State of Iowa

1925

REPORT OF THE

STATE APIARIST

FOR

The Year Ending December 31, 1925

Also Report of the Convention of the Iowa Beekeepers' Association in Des Moines, December 3-4, 1925

F. B. PADDOCK, State Apiarist

Ames, Iowa

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LETTER OF TRANSMITTAL

HON. JOHN HAMMILL, *Governor*—

SIR: As required by law, I herewith transmit to you my fourth annual report as State Apiarist, for the year ending December 31, 1925.

F. B. PADDOCK, *State Apiarist*.

Ames, Iowa, February 10, 1926.

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REPORT OF STATE APIARIST

The season of 1925 was quite profitable for the careful beekeeper. The winter loss of 1924 was no more than normal, but the spring was very unfavorable for the bees to build up in colony strength. All bees without protection of some form failed in colony strength during the long, cold, damp spring. In a good many instances such colonies had to be fed in order to save them, and many colonies either did not develop or perished because of lack of attention. This was a very fine object lesson to show that the bees must be protected during the spring in Iowa as has been advocated. Those colonies which had been given winter protection passed through this severe spring weather quite successfully.

The unfavorable weather of the spring prevented the bees from making early flights for nectar gathering. This resulted in many colonies becoming real short on stores, although the colony population was good. The spring weather condition prevailed so late that in general the beekeepers felt as late as June first that there would be no honey flow. Those people who had not taken care of their bees felt that they had gained over those who had given attention to their bees at a considerable cost. However, the beekeepers who had given attention to the details of management and had fed the bees reaped the profits as usual.

The summer flow appeared somewhat later than normal and started without notice. Almost over night the colonies changed from starvation to prosperity. This statement applies only to those who had given their bees the proper attention. The flow was so unexpected that the beekeepers were not prepared, and they could not give the colonies super storage room fast enough. The summer flow continued for a period somewhat longer than normal, making the work later than usual.

Never before have the beekeepers had a better opportunity to appreciate the benefits to be derived from proper management of the colonies. This experience led many people to believe that the honey crop was very good all over the United States. California and Texas, two of the leading honey producing states of the Union, and several other of the surplus honey producing states were only normal in their production. The states bordering Iowa were just a little above normal, while the crop of the entire United States was below normal.

An unusual amount of honey was produced by the small or side-line producers in Iowa. Such producers can be divided into two classes. The first class consists of those who aim to have enough honey for their family need, and perhaps some to give to friends. This year there was such an increase of production that those who had never before had to deal with the marketing problems found themselves with one thousand to two thousand pounds of honey for sale. The results of this condition were that honey was placed on the market poorly pepared for sale and at a low price. The other class of small producers is accustomed to having honey for sale, and they are acquainted with the details of marketing. Such producers often have as much as five to ten thousand pounds of honey for sale. All of the honey produced this year was of a high quality which was a big aid in selling. The commercial beekeeper in Iowa has experienced no difficulty in disposing of his honey at a fair price, and in fact, the commercial honey was largely out of the hands of the producer by the first of the year.

The interesting results of the season's experience in marketing honey show that there is an increased demand for honey when it is in the hands of those who know how to properly prepare it for market. In every locality there are outstanding and exceptional beekeepers who market their entire output locally at good prices. These people are gradually increasing the consumption of honey in their locality until it is necessary to purchase honey to meet the demand. The prices for honey during the year of 1925 were dependent somewhat upon the weather and the size of the crop, but the average for the state has been twenty-one cents for the section honey, and seventeen cents for the extracted honey. It is estimated from the prices of the year for this state that there was a range of about sixteen percent in the case of section honey, and approximately ten per cent in the extracted honey.

The figures show that comb honey is not being used as much as the extracted honey. Probably this price of section honey is due to the amount produced, for often the crop of comb honey is largely of a low grade. The results are that the low grade must be disposed of at a low price. The above price of extracted honey is lower than it should be, but proportionately higher than the comb honey. The quality of the honey produced is based on the character of the honey flow in the locality, and the strength of the apiary. This will influence the price of honey.

There is an opening for the comb honey producer, since most of

the beekeepers of this state produce extracted honey. There is no comb honey produced on a really commercial basis in Iowa. The experience in marketing this year would seem to indicate that no honey has been more desired in Iowa than that which is produced in the state. There have been good markets and large amounts of honey have been disposed of by the producer. The use of honey more as a food is increasing, and this is brought about largely through advertisement. It would not be difficult for Iowa to increase the honey production which would be of good quality, and all of it could be disposed of within the state. There is a growing tendency to consider honey as a year round food rather than a luxury for only two or three months.

In 1925 the National Honey Week was supported on a large scale in Iowa by the Beekeepers Association. This helps along the work, and in order to make honey production profitable there must be cooperation.

The improved methods of beekeeping are resulting in more people going into the industry and enlarging their apiaries. This means that marketing must be such that the beekeeper can usually dispose of his crop as a whole to outside buyers or locally in a retail way. The increased consumption of honey shows that there is a need for more honey. The people find in honey a food that is ready to serve and it is healthy as well as wholesome.

Profitable honey production at a demonstration apiary.

The activities of the Extension Service for 1925 have been continued along the lines of educational work. These efforts have been largely through the demonstration apiary work. The details of this work appear in another article in this report with the results of the work of the past year. Wherever this work had been continued it has been well received, and good cooperation was experienced at all the meetings.

The inspection work of 1925 was carried on largely by the area clean up method. On this basis work was done in Warren, Woodbury, and Clayton counties. The beekeepers in these counties realize fully the need for the eradication of the disease. The demand for inspection work took all the time of the inspectors during the past summer. The general inspection was in demand enough during 1925 to indicate that the beekeepers do want to eradicate this disease in their own apiaries and in others in the community.

The correspondence courses have been continued and the enrollment has increased quite rapidly in Iowa and other states. The Beekeepers Bulletin is still being published quarterly throughout the year, and it is now ready for volume four. The value of this publication is emphasized by the fact that it is being sent to over sixteen thousand beekeepers in Iowa. During the year, material on beekeeping has been prepared in two handbooks. One is by the Agricultural Extension Service, and it is a very complete treatise on Agriculture in tabloid form. The other book is by the Iowa State College, and contains the outstanding points of information that are available in condensed form. There has been an increased demand for information along the line of beekeeping. Such special requests are given careful attention and consideration.

As a result of all this information, the beekeepers are being interested in better stock, and cooperation is given through the Extension Service and the state association. The association has adopted the slogan "Better Queens." It is interesting to note that two queen breeders in Iowa have put forth their efforts to produce a good quality product. Indications are that there will be two more queen producers start operation in 1926. It is found that a better grade of stock is being introduced into the hives throughout the state. More queens were imported into this state during 1925 than ever before.

The state association has been very active in all the educational movements, and the inspection work. The association has worked

along with the lines of Iowa State College through the Agricultural Extension Service and the Experiment Station. The association worked for the passage of the new law which makes it possible to continue the inspection work quite satisfactorily.

Number of apiaries inspected	713
Number of colonies inspected	11,545
Number of colonies diseased	1,585

BEEKEEPER'S CONVENTION

The fourteenth annual convention of the Iowa Beekeepers Association was held in conjunction with the annual meeting of the State Horticultual Society at the Chamberlain hotel, Des Moines, December 3 and 4, 1925.

OFFICERS FOR THE CURRENT SEASON

President—N. Williamson, Bronson.
Vice President—J. G. Jessup, Council Bluffs.
Secretary-Treasurer—F. B. Paddock, Ames.
Director—W. S. Walker, Iowa Falls.
Director—Ed. G. Brown, Sargents Bluffs.
Director—Gerald Gay, Beacon.

PAPERS READ BEFORE THE CONVENTION

PROBLEMS OF THE DESERT BEEKEEPER

Frank C. Pellett, Hamilton, Illinois

After paying a number of visits to the semi-arid regions, from Colorado and Utah to Texas and California, during the past ten years, I have learned that most of the articles appearing in the bee magazines are written from the standpoint of the Eastern beekeeper or of the man of the California valleys. The essential manipulations do not vary greatly in all that great region from New England and eastern Canada west to Manitoba and south to Kansas. Although the time when a particular operation may be necessary varies greatly, yet most of the beekeepers follow a similar routine. In the desert region, however, conditions are so very different that an entirely new set of problems must be met and the man going there from the North or East must learn many lessons anew.

The beekeeper who operates in the irrigated valleys finds the conditions surrounding his honey flows quite similar to those in the rain belt. With controlled moisture the time of blooming of alfalfa, sweet clover or cotton can be anticipated with some degree of confidence. The man, however, who depends upon the desert flora, finds the time of the coming of the honeyflows very uncertain, as rainfall, rather than season, is the determining factor.

Beekeepers in all that region, whether in Utah, Texas, or Arizona, describe certain problems which we of the East do not often meet. Three things have impressed me especially as of great importance in those states: the conservation of bees and stores during the winter months, the building up of colony strength in anticipation of a honey-flow coming at an uncertain time, and the preservation of a supply of pollen for brood rearing at times when none is to be had from the field.

The Winter Problem

There is no part of the United States where the beekeepers do not have a serious winter problem. In the warmer portions of the Southwest, however, it is not a question of protecting the bees from cold so much as one of conservation of bees and stores at times when there is nothing to gather. I spent the months of January, February, and March of this year among the beemen of Texas, New Mexico, Arizona, and California. In the southern portion of all these states the winters are mild and there are few days when the bees do not fly. During the middle of the day the temperature rises high enough as a rule that the bees break the cluster and little honey is consumed in the generation of heat. Due to the thin atmosphere, temperatures fall rapidly after nightfall, but there is little freezing weather. The great problem, it seems to me is to keep the bees quiet and prevent them from wearing themselves out with useless searching for nectar when there is none to be had. During January the bees were working rather freely on mistletoe in the vicinity

Commercial honey production in Colorado.

of San Antonio, Texas, but were not getting enough of either nectar or pollen to amount to much. Such light stimulation is likely to stimulate brood rearing at an unseasonably early time and results in the consumption of an undue proportion of their stores too long in advance of a honeyflow. In Arizona the temperatures frequently rose to 85 degrees during the afternoon, making it very comfortable in the open without a coat. Although the bees were flying freely there was nothing of importance for them to gather. An occasional creosote bush or squawbush was blooming and the leafless mistletoe also attracted them. There was just enough to be found to keep them active without compensating return in nectar brought to the hive. Just what the beekeeper can do to meet such conditions I don't quite know.

From Texas, New Mexico, and Arizona I found the complaint that the greatest losses come in March. Several beekeepers told me the same story, that their bees apparently came through until March in good condition. With March comes the season of heavy brood rearing with much high wind. By this time most of the bees are old from the frequent winter flights and when taxed with the support of the young brood there is a heavy death rate and many colonies dwindle badly. The solution for this, of course, is plenty of young bees. How to secure the young bees at the right time without excessive brood rearing or raising bees which will wear themselves out too soon is the beekeeper's big winter problem. If brood rearing is encouraged too far ahead of the season, enormous quantities of honey will be consumed without proper returns in surplus stored.

A good windbreak or a sheltered situation pays the biggest kind of dividends, for cold winds cost the beekeeper dearly. Some of the best informed beemen in this region ventured the assertion that special pro-

A desert apiary in Arizona.

tection to be applied during the spring brood rearing period would be a good investment. When asked, why not all winter, it was stated that, when kept warm by night as well as by day during the winter months, brood rearing would be unduly stimulated.

The Uncertain Flows

Outside the irrigated valleys mesquite and catclaw are the principal sources of honey. There are several other plants, which like the huajillo in Texas and the ironwood in Arizona, yield heavy crops locally but are limited in their distribution.

The time of the honeyflow is greatly influenced by the rainfall and sometimes in wet seasons there may be two or more flows from the same

source at different times. Since we have not yet been able to tell very long in advance when it will rain, the beekeeper can only guess when the flow will come. The beekeepers report a variation of as much as two months in the time of the principal flow from mesquite in different seasons.

I found a great difference in the condition of the bees in February in different locations. In some apiaries they were very weak and had very little reserve stores. A few men were visited who have their bees in big hives and who left a large reserve of stores with the bees. Since this proved to be an unusually dry winter with very little nectar available this was a wise provision. These bees were in good condition and, although at that time it looked as though there would be nothing much for them to do, they did in fact harvest a good crop. Mesquite bloomed extremely early and a sudden flow came in April with no previous supporting flow to enable the bees to build up. One of the men whose bees were in the big hives with liberal stores wrote me that he harvested the biggest crop in five years. Others in the same locality whose bees were not in equal condition found it necessary to build up colonies on this good flow. The difference in the crop harvested in this one season will pay big returns on the investment in large hives and ample stores.

A serious problem is offered by the shortage of pollen that often comes during these long dry spells. No matter how much sugar or syrup the beekeeper may feed, if there is no natural pollen available, he can do but little toward building up his colonies. In 1918, in western Texas, I found many bees dying from this cause even though their owners were doing their best to save them by feeding syrup. In such a region large numbers of combs of stored pollen would be worth a big price.

There are many good beekeepers in that region but it takes a better beekeeper to succeed under such uncertain conditions than it does in the irrigated valleys where the regularity of the blooming of the honey plants can be depended upon, or in the humid regions where pollen is always plentiful and the time of the honeyflows vary but little from year to year. We talk much about our winter problem in the north, but to me it appears to be a simple one compared to the winter problem of the beekeeper in the arid regions where the bees fly every day. With us, when we supply our bees with ample stores of good quality, plenty of protection and large clusters of young bees, we can very nearly depend upon their coming up to the spring honeyflow ready for business.

From what I have seen in the Southwest it looks like the fellow with big hives and plenty of stores in a well sheltered position is the one who is most likely to get the honey when it does come. The hive does not necessarily need to be all in one body, for two or more Langstroth bodies accomplish the same purpose when stores are available. There is always some danger, however, that the stores will be consumed in rearing brood out of season when a light flow stimulates such activity.

When the big crops do come in those dry countries, the honey comes in in a way to astonish a man who is unacquainted with the possibilities of the desert flora.

MAKING INCREASE

C. S. Engle, Sioux City, Iowa

Why does the average beekeeper care to increase the number of his colonies? No doubt his reason is about the same as that of the Iowa farmer who each year raises more corn, to fatten more hogs to sell, to buy more land, to produce more corn on.

When I first decided to keep bees, it was the intention to keep not more than forty colonies as a side line. In due time the colonies numbered forty, but by then it was determined to make the side line of beekeeping the main occupation. Several times since it has been decided that when the colonies reached a certain number, no more increase would be wanted. On each occasion something would cause me to realize that I had to earn more money. In order to do so, I have taken the advise of the late W. Z. Hutchinson, whose well-known slogan was, "Keep more bees."

Every spring some increase is made. There is always some winter loss to make up and then a few extra colonies are prepared. By making the increase as early as possible the nuclei generally build up into colonies in time to gather some surplus honey. Making this early increase and requeening is done at the same season. Colonies whose queens disappear are united with weak colonies and those whose queens are failing are marked. As soon as possible Southern queens are used to replace the failing queens which is from April fifteenth to May fifteenth.

