEEPING BEES WITHOUT A BEE JOURNAL.**

Most of the subscriptions to the bee journals expire with the year; and there are always more or less of these subscriptions ordered discontinued. Sometimes reasons for this step are given. The one most frequently given is: "I can't afford to take it another year." When a bee-keeper can't afford to take a bee journal there is something radically wrong. If he hopes and expects to succeed he can't afford not to read all of the bee journals published. It is knowledge of his business that helps a man to succeed; it is from ignorance that he often fails. A man can't know too much about his business. The successful bee-keepers, poultrymen, farmers, gardeners, etc., all read the leading journals devoted to their businesses. The man who drops his bee journal because he thinks he can't afford it, is almost as foolish as the sailor who ventures out to sea without a compass. I am not writing this so much because I hate to lose subscribers as because I know it is true, and that some men have not given it sufficient thought.

**SELLING THE HONEY CROP TO THE BEST ADVANTAGE.**

"Did you ever stop to think that you spend all of your season producing your crop of honey, and then sell it in about fifteen minutes?" I came across the foregoing sentence in a circular just sent out by the energetic, enterprising secretary of our Michigan State Bee-keepers' Association. It is true that we bend every energy to the successful wintering of our bees; we make chaff hives, or protect the bees with some kind of packing, or we put them in the cellar and then watch the temperature as a mother watches her sleeping child; we feed the bees in the spring if they need it; we coax them into the supers by means of "bait" sections; we lift and sweat and suffer stings; and, finally, crate up our beautiful product with loving care; and then, as Bro. Tyrrell says, some of us sell it in about 15 minutes.

The indifference exhibited by some producers in disposing of their crop is certainly exasperating. We can't all peddle our honey; we can't all sell it to retailers; we can't all build up a mail order trade; some of us must sell to wholesale dealers, or consign to commission men; but, in any case, there is no excuse for the lack of interest, the indifference, the "I'll-take-whatever-you'll-give-me" spirit.
KEEP THE STRAY BEES IN THE HONEY HOUSE.

With almost any system of management a few bees will be carried into the honey-house when extracting honey, and, with some methods, a good many will be carried in, and the most of us try to get these bees out again just as soon as we can; in fact, our honey-houses are rigged up with bee-escapes at the windows to allow the bees to pass out as fast as brought in. If the extracting is done during a honey-flow, this practice is not objectionable, but during a dearth of honey, the turning loose of these bees loaded with honey raises the very Dickens; so long as no bee carries home a load of honey all is quiet, but the coming home of a loaded bee at a time when bees will rob, no matter whether that load was stolen, or whether it was acquired during the excitement of carrying a super to the honey-house, will start out hundreds of robbers in hot haste. Keep these loaded bees in the honey-house, let them cluster and cling to the window casing until the work is done at that yard, then give them to weak colonies. These bees are loaded with honey and could hang there for days without starving. Some of them may return to their original home, but no great harm will be done, as the work of opening hives is over.
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