Each season there are some colonies much stronger than the average. When there is a surplus of feed combs or an early honey flow, such colonies are used to furnish combs of sealed brood with adhering bees to form nuclen. One such comb, a comb of honey and an empty comb is sufficient to form each of these early nuclei. To each nucleus is given a Southern queen in the cage. As the season advances, brood is taken from colonies that are far advanced, and added one or two at a time, to these nuclei and any weak colonies in the apiary. Such nuclei soon develop into strong colonies, for the young bees which have emerged from the combs of brood form a strong nursing force, which causes the young queens to fill the combs with eggs very rapidly. To keep the brood rearing at the highest pitch the bees must have an abundance of feed, either from the fields or supplied by the apiarist. These nuclei are always ready for the supers about the time the main honey flow arrives, which is approximately June fifteenth in my locality. The young queens do not let up on brood rearing just as the honey gets the heaviest as many old queens do. For making a little increase in the apiary I prefer this plan, for it supplies a crop of honey as well as an increased number of colonies.

There are several beekeepers who set aside a certain number of colonies to be run only for increase. Last year I decided that when spring came fifty colonies would be set aside and increase them to two hundred colonies if possible. Extra combs of honey were saved for this purpose. During the spring two hundred bottom boards and two hundred covers were nailed up, the bottoms creosoted and the covers painted. fifty good colonies, containing not less than four combs of brood and well supplied with honey, were moved to a new location early in May. Queens had been ordered and the first lot arrived May eighteenth. A week before they arrived most of the brood had been raised up above an excluder, the queens kept below to lay in another set of combs. The upper stories, containing combs of honey and brood, most of it sealed by now, and plenty of bees, were then placed on bottoms on new stands. A caged queen was given to each; the cardboard strip over the candy hole was removed, then the cage placed between two combs of brood, candy end up and the other end resting on bottom board. The cage was cross-ways so that the bees had access to the screen wire, thus enabling them to become acquainted with the new queens. By removing

Making a start with new equipment.

the card from the candy end of cage the bees were able to eat out the candy and liberate the queens several days sooner than ordinarily. This was safe to do as most of the bees were young and would not care to ball the queens. The entrances of the hives were then stopped with grass, then the covers placed on top.

After the fifty colonies were all divided they were unmolested for several weeks in which time they built up so that they were again ready to be divided. Unfavorable weather in the South delayed the arrival of more queens. I did not like to give up the idea of carrying out the plans and therefore prepared bees to build queen cells. About sixty-five cells were completed and on the tenth day forty-four nuclei were formed and given cells. A queen emerged from each of these cells but only six of them lived to become laying queens. This loss may be attributed to the fact that the apiary was located in an open pasture without even a bush to help the young queens mark their locations when leaving the hives for flights. Several dead queens were found lying in front of other hives.

By the time that the last of the Southern queens arrived, most of the queenless nuclei were so run down that they had to be supplied with combs of bees and brood. On July first, the apiary contained two hundred colonies and nuclei. The original fifty and the first nuclei set off were well supplied with bees and brood, in fact many queens had let up on laying because of the crowded condition of the brood chambers. This condition was quite unexpected and supers had not been provided for the bees. The few available supers were placed upon the colonies that had been hanging out in front. Honey enough to winter on was all that had been hoped for.

In August the apiary was inspected and new queens given to all queenless colonies and those with poor queens. Another inspection was made in late October. Several colonies had been robbed out and several were queenless. The number was thus reduced to one hundred and ninety colonies. An unknown party who desired to enter the bee business by the shortest route possible, helped himself to three colonies. Most colonies were heavy with honey but they were not as full of bees as those in the other apiaries. This was because the queens had been crowded for laying room in late July and August. One hundred fifty-one queens were used. About one thousand pounds of surplus honey was secured.

PRIVATE LABELS

R. H. Kelty, East Lansing, Michigan

The beekeeper who is going to have any quantity of honey to sell at retail year after year should give some consideration to the question of the advisability of spending the time and money necessary for the designing and registering of a private label or brand. Of course, whether such a private label or brand were registered or not, after it had been in use for two or three years it would be the unquestioned property of the beekeeper; but nevertheless, if it were not registered it might cause some unpleasantness if infringement were ever practiced consciously or unconsciously, by some other beekeeper at a later date.

In the first place, it might be well to consider what the functions of a label really are. The law requires that a label shall show three facts: first, a true statement of the nature of the contents of the package. In this connection, it is considered misbranding to, by any means whatever, mislead the purchaser by use of words or designs on the label which might place a misconstruction on the true nature of the contents. It would not be legal to use the word "clover" on a label for a package containing a mixture of honeys in which the dominating flavor was buckwheat; nor would it be legal to designate as Michigan honey a mixture in which the dominating honey was from the South or elsewhere. Second, the label must show the net weight of the contents of the package. This means that the contents of any package must be not less than the indicated weight on the label. Of course, it can be more than the net weight indicated and beekeepers who do not occasionally check the weight of, say a five pound pail when bottling may find at the end of the day that they have unconsciously given from two to four ounces overweight on several hundred pails of honey which means a loss of more than a day's wages.

In the third place, the label must show the name and address of the producer or packer so that inspectors can trace the origin of the honey to some one who will be responsible for the package.

There are relatively few instances of intentional misbranding or illegal labeling of honey. Yet, as time goes on there will be more attention given to this matter and it is well for beekeepers to be posted.

But it is not enough to know that the requirements have been met in the label. In fact, the first value of the label should be its effectiveness distinctive and attractive in both the wording and the color combination as a silent salesman. A label shoud be considered as a point of contact between the producer or packer and the consumer. If a label is used, then the "introduction" which the package gets to the consumer is most likely favorable. If the label is dingy, soiled, and unimpressive in appearance, then no matter how good the contents of the package may be the customer is not as well impressed.

The expense involved in originating and registering a private label will depend largely on the design adopted. A Wisconsin beekeeper who is adept at the designing of labels spent nearly $200.00 on the making of plates and registering of one of his labels. This design was quite elaborate and probably was more expensive than the designs many beekeepers would elect, yet the design was so attractive that a state association was willing to pay the cost of procuring the label to own it. The beekeeper mentioned has produced other designs of nearly equal expense which have been purchased by individual beekeepers. They were really worth the money because of their distinctiveness and attractiveness.

When one walks into a grocery store and studies the stock of canned goods behind the counters, at first glance it is apparent that some labels stand out and reach out much more effectively than others. This is likely due to the color combinations used. But it may also be due to the size of the letters and the arrangement of the wording on the package.

Certain colors are not only more attractive to the eye than others, but some colors are more appropriate for use in connection with labels for food than others. For instance, red is one of the most noticeable colors, yet by association, the use of dark red on a package has come to mean "danger" and suggests that the package contains either explosives or poison. On the other hand, a lighter shade of red is widely used on a nationally advertised brand of tomato soup with great effectiveness. Blue is a beautiful color, more particularly the darker shades, yet the reaction of the eye to certain shades of blue suggests coldness and for that reason they are unsatisfactory for labeling purposes, especially as a background. However, sky blue stands out strikingly on a background of straw color, goldenrod or buff color and is very pleasing to the eye.

The shades of yellow, ranging from goldenrod to buff are excellent for contrast purposes and stand out strikingly on a landscape. For that reason many public carriers have been painted this color to avoid collisions. It is very interesting to study the color combinations used on the posters and display advertisments found along the highways and in the cities. The colors used on these expensive display advertisements are used purposely and their effectiveness has been carefully studied and calculated by high salaried experts whose business it is to discover the most efficient method of attracting the eye of the casual passer-by. Labels on nationally advertised brands are given just as much attention. It is true that the expense of some of the more elaborate labels for canned goods would prove prohibitive to beekeepers because they would be unable to purchase such extravagant labels in sufficient quantity to make the cost per label rational: For instance, it is possible to procure quite an elaborate label for a candy bar for less than one-tenth of a cent per label, whereas a less elaborate label in small quantities would cost at least a half a cent per label or more.

The fact that one design may be more effective than another in stimulating sales has been conclusively demonstrated on many occasions in the commercial field. For instance, a candy manufacturer adopted a new style of package with a new color combination for a certain candy bar some time ago with the result that sales for that particular bar were stimulated 3.52% in thirty days in Michigan's largest city. When ordering more of the new style cartons, the candy manufacturer told the printer that he didn't know whether it was the candy or the new carton that was responsible for the increased sales. The carton manufacturer's reply was this: "You have always had the candy, haven't you?"

Many beekeepers use the stock honey labels available from label catalogues because of the economy and the fact that they can get them when they want them without any of the bother that goes with the designing of a private label. There are many splendid honey labels available that may be even better than those beekeepers would design for themselves. The only objection is that the beekeeper may find that his neighbor has elected to use the same style label as he is using which makes it difficult for local customers to distinguish the source of the honey at first glance. Many never prepare a private label because they feel that it is not yet necessary but intend to next year or the year after. The answer to this argument is that the biggest value of a private label comes from its continuous use and becomes increasingly valuable to the owner as years go by and as his business expands. The trade marks of some nationally advertised brands of goods would be valued at millions of dollars and are considered as one of the most valuable assets of business simply because they have become so widely known that their mark on the package guarantees the quality of the contents.

If the beekeeper goes no further, he should see to it that his name stands out prominently on the label for one's name is a distinguishing characteristic on a label that cannot be infringed on.

MARKETING OF HONEY

W. W. Delahoyde, Dawson, Iowa

It is one thing to produce a crop of honey and quite another thing to sell it. During the Great World War when sugar could be obtained only in very limited quantities there was no difficulty about selling honey either in small or car lots at high prices. However, in my opinion the price of sugar is not the only thing to be taken into consideration in pricing honey. Local conditions might have much to do with the price one may get for his product. The present shortage in fruits and jellies automatically opens up a wonderful opportunity for every beekeeper to push and get a fair price for the product of his apiary. This might be a great boon to future sales providing we take full benefit of the opportunity.

By opportunity is meant that the honey should be prepared in a clean package with a neat and attractive label, one that will almost compel the prospective customer to buy. And it should be of such quality, flavor and cleanliness that it will make a lasting customer for honey. Too much stress cannot be given to these two items, cleanliness and attractiveness. Much comes under those two words, in the preparation of honey.

In calling upon the grocer to make sales of honey it is too often observed that honey is offered for sale which is not appetizing in appearance because of the glue which is smeared over the sections and in the corners around the honey and many combs which were only partly filled and no weight marks upon any of them. Very often this assortment called honey would be sitting around in an old box open to the dust and flies, which is repulsive in itself and interferes with the sale of the product from the apiary where beekeepers pride themselves on cleanliness and attractiveness.

In the September Beecause John Auckland asks the question, "How far would the dozens of breakfast foods get if they were put up as indifferently and advertised as little as honey?" He says, "there are 233,000 retail grocers in the United States now selling food products. As this agency is already at hand, honey should be sold through it and advantage taken of this ably managed business instead of trying to duplicate it."

I am a firm believer in cooperation and organization and feel that the beekeepers of each county should be organized, and that each beekeeper regardless of the number of colonies he has, should affiliate himself with this organization that we may get a fair price for our product. Too often the beekeeper with only a few colonies of bees and a small amount of surplus of honey will call upon the grocer and ask how much he will pay him for his honey? Invariably the answer will be about five cents a comb or pound under what he should and can get. He not only sells his honey for a price under the market but in a way sets a price for the beekeeper who must depend upon the revenue of his apiary.

A small producer may dispose of his entire crop at his door, but with the larger producer it is different and it seems to me, the better way is through the grocer. The grocer is entitled to a profit of at least 20% on our product for handling and we should protect him in our retail sales and not feel that if the grocer pays a certain price that we should sell him all that we can for cash and then peddle the balance of our crop in small quantities at the same price we received from him. Our responsibility to the grocer does not end with our unloading a good portion of our surplus of honey upon him, particularly the extracted honey. If any should granulate or for any reason become unsalable, we should pick it up and replace it with fresh stock.

For the marketing of honey, all combs should be graded as to color and weight, the sections cleaned spotlessly clean and then packed in cartons or shipping cases, glass front preferred. For the extracted honey, I would suggest the one pound jar, 2½ pound can, 5 and 10 pound pails for the regular retail trade, which are the best selling sizes. Extracted honey should never be marketed in the common fruit jar, as it is not always possible to get the clear white glass; if packed in the green glass so common in the fruit jar it does not have the clear appearance that it does in the honey jar. For comb honey one should use the carton because it is cheaper than cases. Many grocers prefer to buy honey in cartons, as it is not necessary to wrap it again, the carton being sufficient to deliver to the customer. Experience in the store indicates that honey sells much better when the customer can see the honey instead of the carton. If we could get glacine paper and wrap one average comb, or use a carton with a glacine front, the grocer could make a display and the customer could see the honey which would increase the sale of honey.

BUILDING A LOCAL MARKET

Gerald Gay, Beacon, Iowa

There are so many things which enter into the building of a local market that one scarcely knows where to begin or what to exclude from an article. To cover the subject fully would fill a good sized volume. There is nothing that gives me more pleasure than the preparation and marketing of honey, and what is said are conclusions drawn from experience in this work. The reason for building a local market is obvious, it makes an outlet for our increase in production, increases the consumption of honey, and adds materially to our income.

It is one thing to produce honey and another thing to sell it. Our success in marketing depends much on how it is produced since the value of honey is largely determined by its flavor, color and body, as well as the manner of market preparation. Honey should be packed for market in an attractive manner. Let us liken our honey to a picture in a frame. The container being the frame, the container should bring out the natural beauty of the honey. A glance at the grocery shelves will convince one of the need of an attractive label. The label is our silent salesman that is ever ready to greet the customer. It need not be elaborate or expensive, but should harmonize with the container. The word "PURE" should not be used in connection with the word "HONEY." I would prefer some other word or words which distinguishes one's honey from that of other sources.

It is well to market honey under a trade name or brand, but it does not mean much unless our customers can rely on it for its unchanging quality. We have become accustomed to associate the word "AIRLINE" with honey for the same reason that we associate the words "SUN-MAID" with raisins or the words "GRAPE NUTS" with a breakfast cereal. In each case the product has been so standardized that the quality is always understood.

I should like to give the story of my honey crop from extracting time until it reaches the consumer. About eighty per cent of the crop is packed in one pound glass jars, the rest in five pound pails. The honey is poured through cloth into tanks after extracting. Here it is blended into one grade with the exception of any dark fall honey that may be on hand. The honey is drawn from the tank into the containers and labeled ready for delivery to the grocery. Honey is kept on hand so that an order may be filled any day in the year. To each container is attached a three-color label of our own design. The label carries an outline of the state of Iowa, in the center of which is the bust of "Chief Mahaska." The outstanding words are "Mahaska's Golden Honey." Space is allowed for the net weight and also for the name and address of the producer.

I prefer building a market with the aid of the grocery store because of the ease of reaching the customer. Whenever delivery is made to the consumer, it is only fair to receive the dealer's commission because of the extra service rendered. It is not enough to simply deliver the honey to the grocery. Most store dealers will appreciate it if one helps him place the honey on the shelves. Often it can be attractively arranged near some source of heat, thereby preventing granulation. One must call upon the grocer regularly to replenish his stock and exchange for any that has become crystallized or has soiled labels. A recent experience convinced me that grocers appreciate this "service in honey" as much as any service in groceries. Noticing the supply on the shelf was getting low, I approached the grocer and asked if he could use honey. Without looking up he shook his head "No" but as I was leaving he recognized me and said "Yes, you can bring in some honey." Honey in the grocery store has as its competitors corn syrup and fancy jam and jell. We cannot expect to repeat orders unless we supply him a product that will move.

An important and very interesting part of building a local market is showing honey at the fair. I have exhibited at the local fair for several years, and look forward to the event from one year until the next. The prizes received are usually very small, but when we include the honey sold it proves a very profitable outing. The most benefit is secured indirectly by getting the product before the public. An exhibit should be educational in nature, it should contain honey in the comb, extracted, and in the crystalized form. One should provide a number of labeled samples of extracted honey, and a quantity of bees wax. An observation hive with bees and queen is a rare attraction. A few bee supplies adds much to the value of an exhibit. An attendant must be in charge to point out the queen and tell about the bees and their wonderful instinct, the value of bees as a pollenizing agent; also about honey in its different forms and the value of its use in the diet.

Newspaper advertising no doubt could be used to advantage, if used constantly. The expense does not warrant its general use. There is nothing that advertises honey like the honey itself and one should not lose an opportunity of getting it before the public.

A conclusion is nearly out of line on a subject of this nature, because a market is something that is ever in the process of building. We have new personalities to deal with. Scarcely is one problem solved until another presents itself. In summing up the essentials in building a local market, I would say standardize the product and place it upon the market in an orderly manner.

THE PROBLEM OF GRANULATED HONEY

E. R. Root, Medina, Ohio

Perhaps many who will hear this paper will wonder why there should be a problem in connection with granulated honey. Most of you are aware of the fact that it is fine; that it is delicious, and that it makes a very fine spread upon bread and butter, and on cereals in the morning. That it makes a very fine confection; that chunks of it can be coated with chocolate and make a very fine bon-bon or candy. But the general housewife over the country is unfamiliar with these facts. When she sees that the honey that she has put in the refrigerator or down cellar begins to granulate she thinks that it has begun to spoil, or that it is adulterated. She sees a semi-solid condition in her bottle of honey, jumps to the conclusion that the solid matter is plain brown sugar and, therefore the honey is adulterated, or what may be worse "spoiled." When I say that the housewife generally believes this, perhaps many of you would take issue with me and I am not sure but that I, myself, would have lined up with you, saying that the man who would make such statements as I have just given did not know what he was talking about.

During the last two summers I have been out on the Redpath Chautauqua platform covering some four or five states and my general subject was bees and beekeeping, and how to handle them. My supplementary lecture given at the close of my general talk was on the subject of "Honey as a Food." At the close of my general lecture I asked those who were interested to remain when I would talk to them on the uses of honey in cooking and in general, honey as a food. Most of the housewives in the audience would remain.

In giving this last lecture I always got off the platform, got right down among the women for a heart-to-heart talk. I have wished many and many times that the beekeepers of the country could have been with me to hear some of the responses that I received. Scores and scores of women have told me that they never knew about granulation of honey before and that they had been in the habit of putting all their honey in the refrigerator, supposing, of course, that that was the very place to put it. That when they saw it begin to granulate they thought it was "going back to sugar" and, therefore, adulterated. This always meant that they would never turn in a repeat order for that brand of honey and perhaps for no honey at all.

When I explained to them that honey should always be kept in a warm place and never down cellar or in a refrigerator, they seemed surprised, notwithstanding that tons and tons of printed matter has been sent out

explaining all of this, but somehow the information, important as it is, has not yet reached the housewife, and for that reason I took it upon myself to explain the thing from the platform, off the platform and before little groups of women every day for 88 days last summer, and every day for 77 days the previous summer.

In these little side talks I explained how to use honey in cooking; how to use honey in canning; how that honey had the quality of keeping a cake or a cookie soft; that a small amount of it used in ordinary bread would keep it moist much longer than ordinary bread without the honey. All of this was news to the women.

At the close of these supplementary talks I always handed out some literature explaining just what I had said, telling how to use honey in cooking, giving a few recipes and then adding that very important piece of information that honey stored in a refrigerator is quite liable to granulate.

That this kind of explanation, mouth-to-mouth, and face-to-face with the housewife who buys the food was having some effect is shown by the fact that grocers told me afterward that their shelves were cleaned up of honey, both liquid and granulated, time and time again.

I would explain that most of the women I met were in large cities and towns and even though many of them had been brought up on the farm where some bees were kept, the great majority of them were ignorant of the facts about granulation and for that reason had not put in a second order for honey after they found that the first lot had begun to granulate.

I have been before some large Food Shows and found practically the same reaction from the women and I am, therefore, convinced that we beekeepers, honey producers and buyers should try to get the correct information before the public, both by word of mouth and by pieces of literature handed out to prospective customers. Grocerymen should be instructed to tell their customers to store the honey in a warm, dry place.

In this connection, it is important to let the housewife know that granulated honey is delicious, that many people like it and prefer it to the honey in the liquid form.

I believe that beekeepers should begin a campaign of selling granulated honey in 2½, 5 and 10 pound pails. These pails should of course explain that most honeys are inclined to granulate at the beginning of cool weather; how the same honey can be restored by the application of heat. This will help to open up the way for honey in the liquid form and when it does granulate as it is quite apt to do after the seal of the bottle is broken, there will be no suspicion in the mind of the good woman that this honey is adulterated.

Usually it is not practicable to give an elaborate explanation about the characteristics of honey and its tendency to granulate on a bottle of honey without covering up the honey itself. The most that can be done is to hand out a leaflet with a bottle of honey that will briefly explain how to use honey, about its tendency to granulate, how to restore it back to a liquid condition and likewise how to use it when it is in a semi-solid condition as a spread on bread and butter.

In short, I believe that the beekeepers of the United States have not realized the importance of explaining to their customers that nearly all pure honey when placed in a cold place will granulate, or is likely to do so after the seal is broken.

I am well aware of the fact that granulated honey is not salable in the large cities of this country. The solid, lardy appearance, unless there has been a campaign of education, leads the consumer to believe that he has a "sugared product." He refuses to buy it. This only emphasizes the importance of a campaign of education like what has been going on in Canada.

In Ontario and Quebec, Canada, there is no problem of granulated honey. The larger part of all extracted honey is sold in five and ten pound pails after the honey is granulated solid. The situation in Canada is quite the reverse of what it is in the United States. The housewife on the other side is apt to conclude that when she buys a pail of honey in a clear liquid condition that there must be something wrong, and sometimes when the honey is stored in a warm place and it becomes liquid she will return it because she does not want "that kind of stuff."

In late years, however, in Canada a change is taking place. More and more bottled honey in a liquid form is being placed before the public. This is right and proper as honey should be sold in both forms. In this country we ought to do more than we have been doing to stimulate the demand for granulated honey in tin pails and by so doing we will pave the way for sales of honey in bottles when the honey is in liquid condition. When this honey granulates, as it may do on exposure to cold, there will be no suspicion in the mind of the housewife if she will know what granulated honey is.

It may take years to educate the American public to the wholesomeness and purity of granulated honey, but it is not too late to begin the campaign. In like manner, it may take years before the Canadian public will be educated to buying honey in liquid form in bottles. I, therefore, think that every beekeeper's organization should give this subject of granulation its very careful attention to the end that the public may be properly informed as to all the characteristics of the product that they are producing and desire to sell.

INTRODUCING QUEENS

Paul Laird, St. Charles, Iowa

The past two seasons should convince the most skeptical that beekeeping in southern Iowa is at best a "hit and miss" proposition. Had all colonies in the apiary been divided in June, 1924, the total production of honey would have been increased greatly. This year part of them were divided in June and they produced no surplus, and some of them had to be fed; while those not divided made an average of 55 pounds.

The difference was that the main honey flow in 1924 came from heartsease in August and September, while this year red and alsike clover, blooming profusely in July, furnished most of the surplus. Weather conditions, however, were very similar in the early part of both seasons. Both opened unusually early with excessive temperature, and this was

followed by near freezing weather in late April and early May. By the middle of May in 1925, many colonies were facing starvation. All through the month of June we had a light flow of nectar, just sufficient to insure brood rearing. Meanwhile the dry weather dwarfed the corolla tubes of the red clover, so that the bees could reach the nectar. This condition lasted for about three weeks and was the only real honey flow which we enjoyed. It is interesting to note that only Italian bees worked on the red clover and that even these would not occupy the comb honey supers. All through August there was a light flow of nectar, and prospects were good for a fair crop from heartsease; when the dry, hot weather of early September cut it short.

The condition of the bees at this season is the poorest in ten years. When the honey flow ended the first week in September the hives were filled with brood. The sudden cessation of the nectar flow left the bees short of stores. They promptly ceased brood rearing at the most critical time, and as a result if we have a long, hard winter most of the bees will have used up their energy, and will be too old by springtime. The condition of honey plants is good, so it may be that when 1926 rolls around, we will have an abundance of clover bloom and not enough bees in condition to make the best use of their opportunity.

Early in August arrangements were made to test Jay Smith's theory that unless the frames of brood were placed together when introducing a queen, there was danger of the bees raising a virgin in one part of the hive, while the queen was laying in the other. Four single story colonies were selected and requeened with young Italian queens. No. 1 had each frame of brood placed alternately with one of honey. No. 2 had two frames of honey in the center with four frames of brood on each side. No. 3 was the same except that two empty combs occupied the center, while No. 4 was a colony which had been hived on full sheets of foundation about a month previous. The two outside frames had not been drawn out, and these were placed in the center thus dividing the brood nest into two equal portions.

At the end of three days each colony was examined hastily. All queens were out of their cages, and there was an abundance of unsealed queen cells in all hives. However, no queens nor eggs could be seen. Next days many of the cells were sealed, but in two of the hives, queens were seen on the same frames with sealed queen cells. The fifth day after introduction all colonies were examined with great care. No. 1 in which the frames of brood were arranged alternately, had sealed cells on the first and seventh frames, unsealed cells on the third, and the queen was laying on the fifth; No. 2 in which two frames of honey divided the brood chamber, had sealed cells on one side, unsealed on the other, and no queen nor eggs could be seen. No. 3, where empty combs separated the brood, had unsealed cells on one side and eggs and queen on the other. No. 4 which had the new comb had queen cells on one side, and the queen in a ball of angry bees on the bottom board. The queen was rescued and recaged, the cage opening was closed with a piece of honeycomb and the hive was closed.

Next day the queen of No. 1 was found on the seventh frame, and the queen cells on this frame had been destroyed. Some of the cells on the third frame were sealed, and those on the first frame were intact. No. 2 which had appeared to be queenless the day before, had eggs and queen on one side, and unsealed cells on the other. No. 3 was unchanged, and No. 4 was not opened.

Each day thereafter each hive was opened and its condition carefully noted. No. 1 finished sealing all cells and allowed them to reach maturity. Some were placed in nuclei and hatched within a few hours after being taken away. The others were destroyed. The queen continued to lay, going back and forth between the two frames. The same was true of No. 2. No. 3 sealed all cells, but on the eighth or ninth day, the queen forced her way into the other part of the hive, and all cells were speedily destroyed. The fourth colony released the queen from her cage, and when the hive was opened on the eighth day, she was laying in one part of the hive, and there was one sealed cell in the other side. The frame on which the queen was laying was removed from that side and was inserted next to that containing the queen cell. Next day the cell had been destroyed, but a few days later, ripe cells were found on frames which had been adjacent to the one on which the queen was first found laying. The cells were destroyed as there was danger that they might hatch before the next day. The queen herself developed into an exceptional layer.


A comb that is of no value in brood rearing.

On September 8th, six strong single story hives were united to make three double stories. The queens of three hives were removed, and the hive bodies placed on top of the queen right ones. In two of them queen cells had to be cut out of the unoccupied story nine days later. As no nectar was coming in at the time, the theory advanced two years ago, that this condition never happens during a dearth of nectar was disproved.

About the middle of September, a queen was introduced to a single story colony by the cage method. The honey flow being over, the colony was fed abundantly. In four days the hive was opened and the cage removed. To all appearances the queen had been killed, for there were a number of unsealed queen cells on the frames on either side of the empty cage. However, the hive was closed and was not opened again for three days. The first frame containing brood had sealed queen cells; so with the second; likewise the third. Inasmuch as this frame had contained only unsealed cells three days before it seemed certain that the queen had been killed. The next frame examined was filled with eggs and on the last one the queen was discovered laying. Unquestionably the cells were sealed after the queen was released. Had the bees accepted the queen temporarily, intending to raise one of their own stock? No, for on looking closer each cell contained a dead virgin, but not one showed any sign of having been torn open. What then was the reason for this unusual condition, and why did the bees seal over the cells, only to desert them later? The answer is obvious, and may be summed up in a single rule, which will be verified by careful observation in nearly every instance, where the bees have started queen cells before the queen is released from her cage. "A colony rendered queenless will not accept a mated queen unconditionally until she begins to lay." Sounds reasonable, doesn't it? Bees are providential creatures governed largely by instinct. Why then should they accept a queen about whom they know nothing until she shows her true worth? Far better to go on building queen cells, thus preserving the stock of their own mother, until such time as the new queen can show her worthiness to succeed her. Then and only then will all queen cells be destroyed. This partially accounts for the amazing success of the various "push in the comb" type of introducing cages. By the use of this style of cage, which gives the bees access to the queen before she can leave her prison, the queen is ready to lay when she finally emerges, and there is no probation period at all.

Approximately eighty per cent of all queens introduced are accepted, but what of the other twenty per cent which for some cause or other are rejected? How many of these are accepted conditionally but fail to deliver the goods? Or how many develop into first class queens only to have their lives snuffed out by some virgin, which hatches in a remote corner of the hive? And lastly how many queens are supposed to have been lost when they have really been accepted conditionally? A few years ago the writer requeened a colony of black bees for a neighbor. On looking through the hive a week later a number of sealed queen cells were found, and the queen was supposed to have been rejected. Nothing was done with the colony, but the following year all of the bees were pure Italians. It was assumed at the time that a virgin from some other hive had entered and been accepted, but in the light of recent discoveries, it seems probable that the queen had been accepted conditionally, and later delivered the goods.

QUEEN TESTING

Paul Laird, St. Charles, Iowa

Less than sixty years have elapsed since the Italian bee was first introduced into America. In this time it has spread over the whole of the United States, and has supplanted the old black or German bee wherever the two have come in contact. No better proof of superiority can be offered than the fact that in many parts of the country the black and hybrid bees are non-existent. This well deserved popularity of the Italian makes them the outstanding race of bees in America today, and when we speak of improving our stock, we allude to the changes which this race has undergone.

Three things must be taken into account in a study of the characteristics of the Italian bee of today: heredity, adaptation, and selection. The imported bees inherited uniformity in color and honey gathering qualities. The color was changed by selection, and they lost their uniformity in honey production by both adaptation and selection.

The original Italian was quite dark in color and queen breeders set to work to make them lighter. As a result, we have the light three-banded and the goldens of today. Others, seeing that this craze for color would probably result in the loss of other valuable characteristics, continued to breed the darker strains. As a result, we have hundreds of strains of Italians varying greatly in color and honey production. A few, whether intentionally or otherwise, introduced Cyprian blood in order to brighten the color, and this probably accounts for the fact that the brighter strains as a rule are not so gentle and are more inclined to swarm.

The Italian bee adapted itself to its surroundings. In some sections of the country, where the honey flow was long and light, those queens which produced the most honey were moderately prolific, while the extremely prolific used up all their reserve honey by raising more bees. Then we have places where there is a heavy flow of nectar for a few days or weeks only.

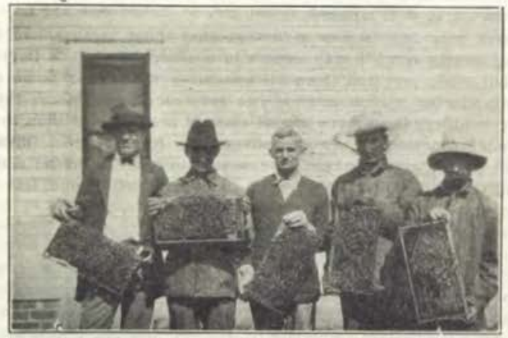
Obviously the queen which will produce the largest quantity of surplus is the one which is very prolific early in the season, and then lays her eggs very sparingly after the opening of the main honey flow. Yet in each section the stock which has produced the largest amount of surplus is selected from which to rear queens. Consequently, we have numerous strains of Italian bees each adapted to its own locality, but differing widely in various characteristics.

A few years ago a number of queens were secured from Michigan. They produced bees of uniform markings, industrious and gentle. Early in April they were the weakest in point of numbers of any in the yard. On June first when the clover flow opened they were well up with the leaders. When the last super was taken away in September, it was found that these Michigan queens had the highest average of any in the apiary. This tendency to delay brood rearing in the early spring, and then to build up rapidly for the main honey flow was dominant in the second generation, but later disappeared.

Inquiry brought out the fact that the queen breeder packed his bees is packing cases. This probably caused the bees to remain quiescent for a longer time in the spring, and enabled them to raise more brood with the same number of nurse bees. This brought the hives to the peak of brood rearing with an abundance of young bees just right for the main honey flow. So long as the queen breeder used his own stock, this trait was noticeable, but a year or so later he changed to a breeding queen purchased from another state, and this desirable characteristic soon disappeared.

About the same time several queens were secured from a Southern state. The queen breeder himself was also an extensive shipper of package bees. He probably had been keeping the most prolific queens to provide plenty of bees for the early season trade, and this tendency asserted itself. Instead of behaving themselves like most sensible bees should have done when the honey flow was on, those pesky creatures determined to swarm. Some were Demareed and the queens went to

laying, filled up the lower story with brood, and in less than three weeks were again ready to swarm. By using up all their stores, both reserve and surplus, they produced a nice lot of worker bees ready for the harvest, but the harvest was over. Such a strain of bees is ideal for the sweet clover regions of the great Northwest, and this particular breeder



Plenty of bees for everybody.

has built up a reputation for high productivity in those regions. These are two extreme cases showing the results of adaptation intensified by selection, but there are numerous other instances almost as striking.

Color has been stressed too often in comparison with other traits, but the queen breeder is not to be blamed too harshly. For some years past the writer has produced and sold a few queens locally. People have come to the apiary and actually seen hives piled high with filled supers. The bees themselves were gentle, but they were dark three-banded Italian. Then take them over to a hive of bright yellow fellows. They begin to admire them, and even though that particular hive has made but a small fraction of the surplus which the darker bees have produced, the chances are just about even that the beekeeper will order his queens from the bright yellow stock. Under favorable conditions the so-called goldens will produce almost as much honey as the darker Italians, and they winter equally as well; but when nectar is scarce and hard to obtain, they lack the do or die spirit of their darker sisters.

If I were going into the queen rearing business on a large scale, I would procure the lightest colored Italians that would produce a fair amount of honey, and would endeavor to brighten the color and improve their working qualities; but for the largest honey production under southern Iowa conditions the dark three-banded are without doubt the better strain.

Time does not permit a detailed account of the various changes in the Italian bee produced by adaptation to its surroundings. There is no broad line of demarkation separating the various types as is the bacon and lard breeds of swine, and the Mediterranean, American and Asiatic classes of poultry; but the queen which produces the largest amount of honey in Alabama, Mississippi, or Texas may furnish very little surplus in New England. Or to bring the matter nearer home, the hive of bees which hangs up a surplus of six or seven hundred pounds of surplus in North Dakota might end the season around Des Moines without a drop of honey to its name, unless the surplus is removed immediately, even before it is well ripened.

It seems very fine to buy a few queens whose mother had made a record of twenty comb honey supers in a season, and thus improve the stock; but when you find them all swarming while your home colonies are busily storing a nice surplus, you get "sore," and blame the queen breeder; yet there is no more honest class of people today than the queen breeders of America. They are advertising to the world through the great bee journals, and cannot be expected to furnish queens adapted to each individual locality. Of course, once in a while one lets his enthusiasm get away with him, like an old established firm which advertised bright Italian queens for sale from stock which had not swarmed that summer, although there were ninety colonies in the yard. The next year they advertised queens from a colony that was the only one of ninety which produced any surplus the year before, and they did it by going one mile farther to an alsike clover field.

Too many bees for the hive.

Just one word as to price. You can buy queens as low as fifty cents each, while a breeder will cost ten dollars or more. Unless one is prepared for queen rearing, it is inadvisable to purchase a breeding queen.

Most queen breeders guarantee pure mating or replace, and probably not more than three per cent of all untested queens are mismated. So it really looks like a question of whether the beekeeper prefers to run the risk of having to requeen an occasional colony a second time, or of paying a higher price for a tested queen. But there is another phase to the problem to be taken into account. An untested queen is sent out as soon as she has begun to lay, but a tested queen must be kept at least three weeks to make sure that her progeny are pure. When you buy a tested queen, you therefore buy at least three weeks' less service than is the case with an untested queen.

Again a tested queen is heavy with eggs and is more likely to be injured in shipment. So it seems that it is an economy to buy an untested queen. Generally speaking, when you buy an untested queen, you get about what you pay for. If you pay fifty cents, you get a fifty cent queen. If you pay one dollar and a half, you get about that value. It is true that there are many good queens sold for fifty cents, and some poor ones for one dollar and a half, but the chance of getting superior queens will be much greater, if you pay a higher price.

The queen is the life of the colony, and it is essential that she be a good one. No queen breeder has devised a method of producing all 100% perfect queens, but it is surprising how few poor queens are sent out by some of our leading queen breeders who do not sacrifice quality and uniformity in order to sell at lower prices.

In December, 1922, an experiment in queen testing was undertaken in New South Wales, Australia. Three queens were furnished by each of several breeders in the province. These were introduced to colonies in the government apiary. Scoring was based on productiveness, disease resistance, no swarming, building-up qualities, stamina, comb building, wintering, and brood. The contest which continued for two years was open to all beekeepers having twenty colonies or more. Some day we will have the same thing in Iowa, modified to fit American conditions. Then we will have something to go by when we went to buy quality queens. At present it is a hit and miss proposition, and the best advice that can be given is to buy your queens from some place where conditions are similar to your own locality.

QUEEN REARING

N. Forehand, Gonzales, Florida

Just as scientific farming is agreed by the world to be necessary for one's success, so is scientific queen rearing absolutely essential. The first and most important step is to secure a good queen, but how? My experience in commercial queen rearing is the result of forty years' work, twenty-five of my father's, W. J. Forehand, and fifteen of my own. The race which has given me the best results commercially is the direct descendants of a queen imported from Italy. The daughters of imported queens as a rule are too dark for the trade; they are classed with hybrids by the inexperienced. However, the third generation or grand-

RAMBLINGS OF A SIDELINER

John A. Johnson, Pomeroy, Iowa

I have been a sideline beekeeper for over twenty-five years, and I am sure you will agree with me that there is no medicine in the world except bees that will keep a person alive when a real case of bee fever has been contracted. Of course the embryo beekeeper begins to build his aircastles reading everything that comes to his eyes about bees and beekeeping, looking of course only on the bright side of the subject and discounting the failures and dark side of it. He or she begins to plan and think, and think and plan, trying out different theories of men, both scientific and otherwise; then also to think up some new and original idea, only to find that somebody has announced it to the world sometimes years before he was born. But no true lover of our pets will let small matters like that deter him in delving deeper into the mysteries of beekeeping, and not like the old German whom Eugene Secor pictures in his poem as thinking himself a beekeeper when he had come into possession of an old box hive of bees and said, "Oh, I iss one of them happy beemans. I don't got to work no more. All der day long I sit in der shade of der apple tree or shmoke mine pipe in der door." Mr. Secor was a son of Iowa; all honor to his memory.

I had a beekeeping friend who told me he used to take the bee journals, but the big fellows who wrote in them were always quarreling about this and that being right or wrong, so he just quit taking them. He also told me that bees didn't sting him like some folks, and on some occasions he made fun of me for wearing an Alexander veil. How I longed for his presence in my own apiary when my bees were going after things right. This friend also said beekeeping didn't pay here. This wasn't the right country for bees. He passed to his reward before I got to producing five or six tons per year within a mile of his home. Somehow he never came out to see me in my apiary.

I am most happy when I can visit with friendly beemen in their own homes and swap ideas with them. One time a lady friend was visiting at our house, and the first thing she did was to walk into the bee yard and stand right in their line of flight on a hot day. I yelled for her to get out of there or the bees would sting her, when she up and told me she wanted them to do so in her little finger as she had rheumatism in it. Imagine my surprise when she stood there a long time and not one bee was accommodating.

A good many years ago there was a great deal of discussion in the journals about likes and dislikes of white and black color by the bees. One that fastened itself indelibly on my mind was an article by the "Jay." No doubt, that same Jay who is so busy raising queens down in Indiana. He told of having a black dog and a white dog and of taking them into the bee yard to find out if the bees would sting the black dog more than the white dog. Now it ended up with the white dog beating it for the house and in through the screen door without knocking for admission and crawling in some dark corner, refusing to enter into any further experiments. I came to the same conclusions as the Jay when one day a boy coming into my bee yard wore black stockings in one of which there was a hole the size of a quarter of a dollar through which could be seen his white skin. One of my busy stingers instead of stinging him on the black stocking stung him right on the bare spot. So I also thought bees preferred black clothing to white. However, I wear white when working with them.

A perfect comb of worker brood.

Then they got to arguing about if bees could hear sounds, so I made an experiment that I know would make any of you jump if you did not know my intentions. I took my revolver and held it about two feet in front of a hive where the bees were clustering out heavily and fired. Well the pesky things never fluttered so much as a wing and I thought they were truly deaf.

Then they got to talking about bees being reflex machines without reasoning power, but one late autumn morning one of my neighbors, who was also a beeman (but only in his mind), brimstoned a hive before breakfast and went in to partake his morning repast telling his housefrau he would bring the honey in later. After breakfast he went to carry in his honey and lo! and behold! my reflex machines had reasoned out where there was some free honey and were having a real old-time scramble, and so hot was the onslaught that the rightful owner "couldn't get a look in," and I was left to settle with an irate neighbor for the sake of peace. I don't know yet if the bees smelled the honey or the sulphur gas, or reasoned out that now was the time to get the honey. All this happened in less than an hour.

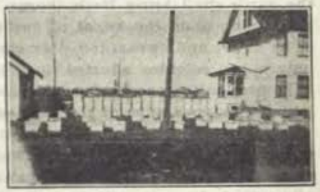
Foulbrood is the curse in beekeeping, and I prophesy that there will be foulbrood as long as there are bees and beekeepers. You know that the earth shall bring forth thorns and thistles in order that we may eat our bread in the sweat of our brow, and foulbrood is making a lot of us sweat and swear, too. My conclusion would be, I believe, if I had only a few colonies affected, in a big yard to burn the sick ones, and if it were quite general, I would shake the entire yard and be ever vigilant for reappearance of the disease.

In regard to some bees being immune to American foulbrood, I believe there have always been and adways will be some bees immune, the same as some people are born immune to smallpox, influenza and other ailments, but you can never tell until the disease is raging which are immune and not, and then the damage has already occurred to those not able to withstand its ravages. Whole tribes of people have been swept away by plagues, while other tribes have survived the same pestilence. This is why we still have bees in spite of foulbrood being mentioned by the early writers hundreds of years ago. No doubt science will find a way to handle the problem better in the future, but outcroppings of the disease will ever occur from time to time the same as contagion in the human race. Take my advice and do not fold your arms in the hopes that your bees are immune. Eternal vigilance is necessary if we desire a profitable experience in beekeeping.

It was my pleasure to be present when the Western Honey Producers' Association was organized at Sioux City. N. E. France, then manager of the National Association was present, as was Thomas Chantry, its first president, Mr. E. G. Brown, Mr. Southworth, Mr. Hall, then of Hull, Iowa, but now at Colo, Iowa, Mr. Snyder, R. A. Morgan of Vermillion, South Dakota, and others. The thing desired to be put across at that time was foulbrood legislation and honey marketing. They are still fighting foulbrood and the price cutter in Woodbury county.

In regard to honey production, I feel that I am betwixt and between. What I mean is that I am not producing enough to sell in carload lots and too much for my local market to handle. Many seeing my little success and thinking perhaps that I was getting rich too fast are now my competitive producers, selling comb honey for as little as 13c per section to retail customers and some pretty good sized beemen, too, who are putting in supplies, delivered to merchants in five pound pails at 13c per pound. I have managed to place some of my honey in the same stores, however, along side of theirs in lithographed pails at a higher price, and the finer looking pail sold first. The new lithographed pails are the thing for honey. They do not rust and are ever bright and clean, although higher in cost than the plain tin. When one figures the cost of labels and the work of labeling, there is not a great deal of difference in the cost of the two, and the preference is always in favor of the lithographed pail. There is only one drawback to the lithographed pail and that is the colors. The enamel turns white and dull by the action of the water when liquifying honey that has granulated in them. Of course, dry heat can be used, but it is rather irksome and risky.

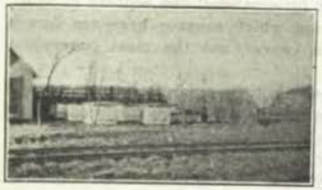
When the combless package business was started, I was one of the first to try it out. Purchasing some bees from southern Alabama, I had them come in early May, and being anxious to toot my own horn, I made arrangements with one of our merchants to display the bees in his window. They came at seven o'clock in the morning and I put them immediately in the window facing east, where they stood till evening. The forenoon sun and the gaze of the curious sent half of them to bee-heaven. Moral: "Get your bees into the hives as soon after their arrival as possible." Have all your hives ready beforehand, especially if the weather is warm. The best luck I had was with bees that came to me from Texas in a blizzard. My heart went down in my boots when I heard they stood out on the depot platform, but they clustered nicely and subsisted on the sirup in the can, with a very small loss of bees. This consignment was shipped me about April 15th, but I feel this is too early unless you have sealed stores



Supers may serve as a windbreak during the spring.

for them to go on and can keep them warm. I wrapped them with tar paper as soon as they were in their hives, and many of those packages outstripped some of my wintered colonies. But I don't think I will ever muster up courage to kill all my bees in the fall and then replace with packages the next spring. It seems cruel to me.

My method of swarm control is by the Demaree method, and it works good, except a few instances when results are not all that could be desired. I have had some absconding of Demaree colonies, and some didn't seem to get to work after the treatment like they should. I am going to take a chance at telling this one on one gentleman who was working with the field force of our college at Ames. He Demareed a colony at one of the demonstration apiaries, just before dinner one day. Some of the work undone was to be finished after dinner. After the dinner hour it was discovered that the rousing swarm had left with bag and baggage. No doubt the average yield of this yard was reduced by this French leave of absence. It is mean of me to mention this, but like the old Scotchman said, "It goes to show that the best laid plans of men and mice gang oft aglee." But just the same, don't get the idea into your noodles that these State Extension men don't know their "stuff." I'll tell you they do, and get results, too. Where would we be if it were not for the galaxy of illustrious men of science and experiments, both living and dead, who have given to us so unstintingly of their knowledge and discoveries, often without any great remuneration and often against great opposition. All honor to them, and may Heaven bless to us their sacred memory.



A spring windbreak which is very effective.

And now in closing these ramblings where we have touched on only a few things of the many problems we have, in only a superficial way, I wish to close with the admonition of the good Saint Paul when he said, "Prove all things—hold fast to that which is good."

SPRAY POISON IN COLORADO

R. G. Richmond, Fort Collins, Colorado

A condition commonly referred to as "spray poisoning" occurs in the fruit district of western Colorado. The area affected is included in a strip of irrigated territory a few miles wide and extending from north of Grand Junction in Mesa county, southeast toward Montrose, including Delta and Paonia Districts. The fruit sections also extend up narrow valleys where apples, pears, peaches, cherries and apricots are grown very extensively on extremely fertile irrigated soil.

There would seem to be substantial reasons for attributing the loss of great numbers of bees to fruit tree spray poisons. Among these reasons put forth is the peculiar circumstances calling for prolonged spraying of fruit trees in the control of the codling moth. Several broods per year of this insect have necessitated spraying as high as 11 times, and that throughout the season from May 4 to the last of August. As a rule spraying occurs for the first time between May 10 and 22 as a calyx spray, and the last cover spray about August 18 to 31. In the interim, it may be necessary to spray every ten days. As a rule, arsenate of lead is used, though various other insecticides have been tried.

During the summer season, there is little rainfall and sources of water are confined to irrigation ditches from which sources bees are forced at times to take water. This is, of course, not the most convenient source of water supply for bees.

For some years it has been customary for orchardists to use cover crops in the orchards rather than clean cultivation for conserving moisture and for soil building. The cover crops are composed chiefly of alfalfa and sweet clover. When the time comes for the first cutting of alfalfa, the crop, grown extensively in this region, is all cut in a

An apiary in Colorado for extracted honey production.

period of about two weeks. This sudden cutting off of the honey flow from the extensive alfalfa crop leaves the colonies without a large flow forcing them to resort to the still blooming cover crops in the orchards.

Spraying is still in progress in the orchards and though the fruit is not in bloom, it is assumed that the spray settles on the blossoms of the alfalfa and sweet clover, thereby contaminating the nectar of these plants. It has not been proven that such contamination is possible. The structural characters of the flowers may permit or prevent such access of poison to the nectar. No proof is available that the poison may simply adhere to the proboscis and be taken in even after leaving the flower and in cleaning the body. Or may not the poison be in the pollen and taken as food? The latter assumption would seem incorrect since, if

this were the case, the brood would be affected, which does not seem to be the case.

The so-called poisoning does not seem to occur in any specific season of the honey flow. It seems to occur quite promiscuously throughout the summer. Colonies may be building up in late spring and suddenly the field bees die off. The same may occur after as much as half a crop has been gathered. Colonies have been observed to have gathered more than 50 pounds average and in two days weaken down to a small handful of bees, a queen and several frames of brood in all stages. Colonies which were strong on one day may be pitifully depopulated on the following morning. For several feet in front of the hive, bees may be observed crawling, trembling, with bedraggled wings, gravitating to sunken spots before the hive entrance. Groups seem to congregate in hollows and unable to move further, seem content to die in company with others in the same predicament.

A theory has been advanced that there is another possible source of the poisoning attributed to the spray. Since this district is relatively dry except for the irrigation water supplied to orchards and other crops, a convenient source of water is absent. Bees may find a convenient source of moisture in the globules of water from the spray tank in which the poison is suspended. If this be true, apparently no measures may be adopted for prevention of the visitation of bees in search of moisture. Repellants in the poison have been tried but not extensively enough to make intelligent or conclusive observations. Then, on the other hand, a report comes indicating an exactly similar loss of bees in an apiary located nine miles from any orchard.

Spray poisoning has become so serious in a few small districts as to force the beekeepers to move back from the orchards, back up the narrow canyons or up on the mesas where no fruit is grown, but where good honey crops may be secured from alfalfa.

THE SPREAD OF THE BEE MOTH

F. B. Paddock, Ames, Iowa

The spread of the bee moth over the globe is traced chronologically by countries. The date of introduction is given wherever possible and the distribution with natural restrictions is given.

The honey bee is an insect of very ancient origin for its associations with the civilization of the human race cover 50,000 years according to Wells. We do know that the earliest records made by mankind include references to the honey bee and its importance in their life economy. The problem of the origin of the honey bee is usually solved in an indifferent manner covered by the statement that they followed the spread of the human race over the globe. It is interesting then to picture a possible time in beekeeping when the pest known as the bee moth was not present. At that same time we must ask if the bee moth ever occurred as anything but a pest of the honey bee. Was there a time when the insect had life habits somewhat or entirely different from what is recorded in beekeeping literature? Or did it appear as a true species and a distinct pest of the honey bee at the same time? The statement is made that the bee moth is wholly of Oriental origin. This must be based on the assumption that the moth was a pest of bees before they were kept by man in his early life even in the Euphrates valley.

Of the records which are readily available to the writers of antiquity we find that Aristotle of Greece, living B. C. 384-322, recorded in his writings on agricultural subjects the fact that the bee moth was then generally known by beekeepers and considered a serious pest. In Italy we find Virgil B. C. 70-19 in his 4th Georgics mentions the bee moth as the cause for a condition which he described as a brood disease of bees. Again Columella (1-68 A. D.) the Roman authority on agriculture tells of the bee moth as a serious pest in the bee hive. Pliny (23-79 A. D.) the celebrated Roman naturalist discusses the bee moth in his Natural History as a Papilio.

Linneaus, whose system of nature is the foundation of our modern system of classification first (II, 888, 375) referred to the bee moth as *Phalaena Mellonella*. The specific name coming from the supposed fact that the food of this species was honey. In his tenth edition (1758) the bee moth is listed as *Tinea Mellonella* and he quotes other references to this species by the systematists of that time. In his twelfth edition the bee moth is called *Tinea Cereana* which specific name had been applied by other writers of systematic entomology.

Swammerdam in his Bible of Nature which was not published until 1752 although the work was done from 1673 to 1680, refers to the bee moth as *Tinea Mellonella* and calls this commonly known pest of bees the well deserved title of "bee-wolf." Reanmear in France listed the bee moth as *Tinea Mellonella*. Linn. Fabricus in his Systema Entomologies in 1775 lists the bee moth as *Tinea Mellonella* Linn but in a later edition of this species was wax and not honey as had been supposed previously. In his supplement published later he established the *Genus Galleria* to characterize the moth living in bee hives. This genus is well defined today and recognized by systematic workers although the species are very few.

It has been very difficult to make contact in Greece in order to have a survey of the bee moth as it exists today. So no statement can be made relative to the extent of spread and intensity of ravages of the bee moth in Greece in present times. In Italy several reports were made which indicate the very early occurrence of the bee moth and its general distribution. Reference has been made to the writings of early Roman authors. It seems there are no regions in Italy where bees are kept that the bee moth is not also present.

So far no references have been available to indicate this first appearance of the bee moth in Hungary; the date must be left as one correspondent said, "since remotest antiquity" and another wrote "with the beginning of beekeeping." In this country the moth becomes more rare at the high altitudes which are described as the colder parts. In Austria it is reported as having been present "for several centuries" and "known at all times." Here the bee moth seems to be distributed without restriction. Likewise, in Germany, there seems to be no recorded date for the introduction of the bee moth.

Such a time goes back of any modern literature though the pest was recorded by very early systematic workers. Linnaeus states that the bee moth was not known in Sweden prior to 1750 when it was imported with bee hives from Germany. In this statement we have an accurate date of the arrival of this pest into Sweden, and also the inference that it was common in Germany at that date. The spread of the bee moth in Sweden is much restricted in the altitudes and it is noticeably a pest only in the coastal areas. The early records of this insect in France is by systematic workers referred to above. The spread today seems to be very general even in the more normal altitudes. It is present today with general distribution in Portugal and Spain where it has been known as a pest from earliest times. Contact has not been made with Russian workers so the early history of the bee moth in that country is lacking. One writer says this pest has been known in Russia from a very early date. Publications since 1913 frequently mention this pest of bees so that its distribution must be quite general.

In northern Africa this pest must have been found very early in history but the records have not been available. The bee moth is reported today as not uncommon throughout Egypt. In Tunis the bee moth is generally distributed throughout the country. It has not been possible to secure any data on the introduction of the species into that country.

When the bee moth appeared in England is a matter not yet to be established but it must have been at an early date. It is mentioned by all early writers of the period 1780, principally as a pest of old stocks. Recent importation of the Dutch race of bees from Holland has brought in the pest. There is some indication of a correlation in England between the race of bees and altitude with the severity of this pest. In Scotland the reporters indicate that the bee moth is present but seemingly they are not much as a pest, perhaps this is to be accounted for by climate as it may be made up of factors of temperautre, moisture and altitude in terms of barometric pressure.

There is a difference of opinion in regard to the time this insect was introduced into the United States and the origin of such shipment. The year 1805 is given for the first appearance in this country although the honey bee had been here for more than 150 years. The spread of the moth has been consistent and today it covers the entire country with the possible exception of areas of high altitude in the Rocky mountains.

In Canada the distribution of the bee moth is very interesting. In the eastern provinces the species is present and especially in Ontario where it seems to be most abundant. In Manitoba, the moth has been introduced but does not become established and in British Columbia the insect has not been observed in ten years of inspection work. It seems quite evident that here again the pest is prevented in its spread by climatic conditions.

Records are not available showing the time that the bee moth was introduced into Mexico although one correspondent mentioned it was "when the first box hive was introduced." The spread seems to have irratic and apparently the higher altitudes are freer than the lowlands.

The bee moth is supposed to exist under optimum conditions throughout the temperate zone. Therefore, its appearance spread and present distribution on the islands of the West Indies group is interesting. These small bodies of land are considerably isolated but with a moderate amount of commercial exchange. No date for the introduction of the pest is available but the distribution now appears to be general in Cuba, Porto Rico, Santa Domingo, Jamaica and the Virgin Islands.

In South America the bee moth is quite commonly distributed with the probable restrictions indicated by higher altitudes. In British Guinea whenever colonies become weak for any cause, the moth is always present to complete the job of destruction. In Brazil the distribution of the bee moth is considered quite general but there does not seem to be any records available as to the time and methods of introduction. The pest is exceedingly severe in Argentine as black bees and poor methods prevail throughout the country. In one area the severe winters serve as a decided check on this insect. In Ecuador there are no records of the presence of the bee moth and very little beekeeping. However, in Chili the insect is prevalent in the Provinces of Valparaiso, Santiago, and Aconcajua, along the coast, which means the lower altitudes.

The conditions in South Africa are such that it is considered more timely to take them up at this stage. To us today it seems that the insects in states of the union of South Africa were largely imported in comparatively recent times. Therefore, the comment of C. W. Malley is very interesting. He says that the oldest beekeepers remember the bee moth from the days of their youth. It may have been present from time immemorial, even at the time when the civilization of North Africa was not separated as it is today. Definite records were made of the bee moth in 1888. Today its distribution is quite general and on account of the mild winters its ravages extend throughout the year.

Again it is interesting to record the bee moth in an isolated territory, Japan. Here the insect must have been imported and the early record of 1791 is very interesting, earlier than the pest is recorded in United States. Its spread has been such that it is now found over all the island. The native Japanese bees are often destroyed by the moth.

In Manchuria, the bee moth is now spread over all the country. The time of its introduction is much uncertain. There were wild bees in the country at the time of its colonization by the Russians. The records do not show if the moth was present then or not. The present importation of bees from European Russia dates at 1898. The pest is very serious in this country.

In north China no records are available to determine the date when the bee moth was introduced. It has been known as long as modern authorities are familiar. The spread has been general and the damage is severe since the beekeeping methods favor the waxworm. It is considered an ancient pest in South China and today it is the source of great loss among beekeepers, who, of course, use the old methods.

The bee moth is considered a very bad pest of bees in India. Here we find its ravages among **Apis indica** as much as **A. Mellifica.** Perhaps the native bee is less active in its welfare against the moth than are the introduced bees. Colonies are so severely attacked that any uncovered comb may become infested. The moth is reported as indigenous to India. In Ceylon the native bee is **A. indica** and it has been subject to the ravages of the bee moth from a very early time. Italian bees introduced on the island are readily attacked, in fact, it is difficult to pursue beekeeping on account of the moth. In Hawaii the moth has been known from the earliest times. It is possible to keep bees clean by persistent effort but lax methods permit the moth to increase to a menacing degree.

The island continent of Australia is interesting because of its recently developed beekeeping. The bee moth is now found in all the states but in varying degree. In Queensland its distribution is general but it is not regarded as a serious pest. The moth was reported from New South Wales about 1872 and spread very rapidly. It is only a pest in neglected apiaries but due to the mild winters it does great injury to stored combs. The moths are great pests of the black bee in Victoria where it is reported there are four generations each year. Italian bees seem to go with modern management and the combination serves to make moth control relatively simple. The earliest record of the moth in South Australia is 1891. The spread has been very rapid and complete, so that it is considered a very serious pest. Due to the mild climate combs are severely attacked. The spread of the moth in West Australia is very general, being correlated almost entirely with black bees.

The first record of the moth in New Zealand was in 1900 at Egmont. It is believed that this infestation came from Australia. The spread was very rapid with the aid of careless beekeepers and black bees. In New Zealand the moth is included in the disease apiary act.

In this brief tabloid manner an effort has been made to outline the spread of the bee moth over the globe. The honey bee has been very closely related to the spread of the human race and the bee moth has been a pest of bees from very early times. The trace of the bee moth is closely related to the development of civilization.

AMERICAN FOULBROOD

Stewart M. Farr, Detroit, Michigan

Historical Account

The brood disease of bees have held an important but uncertain place in bee literature for centuries—important because no other single factor in beekeeping determines the success of a beekeeper as knowledge and judgment concerning the brood diseases—uncertain because accurate knowledge of the organisms causing the various diseases could not be obtained. It was not until 1906 that acceptable scientific work was done with the brood diseases of bees.

Aristotle in his book "History of Animals" written more than 300 years B. C., spoke of a brood disease of bees that produced a foul odor in the hive. He recommended the feeding of thyme as a cure for the disease. His description of the disease is inadequate to say definitely what brood disease of bees he had reference to, but it is generally conceded in bee literature that he had reference to what is now known as American foulbrood, inasmuch as American foulbrood is the only brood disease that in severe cases, consistently produces the foul odor.

No further mention was made of the brood diseases of bees in literature until 1771. In that year, a French scientist, A. G. Schirach, describes what probably was American foulbrood. He recommended taking all combs away from the bees and giving them a clean hive. Schirach's work is interesting principally from the fact that the treatment he recommended is practically the same as that recommended today for American foulbrood.

In 1860 a Dr. Leuckart spoke of a brood disease of bees and expressed an opinion that it was caused by a fungus. He later changed his mind, saying that the cause of the disease was unknown to him.

Muhlfeld, a German scientist, in 1868 described two brood diseases. A mild form, which he said was due to chilling of the brood and which probably was what is now known as European foulbrood; and a virulent form which he described as due to Ichneumon flies to which he gave the name Ichneumon Apium Mellificarium. He said that the flies pass into the hive and lay their eggs in the bee larvae. The infected bee larvae live until the cell is capped and the cocoons are spun. The fly larvae feed upon the fat of the bee larvae and finally bore their way out of the larvae into the cells. There they undergo metamorphosis and escape through the opening which they make in the cappings. The escaped adults in turn lay eggs in the bee larvae and continue the cycle. The diagnosis of the disease consisted in a close examination of the cells to determine whether or not the cappings were perforated. Treatment consisted in removing the bees to a clean hive with frames of foundation; and protecting them and the other colonies of the apiary by pouring camphor dissolved in oil of turpentine about the yard, and also on the alighting boards of the hives. The odor of the camphor and turpentine was thought to be disagreeable to the flies.

Although Muhlfeld was wrong concerning the cause of the disease, his recommendations relative to the treatment of the virulent forms of foulbrood, if carefully carried out, would have effected a cure.

In the same year, 1868, Dr. Preuss, also German, in writing of the virulent form of foulbrood expressed the opinion that it was caused by a fungus which he named Cryptococcus alvearis. He studied infected larvae microscopically and found numerous spherical bodies measuring two microns; closely related was Cryptococcus fermentum. He believed that the fungus Cryptococcus fermentum could infect bee larvae and change to Cryptococcus alvearis and thus produce the virulent brood disease. For treatment of the disease he recommended the removal of the diseased frames from the hive and burning them. The hive was to be washed with 10% H_2SO_4, rinsed with water and then heated in an oven to boiling temperature for several hours. The ground in front of the hive was to be sprinkled with H_2SO_4 and dug up deeply; and all dead bees were to be buried.

It is noteworthy that Preuss' recommendations for treatment of the disease, although containing unnecessary steps, are very much the same as the most successful treatment used today.

In 1873 Dr. Schonfeld, a German scientist, conducted experiments to determine whether or not Dr. Preuss was correct in his assertion that the virulent form of foulbrood was caused by Cryptococcus alvearis and concluded that Dr. Preuss was right.

J. Dzierzon in his book "Rational Beekeeping," written in 1882, describes American foulbrood and European foulbrood, but he gives no treatment. He considered the two diseases "two forms of the same disease."

By request of the editor of the British Bee Journal in 1884, Frank Cheshire, an English scientist, took up the study of the brood diseases of bees. Papers setting forth the conclusions from his work appeared in rapid succession in the British Bee Journal; and for twenty-five years his work was taken as authority. The absolute positiveness of his assertions concerning the disease misled beekeepers and scientists to the extent that little or no progress was made for many years; in fact, the work that was done in the twenty-five years following, confirmed rather than discredited the work of Cheshire.

Although Cheshire gives a very accurate description of both European and American foulbrood, he made the error from the start of considering them two forms of the same disease. He studied healthy and dead larvae microscopically and found spores of bacteria which he supposed Schonfeld had made the error of calling micrococci. He also studied larvae in different stages of disease and found rods, or the vegetative stage of bacteria, in those yet alive. In a more developed stage of the disease, he found both rods and spores, and in a still more developed stage he found spores only. His conclusion from these observations was that foulbrood was caused by a bacillus. This conclusion, of course, was unwarranted because of the various bacilli that infest the apiary and even the bees themselves.

At the time of Cheshire's first investigation, he made a medium from the juice of drone larvae and inoculated this with spores and rods from diseased larvae. He suspended this in a bee hive to get the proper temperature, for twenty-two hours. At the end of this time, he found rods only present. He concluded that spores germinate giving rise to rods under suitable conditions and that under reverse conditions, rods give rise to spores. However correct his conclusion might be, the data were of little value because of his technique.

In the same paper, Cheshire tells of finding acting bacilli in live bees and concludes that workers, drones, and queens are all subject to the disease. At this time he names the organism Bacillus alvei. For treatment of the disease he recommends the feeding of phenolated syrup—

one part of pure carbolic acid to five hundred parts of syrup. He says of this treatment, "I could take an apiary at the beginning of March with every stock diseased, and by May 1st, with very little labor, deliver it up clean and strong, as strong as though the disease had never appeared."

In a later paper, Cheshire writes of finding bacilli in the ovaries of the queen and in eggs. He concludes that the bacilli may infect the egg, larvae, pupae, queen, workers and drones.

A month after his first paper, he wrote again expressing his belief that there was but one brood disease. He says the difference sometimes noticed was caused by the size and virulence of the spores.

In an experiment with his phenolated syrup, he placed six combs infected with foulbrood in a clean colony and in a few days there remained only a few diseased cells. He says concerning this treatment, "The Beekeepers Record says, in referring to my paper, 'whether Phenol is really a specific for foulbrood, only time will tell, but we urge our readers to give it a thorough trial.' I reply that all that could be done to prevent Phenol from succeeding, I have done. I have heaped up difficulties, giving bees such combs as I venture to say, they have never received before in the history of beekeeping, secured the most virulent type of the disease I could discover, and yet in seventeen days a most perfectly healthy aspect is presented, and the bees with brood in their six frames are hard at work comb building. I assert with all the positiveness I can command, that Phenol upon my plan, is a specific, and only needs a careful and correct application."

A questionnaire conducted by the British Bee Journal among beekeepers revealed the fact that Cheshire's Phenol treatment was used extensively but met with no success. Cheshire made the mistake of basing his conclusions on a single experiment. The striking success of that experiment was probably due to the fact that he inoculated the colony used with European foulbrood instead of American foulbrood. Since he considered them both forms of the same disease, such a mistake was quite probable.

In a later investigation, Cheshire found bacilli among the spermatozoa in the spermatheca of a young queen. He concluded that the disease could be transmitted by the drone in mating. In this paper Cheshire claims to have produced the disease by spraying brood with milk that had been previously inoculated with Bacillus alvei. Concerning the work of Schonfeld in which he confirmed the work of Preuss regarding the connection of a fungus with foulbrood, Cheshire says, "I cannot refrain from expressing my conviction that it is much to be regretted that so misleading an account of experiments, to all appearances conclusive and complete, should have been given to the apicultural world. In their absence it is hardly possible that we could all have been in the dark so long." Cheshire's statement is significant when we consider that he was almost as much in error as Schonfeld and also that his work was more misleading.

In 1885 Cheyne, also a British scientist, worked with the brood diseases of bees and confirmed the work of Cheshire. He was misled by Cheshire because he took for granted that Cheshire had produced the disease with Bacillus alvei. Cheyne gives a very accurate description of what is now known as Bacillus alvei—the non-pathogenic organism always associated with European foulbrood.

N. W. McLain, in a report to the United States Commissioner of Agriculture in 1887, writes concerning American foulbrood, but he shows very little understanding of the disease. He recommended the feeding of drugs as a treatment for the disease, and also describes the probable source of infection. His conclusions were mostly incorrect. In his report the following year, he calls attention to the similarity of his work to that of Cheshire, and emphasizes the fact that pollen is the main source of infection, and not honey as was commonly supposed.

In 1890, Dr. Lortet, a French scientist, writes confirming the work of Cheshire concerning the cause of American foulbrood. He considered adult bees subject to the disease, but he said they were very resistant and lived a long time after infection. He said the source of infection of the larvae was through the digestive tract of the adult nurse bees and recommended as treatment an intestinal antiseptic. Lortet reports success through feeding syrup medicated with beta naphthol, one-third gram to 1,000 grams of syrup.

J. J. Mackenzie, in a report of the Ontario agricultural college and experiment farm, writes of work he did with foulbrood. He agreed with Cheshire that Bacillus Alvei was the exciting cause of the disease. From his experiments he concluded that drones, workers, and queens were subject to infection as well as the larvae. He demonstrated that drugs in the dilutions recommended were not sufficient to kill the organism, but probably prevented the germination of the spores.

In 1894 W. R. Howard of Fort Worth, Texas, wrote confirming the work of Cheshire and Cheyne. He, however, considered that the organism grew better under anaerobic conditions.

F. C. Harrison of the Toronto agricultural college in 1900 did considerable work in examining samples of foulbrood from all parts of the world. He reported the same organism in all of them. His description of what we now know as American foulbrood is very accurate, but his description of the cultural characteristics of the organism shows that he was working with several organisms common to the apiary, but principally with Bacillus alvei. By inoculating colonies and feeding medicated and unmedicated syrup, he found that where colonies were inoculated and fed medicated syrup, no disease developed. But when they were inoculated and fed unmedicated syrup, disease developed. He concluded that chemicals have an important bearing in preventing the germination of the spores of the disease. Harrison thus confirms the work of Lortet that the digestive tract of the nurse bees is the principal source of infection. He also agreed with Cheshire concerning the etology of the disease.

Dr. Lambotte gives a report of his work with bee diseases in the annals of Pasteur Institute for 1902. He found that the spores observed in dead larvae were difficult to grow, and considered that there was something in the dead larvae with antiseptic properties which prevented the germination of the spores. He therefore inoculated a large quantity of nutrient bouillon in order that the antiseptic might be diluted. He obtained growth and identified the organism Bacillus Mesentericus Vulgaris. It was his conception that it was this organism which Cheshire and Cheyne isolated. He believed that the disease could be produced by it, but that it could be produced at any time, anywhere, without the introduction of infected material. In other words the common organism Bacillus Mesentericus became a pathogenic organism when introduced into bee larvae.

It was not until 1903 that the work of Cheshire began to be discredited. In that year, Moore and White of the New York Department of Agriculture, concluded by a study of data collected from the bee inspectors of the state, that there were two distinct diseases coming under the name of foulbrood. They made a study of the spores found in dead larvae and found they could not be made to germinate on any medium they had. They also found that the organism described by Cheshire, Cheyne and others could not be made to produce the disease. They conducted an experiment in which the Bacillus alvei was fed to bees. A microscopic examination was made before and after feeding. The bacilli were not found in larvae before feeding but were found present in larvae after feeding, but the disease did not develop.

Their work was significant from the fact that it left them free to work unhandicapped by Cheshire's work. The later work of White proved conclusively that Cheshire's conclusions were wrong. After 1904, White calls the less virulent disease European foulbrood, and the other American foulbrood. In examination of large numbers of samples of the two diseases, he reports that Bacillus alvei in every instance was found present in what he called European foulbrood, but never in samples of American foulbrood. In 1904 White claims to have obtained a germination of the spores of American foulbrood by use of a bee larvae medium. It was from this work that White obtained his Ph. D. degree, but he could not say definitely at this time that the spores he germinated on bee larvae medium were the real cause of American foulbrood, as he had never been able to produce the disease with them. He also experimented to determine the efficiency of formalin gas as a disinfectant for American foulbrood and found it of little or no value.

In 1904, a Dr. Burri stated definitely that there were two distinct bee diseases coming under the name foulbrood. He confirms the work of White regarding the presence of Bacillus alvei in the dead larvae of European foulbrood. He states also that he was unable to obtain growth from the spores associated with the other disease—American foulbrood. Dr. Burri regarded the work of Lambotte relative to Bacillus mesentericus vulgarus as without confirmation.

Dr. Erne, a German scientist, in 1906 wrote that American foulbrood could not be produced with Bacillus alvei and that the organism was never found associated with the disease. He expressed his opinion that

the spores found in larvae dead from American foulbrood probably caused the disease, but he was unable to obtain a germination of the spores, so could not make a definite statement.

In 1907, White, in a United States Department circular, for the first time states definitely that the cause of American foulbrood is an organism named by him Bacillus larvae. He obtained growth of the organism on brood filtrate medium. Bee larvae were crushed, diluted about fifty volumes with water, and filtered through a bacteria-proof filter. 1 c.c. of the solution thus obtained, was added to 5 c.c. of melted agar which had been cooled to 50° C. This medium inoculated with spores from dead larvae of American foulbrood, produced growth. Colonies inoculated with organisms thus produced, developed symptoms identical with the symptoms in the colony from which the spores were taken. Since the publication of the circular in which the above work appeared, White has written several bulletins relative to the brood diseases of bees, but his original conclusions regarding American foulbrood have not been changed.

In 1920, White put out a technical bulletin on American foulbrood. In this work he gives a complete description of the organism, Bacillus larvae. He gives its cultural characteristics, resistance to heat and light, and also a description of the various media on which the organism can be grown.

Literature has not been published confirming the work of White. Several workers claim, however, to have grown the organism using the technique described by him.

WHAT IS FOULBROOD DOING FOR US?

John G. Jessup, Council Bluffs

Reports from the office of the State Apiarist show that American foulbrood is found in every county of the state of Iowa. This fact at once makes foulbrood a state-wide problem and one worthy of careful study.

All those who have ever had anything to do with the American foulbrood will agree that, it results in (1) an increased cost of production of every pound of honey secured, (2) the season's profits are reduced, and (3) the sale of honey is reduced because of talk heard by the consumer that Mr. Beekeeper's bees are diseased. More than this, the disease is actually putting the beekeepers of the state out of business. The United States census report shows that from 1910 to 1920, 10,655 beekeepers in the state of Iowa, actually went out of business. At this rate no one will be keeping bees in 1938, as there were only 18,280 beekeepers reported in 1920.

In order to show what effect this disease has on the individual I will give a report of my own yard at Council Bluffs in 1925. This yard of 75 colonies was carefully examined in the fall of 1924 and packed free from disease. When the bees were examined in May a few colonies were found beginning to show American foulbrood. And each time the colonies were examined after that until the first of July, more of the disease appeared. A total of 23 colonies or 30% of the yard developed the disease and over half of these showed up before any supers were added. This is certain proof that it is not spread by putting back foul supers. As not a single colony was robbed out in the apiary the infection must have come from the outside.

The source was found when too late as is often the case. A party had ten colonies located in a secluded spot about a mile from the yard. These all died in the winter, so the owner scattered the combs about the yard and left them there. He may have thought he was doing a kindness to offer honey in this way to other bees.

All of the infected colonies were treated, most of them at the beginning of the honey flow, and others during the flow. Few built up more than enough to secure sufficient winter stores. It can safely be estimated that there was a loss of 30% in the total honey crop, with the additional labor for shaking and treating the equipment.

Similar losses are being suffered throughout the state. Some put up a successful fight, while others give their bees little attention and finally go out of business. Probably American foulbrood is the direct cause of the majority of the 10,000 beekeepers going out of business from 1910-1920.

At the present time American foulbrood is being successfully combated in several states. Wyoming last year passed a very rigid foulbrood law, and appropriated $25,000 to be spent during the next two years to carry out its enforcement. Wisconsin and Michigan have had substantial appropriations for several years, and have gone a long way toward controlling the disease.

Iowa cannot be listed among those states that have made successful attempts to drive out the disease. Not for lack of a foulbrood law, nor for lack of an efficient organization to carry on this work, because our State Apiarist, Professor Paddock, already has competent inspectors lined up to do this work, and petitions 10 county associations asking that a clean-up campaign be carried on in these counties. This shows the demand for this work and also assures the active co-operation and support of the local beekeepers. The only reason in the world why Iowa is not eradicating foulbrood is because the State Apiarist does not have the necessary funds to carry on this work. Today he is granted $1,500.00 per year. As it costs 10 cents per colony for one inspection, how far will this go toward inspecting 138,000 colonies. Hardly enough to inspect the bees in one county, to say nothing of enforcing the clean-up regulations, and no use to inspect unless there is a follow-up made to see that a clean-up has been made.

For this reason we are going along in Iowa today, inspecting those who ask for it, telling them how to clean up and letting the source of infection remain. An appropriation of $5,000 to $10,000 per year would give us enough funds to effectively start a campaign, that when completed would increase the beekeepers' returns by $100,000 annually.

We are in the midst of a great competitive period and many organized producers are claiming the attention of our legislature and asking for appropriations. The funds are limited, so naturally they go to those who put up the greatest cry for help. If we are going to have state support in this matter, we have got to fight for it. The state will never hand us $10,000 with a request to spend it, but we will get our share if our needs are understood.

A request signed by 18,000 beekeepers, showing that they have an annual loss of from 10% to 20%, amounting in the aggregate to $100,000 would certainly bring substantial aid.

Let us start now to work for a $10,000 annual appropriation.

DISEASE IMMUNITY IN BEES

J. M. Bixler, Corning, Iowa

For years I had read about foulbrood but it seemed a long way off so was given but passing notice. The spring of 1912 was a good one and the bees built up rapidly, so the white clover harvest was a big one. But before the white clover season had passed it was noticed that some of the colonies had quit work in the sections. Queenlessness or failing queens was suspected. Then after the close of white clover flow the bees were found to be robbing out two colonies. This caused an investigation and a few other colonies were found that had been already robbed out. Cells were found which were full of decayed brood, and disease in many different stages was found. Some colonies were badly infected and others were in the first stages of the disease. Three colonies were powerful ones and were seemingly doing the big part of the robbing. When their brood was examined, it was found full of healthy brood; not a single cell of diseased brood could be found. A sample of the diseased brood was sent to Washington and it was reported to be American foulbrood.

Knowing that these three colonies had robbed freely from the diseased ones, it was thought that there would be nothing to lose so a frame of badly diseased brood was taken from the same hive where the sample was obtained. This was put into the center of one of the strong colonies which showed no sign of the disease. In about a week it was found that the bees had entirely torn down every bit of the cells and had left only the mid rib and were beginning to construct new cells. In ten days this frame was found full of healthy brood. This colony as well as the other two were repeatedly examined and a diseased cell was never found.

On inquiry it was found that the bees of the neighborhood were nearly all dead. The common verdict was that beemoth had killed them. In a neighborhood to the west three colonies out of a hundred were found flourishing. They were busy going through the remains of the others. They proved to be all from the same stock. In another neighborhood only one live colony was found out of about three hundred.

The three surviving colonies in the home yard lived on and increased rapidly the following seasons. In 1913, the increase was made as much as possible from the three clean colonies. Some extra queens were also reared from them. The badly diseased colonies were burned and the others were shaken on foundation according to regular process. No diseased cells could be found in any of the colonies until the fall of 1915.

At this time two colonies were badly infected and a few others slightly diseased. All of the colonies now showing disease were from the colonies which were treated late in 1913. The two were destroyed and the rest were treated.

The bees did well until the summer of 1921, when a party shipped bees from another part of the state and located near by. These bees were badly infected with American foulbrood and my colonies were soon robbing out the weak ones. The result was that my bees contracted the disease. Some of the old stock that was immune in 1913 could be traced and these were still healthy. Some colonies had the disease very badly and some were only slightly affected.

Now was the time to test the immunity idea to the limit. The regular treatment for disease was used on most of the diseased colonies. In one case after the honey flow had ended, a weak nucleus which had been used to rear the queens from an immune colony was united with a colony which was considered nearly dead with the disease. When the bees were being packed for winter my assistant said "What are you going to do with this one?" I thought that it might be dead so asked, "Are they alive?" The reply was "Yes" so we packed them. They came out in the spring in fair shape and built up rapidly on the old diseased combs and they never have shown any signs of the disease. The bees have been given diseased colonies to rob out in the fall and spring. Every colony that has been given the shake treatment has contracted the disease again when given the chance to become infected.

I have a strain of bees that gather a good crop of honey with the disease in the apiary. The big proportion of them show no sign of the disease when it is purposely fed to them. Some colonies contract the disease but it seems to do very little damage as but few cells become diseased. There are always a few colonies which die from the disease very quickly. One colony was in the last stages of the disease when a young queen was given them. The next season of 1924 they never showed the least sign of the disease and produced 140 finished sections. This year the disease showed up but they were about average in honey production. The brood was examined from this colony and was pronounced American foulbrood. I find that queens from some of the old immune stock do not always prove to carry the immunity.

There is something in immunity but it seems to me that we are far from the goal. It looks farther than it did years ago when a few apparently immune colonies were first found. Then it seemed that the way to rid ourselves of the dread disease had been found. One of the great obstacles is the drone. The tendency of all life is to lose immunity if not in constant contact with disease and many others. A few noted men have become interested, and it seems certain something definite will be accomplished. Let us all help them in every way and in the meantime, let us hold on to the method that is practical until a better one is found. This may come sooner or later and what seems to be truth today may be only the gleam of the golden reality of tomorrow.

THE SCOURGE OF BEEKEEPING

R. L. Parker, Manhattan, Kansas

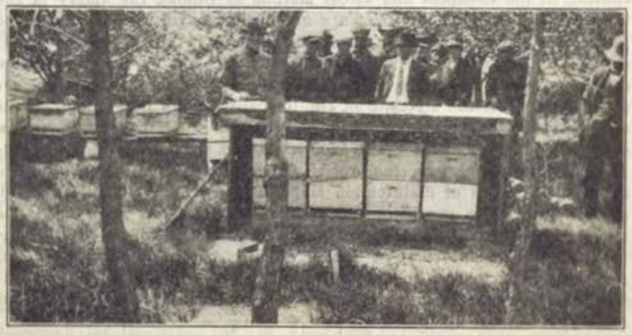
The scourge of beekeeping is American foulbrood. The strongest colonies of the apiary usually have it first and then it spreads gradually throughout the yard. It attacks at any time of the year the grubs in the cells when brood-rearing is in progress. This is not a seasonal disease to cause trouble for just the immediate time, but one which causes trouble at all times during the active season. All races of bees succumb to its attack. A colony once attacked has no chance of recovery, except by the help of man. Learn to know the symptoms and characteristics of the disease. Learn how to treat and cure this costly burden to the beekeeping industry. Do all that is in your power to keep the disease out of your territory and if it is there, take measures to rid the area of the menace.

Spring and Summer

During the spring and summer when there is no honey flow in progress, entrances should be contracted as much as possible to prevent robbing. At all times prevent healthy bees from coming in contact with diseased material—stored disease combs and equipment which are not in actual use—stored in a bee-tight building. At a convenient time during a honey flow, the diseased colony may be treated. It is moved some distance from the healthy colonies in preparation for the day of treatment. After moving, make the bees note the new location by leaning a board in front of the entrance, ior by piling grass or weeds at the entrance for them to work through. Prevent drifting of bees at all times to other hives. After several days in the new location during the honey flow during the middle of the day, treat the diseased colony by shaking. Of course, to treat the disease successfully, it is necessary to have the bees in movable frame equipment, not hives with cross combs or box hives.

Fall and Winter

A colony in the fall may appear to be strong and will go into the win-



Constructing the Iowa packing case at a demonstration apiary.

ter with a large number of bees. As a rule, the strength in bees is the old workers, and they may die during the early winter period. Thus a diseased colony is exposed to the action of robbers on good flight days. In this way the disease is spread at this time of year to healthy colonies. It is money, labor, time and colonies saved if the diseased colony is killed in the fall and the equipment treated or stored in a bee-tight building. Treat such infected material at the earliest possible time and by all means before the spring activity begins. If the colony does not die in the winter, it is weakened to such an extent that robbing takes place, thus the dissemination is carried on as before. The diseased colony becomes weaker and weaker and may die before treatment can be made. This colony is a living source of infection for the apiary. Living or dead, such a colony is the beginning of a heavy loss to the beekeeper in colonies, honey, time and labor, not to say anything about honey.

Treatment and Care of Diseased Equipment

American foulbrood is not a theory, but a disease caused by germs. It cannot be cured by smoke or the feeding of medicants. It requires strong treatment. The most drastic measures have to be used to fight it. The equipment is treated after the brood has died of the disease, since there is not as yet any treatment to cure the grubs.

Honey from the diseased colony, brood-combs, super-combs and all other equipment of the colony should be stored in a bee-tight building until a convenient time for disinfecting it. A separate smoker and hive tool should be used when working with diseased colonies. These tools after being used in connection with the work of diseased colonies should be disinfected and the hands washed to prevent the germs from coming in contact with clean material.

An old method of treating a diseased colony, and one that is used often, is to burn all infected material. The bees are sulphured and a pit is dug in which the colony is put. Gasoline or kerosene is then poured over it to make it more inflammable and the whole burned. Then the remains in the pit are covered over with earth. By many this is still considered the cheapest and safest method of ridding the apiary of the disease. Drugs fed to the bees are unable to control the disease in the hive, since when they are used strong enough to kill it, the bees succumb also. Recently, formalin mixed with alcohol for the disinfection of contaminated materials has been put upon the market. In the use of this, however, the strength of the formalin should be kept up to the correct strength since honey or water dilutes it. Formalin is an exceedingly efficient disinfectant and, when the strength is correct, kills the spores of American foulbrood, which prevent new growth of the germs. The work of disinfection is facilitated by the uncapping of all cells. Water with the same strength of formalin has been used and gives good results, provided the solution enters the cells. The alcohol lowers a physical property of liquids which is known as surface tension. Surface tension might be likened to a kind of resistance. When it is lowered, the liquid flows more easily. Soap is used with the water solutions to lower the surface tension.

Lye solution is used by some for the treatment of all wood and metal parts after the combs have been cut out. The combs are melted into the hive parts, which are immersed for fifteen or twenty minutes in the beeswax. A ten per cent solution of lye is used for the treatment of boiling solution. The parts are next rinsed in water to remove the lye solution. After this they are stacked up to dry.

The best time for this work of treating diseased parts is during the late fall, winter, or early spring. This time of the year there are no demands on the beekeeper for outdoor work and the bees are not flying. This is the inactive season of the bees, but for the beekeeper it is not always so. If time is available, treatment of equipment should be done as soon as possible after treating the colony.

Resistant Strains of Bees

Recently in the bee journals there have been printed articles telling about the development of resistant strains of bees. This is a good thing and it probably will be a number of years before we will have a strain which will run true in this factor of resistance. All of this work is still in the experimental stage, and much more work will have to be done before anything worth while will come of it for the beekeeper. As a plaything, a match is dangerous, but in the hands of the expert it is a useful tool. So it is with American foulbrood resistant bees.

Conclusion

We have outgrown long ago the age of driving the evil spirit from the bodies of our domestic animals and also from their living quarters by such magic methods as air and smoke treatments. Theories are pretty mental pictures which only exist in the minds of few people. Many beekeepers have had an occasion to meet and become well acquainted with the disease, American foulbrood, much to their sorrow. Others have had it and wondered why their colonies kept dying out, not recognizing the fact that the colonies were diseased. Other colonies would be put into the empty hive bodies which still had present the spores of the disease. In a short time the new ones had also died. The final word is to continue to use the shaking treatment and then disinfect the equipment with formalin or lye solutions. With a colony or two, it is more profitable to burn them. Rid the industry of this specter, American foulbrood.

INSPECTION OF 1925

F. B. Paddock, Ames, Iowa

The disease eradication work of the past season naturally falls into two classes, area clean-up, and general inspection. On a basis of area clean-up the inspection was continued in Warren, Woodbury, and Clayton counties. General inspection work was done in thirty-five counties. A total of eight hundred twenty-five apiaries composed of eleven thousand, three hundred ninety-nine colonies of bees were inspected. Of this number of colonies inspected one thousand seven hundred two were found diseased. In this summary no attempt is made to distinguish between European foulbrood and American foulbrood. While we are interested for the most part in American foulbrood, nevertheless, the presence of European foulbrood and even Sac brood indicate a class of beekeepers which would fail to fight American foulbrood. For all the inspection work there were fifteen per cent of the colonies diseased. In the work of 1925 there was a very large increase in the apiaries visited, although the number of colonies inspected was not as large as in 1924. More time was put in making inspections in 1925, than in 1924. The per cent of disease was found to be higher in 1925 than in 1924.

Area Clean-up

In Warren county a very careful inspection was made in 1924 which concerned survey work with inspection. In 1925 every effort was centered on the known disease apiaries. The results were very interesting colonies and no disease was found. In connection with Warren county it certain that the disease has been eradicated.

In Woodbury county last year the work was of general nature but only the western half of the county was inspected. The work was started late but every effort was made to reach the known diseased apiaries of the county. In spite of the efforts put forth, there are some apiaries which have not been inspected yet. During the summer of 1925 more farm apiaries were inspected. For this reason probably more disease was found than was in the results of 1924. In this county the only case in the state was found where it was necessary to enforce the law and this was settled without being called before the jury.

In Clayton county effort was made to reach the entire area with the general inspection, but this was found to be impossible as there were so many more beekeepers than was anticipated. The work was very well organized in Clayton county, and progressed as well as could be expected. The amount of disease was unusually large, and the work next year will be centered around the known disease areas.

General Inspection

A very large amount of requests were received for individual inspection. While it is our policy to do area clean-up work, we cannot ignore requests for general inspection. There was an increased interest on the part of the beekeepers to eradicate foulbrood in their apiaries. There were some counties inspected that showed no disease. This does not mean that this office maintains these counties to be free of disease, for it is thought that if pursued some disease will be found. The clean-up methods are better, and must be continued by the beekeeper.

County	No. Apiaries	No. Colonies	No. Diseased	Ave. Dis.	%
Clayton	209	3,096	516	24.7	16.6
Warren	58	613			
Woodbury	166	2,838	482	17.0	16.9
General	396	4,882	704	12.3	14.0
Total	829	11,429	1,702	13.7	14.9

The inspection work of 1925 was made effective from the first through this state. This was because the law was strengthened through the efforts of the beekeepers association legislative committee at the last

legislature. While the law is not perfect it is very far superior to the previous law, and enables the inspection work to progress without interference of the intentional law breakers.

DISINFECTING FOULBROOD COMBS

J. C. Davis, Corydon, Iowa

Before 1923 the method of handling combs from foulbrood colonies was the usual one, of burning the combs and frames containing dead brood and melting the rest for the wax. If carefully done, this will hold foulbrood in check, but it is expensive. In May, 1923, Bee Health was used on combs which had no dead brood in them. The honey was extracted and the cells filled full with a pressure sprayer and kept closely covered for 48 hours. The solution was shaken out and strained and used over several times. After six days' airing, the combs were given to the bees. Some were put in the supers and some in the center of the brood chamber. They were carefully inspected frequently and no disease developed. It cost ten cents per comb for the Bee-Health. The combs with dead brood in them were still burned.

In June, 1923, formalin was used—1 pint to 16 pints of water. It was used the same way as Bee-Health except that after shaking it out of the combs, they were kept closely covered for ten days, and then dried for six days. Each comb had three or four ounces of sterilized honey poured into the cells. They were given to a colony in the super and no disease developed in twenty-one days. One comb was then placed in the brood chamber, and was filled with healthy brood. No disease has since appeared in that colony. At that time no one was known who was using formalin for foulbrood combs. The results were reported to the editor of Gleanings after further experiments with formalin, and asked if he knew of anyone using it. Since then several have reported good results with it.

In September, 1923, I began using Dr. Hutzelman's solution on combs with dead brood in them, immersing them for forty-eight hours as directed. After another season's use, it has given perfect results at a moderate cost. In August of this year a 20% solution of formalin was used. Combs containing dead brood were immersed for forty-eight hours. It did not fill the cells full like it did when applied with a pressure sprayer. The solution was removed in the extractor and the combs aired. The combs were placed in the brood chamber of several colonies and were filled with healthy brood. This solution costs but little, sixty cents per gallon for a 20% solution. By straining it through cloth, it can be used repeatedly. It is not so pungent and disagreeable to use as the Hutzelman solution. All honey was first extracted and care was used to uncap every cell. Some better method is needed by which the combs could be sterilized without extracting the honey from them first. May it not be possible to do so with some of the gases that are used in war to kill men?

DEMONSTRATION APIARIES IN IOWA

A. D. Worthington, Ames, Iowa

The Demonstration Apiary is a project conducted by the Extension Service through the county farm bureau. The object of the project being to increase the profit of the beekeepers by demonstrating the use of good equipment, proper care and attention of bees, eradication and control of bee diseases, and by producing clean, well-ripened honey and the marketing of it at a stable price in neat, attractive containers.

The project has been successfully conducted in Iowa for six years and has proven to be very effective in its object. There has been a steady increase in demand for the project. A total of 40 counties have requested a total of 120 demonstration apiaries for 1925. The beekeepers are well pleased with the results and there are continuous calls for information in regard to how they can secure the demonstration apiary for their locality. The specialists connected with bee work feel that there is no

Ladies' Day at a demonstration apiary.

better method of reaching the beekeepers, securing their co-operation and actually getting them to accept the methods advocated. The records on demonstration apiaries as well as observation on the part of the specialists assure us that the project has been a big factor in controlling disease, transferring of box hives, increase yield per colony and the increased demand and sale of honey locally in Iowa.

The project is educational and made effective by securing results in dollars and cents. The direct object of the project is to solve the local problems of the beekeeper in the locality where interest warrants conducting the project. For example, in Osceola county European foulbrood has been a severe menace, causing the beekeepers continuous loss in

colonies as well as a large decrease in honey production. Here the demonstration apiary was established in the apiary of Austin Knudt. The apiary was formerly about 50 colonies, but had been killed down to 20 colonies which were badly infected with European foulbrood. The colonies were united, requeened and given the proper care and attention. Here the yield the first season was three times the yield the previous year and the European foulbrood had disappeared. In Palo Alto county, the demonstration apiary was established in the apiary of Mr. Carter. The apiary consisted of 22 colonies in eight frame hives which were allowed to swarm at will. Five colonies were set aside for demonstration. Two hive bodies were used instead of one, the colonies were Demareed and given the proper care and attention. The five colonies produced over 900 lbs. of honey or more than the remaining 15 colonies. The main object of the project is to demonstrate the economy of having a few colonies well equipped and properly handled.

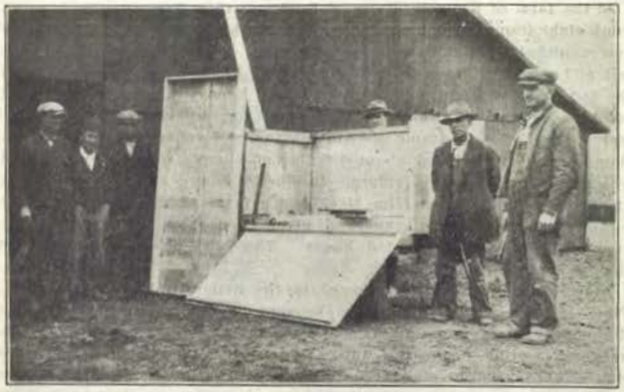
At the farm of Kelly Williams at Rockwell City, five colonies in cross comb eight frame hives having American foulbrood were transferred into new modified Dadant hives in the summer of 1923, requeened in the fall and wintered in Iowa Packing cases. During the season of 1924 the five colonies produced 1,000 lbs. of bulk honey. The remaining eight colonies, several of which were treated for American foulbrood but were placed in eight-frame one-story hives, not requeened and left outside to winter, produced about 400 lbs. of honey. European foulbrood was also present in this apiary. In Shelby county, the demonstration apiary was conducted at Jim Meckleson's farm at Walnut, Iowa. The ten colonies which were requeened, given good attention and care, produced 3,000 lbs. of extracted honey. The best colony produced 500 lbs. of honey.

A definite program was followed in the demonstration apiary work. First, it is necessary for the beekeepers to request the project thru the county farm bureau. A specialist then attended a general beekeepers' meeting, some time during the winter. Here slides, films, and charts were used to make the project plain. If enough interest was manifested to warrant conducting the project, two or four beekeepers were selected by the vote of the beemen to act as co-operators or to furnish the five colonies for demonstration apiary work. The requirement of a co-operator is that he will turn over to the bee specialist five colonies hived in good equipment, that he will assist in handling the colonies according to the specialist's instructions, that he would allow the meeting to be held at his place for two years and during that time do everything in his power to interest his neighboring beekeepers in the project. At the summer meetings, seasonal subjects are discussed and demonstrated at the demonstration apiary. The subjects for lectures and demonstrations on the months indicated are as follows:

1. Preparation for Season's Work—Nov. 15 to March 15.
2. Spring Management—March 15 to May 15.
3. Swarm Control and Diseases—May 15 to July 15.
4. Fall Management—July 15 to Sept. 15.
5. Wintering Bees—Sept. 15 to Nov. 15.

An outline of each lecture is given the beekeepers attending the meeting for future reference. The results with the five demonstration apiary colonies are compared with five "check" colonies in the same apiary. The "check" colonies are set aside and are handled by the co-operator according to his wishes. Two or four demonstration apiaries are located in a county. This is determined by the interest shown by the beekeepers and possibilities of the localities as a location for bees. The meetings are advertised by the county agent through the local press, his directors, and by sending mimeographed letters to each beekeeper in his county. The Extension Service furnishes the names of the beekeepers and publicity matter. The expenses of the specialist are paid jointly by the state and county farm bureau.

In 1924, 76 demonstration apiaries were conducted in 26 counties. The average yield of the demonstrational colonies were 157 lbs. The total yield of the 380 demonstration apiary colonies were 57,760 lbs. The



Learning how to protect bees in winter.

average yield of the 760 check colonies were 99 lbs.—or a total yield of average yield per colony in apiaries where specialists conducted projects 75,240 lbs. The average yield of all colonies in Iowa is 79 lbs. The were 116½ lbs. Therefore, the increased yield over the average colony in Iowa was 37½ lbs, or a total increase in yield of 42,850 lbs. The average price received for honey produced in demonstration apiaries were 18 cents. Therefore, the increased profit of the beekeepers in demonstration apiaries was $7,613.00. During 1924 420 bee meetings were conducted by bee specialists with a total attendance of 7,987 people or an average of 19 persons per meeting. This attendance represents actual beekeepers. The value received in the actual tabulated results is only a small estimate of the real value the project has been to the beekeepers of Iowa. The big benefit derived has been its value as a means of controlling disease, transferring of box hives, creating a de-

mand for honey and replacing the black and hybrid bees with Italians. At all meetings disease is mentioned and its care, symptoms, and danger discussed. Therefore, the beekeepers are on the lookout for it and are careful about exposing dead colonies. The beekeepers realize that we are helping them to solve their problems, and are anxious to co-operate and assist in the work. Therefore, the demonstration apiary work is paving the way to a successful and economical foulbrood eradication campaign.

We owe many thanks to Dadants and Sons, A. I. Root and Company, and Leahy Manufacturing Company for the splendid co-operation they have given us. They have furnished us free literature, equipment, and given us liberal discount on all equipment to be used for demonstration apiary work.

NECTAR SECRETION AND THE INFLUENCE OF CLIMATIC CONDITIONS

J. C. Davis, Corydon, Iowa

The conclusions given here are the result of observations and notes kept in southern Iowa. The nectar secretion was indicated by one of more colonies kept on scales and weighed each evening during nectar secretion for the past 26 years. Most of the records apply to white clover as that plant has given 66% of the honey in this locality.

The nectar secretion is very much dependent upon the climatic conditions at the time of the blooming of the flowers. The extent to which flowers are affected by unfavorable conditions at that time depends upon the vigor of the plants which have been developed by the preceding twenty-four months. It requires three years to bring about the conditions most favorable for greatest nectar secretion and 1901-1902-1903 gave these conditions. The year of 1901 was notable for temperatures much above normal, 100 degrees or more for several weeks in July and August. The rainfall was much below normal in April, May, July and August. With this condition white clover was all killed. The subsoil was dried out and plant food was developed and conserved by this condition. Bees had to be fed during this year.

In 1902 the rainfall was 61% above normal and most of the excess was from May to October. White clover made an unusually vigorous growth, so much so that it became a weed in gardens. Single plants in cultivated ground spread over a space 36 inches in diameter. As it is a biennial, no nectar was secreted that year but the climatic conditions was favorable for basswood and it gave a fair surplus. During 1903, the rainfall was again above normal and clover began yielding May 22 and continued to yield every day until August 6. Nectar secretion is usually decreased or entirely checked by the wind changing to the northwest with a sharp drop in temperature and rising barometer but during 1903 the clover had developed such a reserve of vigor that it was very little affected by such conditions.

Of first importance in nectar secretion, I would place rainfall above the normal for two years in succession. White clover is injured very little in the winter here if it has made a good growth and has normal precipitation during fall and winter even if there is no protection by snow. The years of 1923, 1924 and 1925 have all been below normal in rainfall and as is usual in such years much of it is local so that one outyard 5 miles east gave no surplus and others 10 miles north and southwest gave fair surplus from clover and fall flowers.

RETAINING CONTACT WITH THE PAST OF BEEKEEPING

E. T. Phillips, Ithaca, New York

At a recent association meeting, I happened casually to say something to one of the beekeepers present about Elisha Gallup. He hesitated a moment and then asked: "Who was Gallup?" He and all other beekeepers should know that Elisha Gallup of Iowa was once a great American leader in beekeeping, the man whom Doolittle among many others looked upon as his teacher.

Shortly after returning home from that meeting I read an article on one of the bee-journals and the advice had a familiar ring. I looked it up and found it in Langroth's first edition, where I usually start in such searches.

In teaching any beekeeping method, such as swarm control, or the treatment of European foulbrood, I invariably find that it leads to a better understanding of the subject if I discuss it with reference to the historical development of the method.

These three widely separated thoughts are here mentioned by way of introduction to the subject of this paper. Every beekeeper wants to be right up to the minute in his methods and ideas, yet there is valid reason for insisting on the retention of contact with the past of beekeeping, not with the idea of following old methods but for the sake of making beekeeping a growing evolutionary concept. In the hurry of modern beekeeping, we are apt to think that everything good is new and that everything old is therefore necessarily obsolete. This is a wholly wrong conception, for most of the facts which we use were long ago discovered and we are adding now chiefly the solutions to the problems which were either too difficult for the earlier workers in apiculture or even beyond their dreams of the needs of the beekeeper. To worship our ancestors in beekeeping would place us in apiculture where our Chinese friends are in their political and religious life. To neglect the history of our industry places us in an almost equally bad position, that of the modern up-to-theminute booster.

With these hastily sketched thoughts before us, let us look for a moment at our present accomplishments in holding contact with the past. The beekeepers of the United States established at the University of Wisconsin a library to the memory of our great bee-master and friend, Dr. C. C. Miller. A very few of his beekeeping friends placed a monument over the grave of Langstroth, the man whose work made modern beekeeping possible, but most American beekeepers have not in the slightest manner attempted to show our appreciation of his labors, and it is to be feared that many of the younger beekeepers do not know fully what Langstroth did. There is or was no monument to Moses Quinby, using the word monument to express a token of the beekeepers' appreciation for his great services—but this statement must now be modified for the beekeepers of New York state a few weeks ago established an endowment fund in memory of this great beekeeper. What have beekeepers done to show their appreciation of the works of Doolittle, a man who labored late into the night, and night after night, that perplexed beekeepers might have answers to their queries? What beekeepers have shown appreciation for the labors of Alexander, or Charles Dadant, or John S. Harbison who made California beekeeping possible? And this list may be extended almost without end. Many beekeepers will agree in thinking that it is not the men whom we have failed to honor whose memories suffer from this neglect but that it is ourselves who are losing something important by our failure to express thanks for the labors of those whose work has made our present day beekeeping tasks so much easier and our profits so much greater.

The establishment of the Miller Memorial Apicultural Library was a milestone of progress in American beekeeping, for it was the first large effort to gather together the world's literature on beekeeping, to form a foundation for a history of beekeeping. It was, furthermore, a memorable event, since it was the first large effort of American beekeepers to honor the memory of a freat friend to all beekeepers. Not a person who had even the smallest part in that movement regrets it and many are in their hearts sorry that they did not take part.

In the establishment of the teaching of apiculture at Cornell University, where the work is intended primarily for the training of men for research and teaching, there was a crying need for better library facilities. It might have been possible to get an appropriation of a few hundred or perhaps a few thousand dollars to buy books and files of bee-journals. This method of obtaining a suitable library was considered but was quickly cast aside and has not since been thought of for a moment. There was and is a better way, and this way was chosen. First of all, an effort was made to get the very books which had been owned and studied by former great leaders in American Beekeeping, and there are now in this library books and other literature formerly used by such men as Moses Quinby, Julius Hoffman, Elisha Gallup, J. B. Mason, Heddon, Hutchison, T. W. Livingston, Miles Morton, F. W. L. Sladen, Wm. Alexander House, Dr. C. C Miller, Charles Dadant, Isaac Hopkins of New Zealand, Arthur C. Miller, all no longer living but all men who made notable contributions to the advancement of beekeeping. All beekeepers who have any sentiment in their souls will agree that books bearing an inscription that they were owned and used by any of these men have a value far surpassing that of the identical books bought in a secondary shop. What is the value of Quinby's copy of the first edition of Langstroth's book? There are other names of men still in harness represented in this library and the value of their books will be steadily enhanced by the future contributions of these men, among whom may be mentioned L. C. Root, Pellett, Paddock, Millen, Wilder, Vaillancourt, Kelty, Jay Smith, Merrill, Demuth, Kindig, France—but this list is too long and one should use caution in saying too much about these men for fear of turning their heads, yet I suspect that in the eyes of any beekeepers their contributions to the library will be considered more valuable than the same books from other sources. The persons who have made the 2,405 donations to February 15, 1926, number 162, coming from half the states of the Union and from twenty foreign countries.

Then there are certain other notable memorials in this library. The A. I. Root Company is placing all the foreign bee-journals of the world in this library as a memorial to A. I. Root, founder of the firm. The Ohio Beekeepers' Association has established an endowment fund in memory of Langstroth, the Mohawk Valley Association has done this for Julius Hoffman, the New York Federation for Moses Quinby, and other organizations are following this lead, sometimes in appreciation of the work of men still living. Other states are planning to follow the example of Ohio in a belated effort to show thanks of beekeepers for the work of Langstroth.

This is not to be a catalogue of the library or a list of its components. The things which I wish to bring strongly to the attention of beekeepers are: (1) The need of preserving with care all the literature of beekeeping, so that its historical progress may be followed, and (2) the need for the sake of the present beekeepers, of their expressing their appreciation for what has been done for them by unselfish leaders of the past and present. To this a third suggestion might be added, namely, that it is better to show this appreciation in the form of a useful memorial than to send flowers after one's death or to help pay for a pile of rock over his grave. Still a fourth thought may be added, namely, that it is well to express thanks before the benefactor leaves us, and there could be no better Christmas or Birthday present to any of the devoted workers for the advancement of apiculture than to establish some such working endowment before it must take the form of a memorial.

We see many schemes for the organization of beekeepers, efforts to induce them to co-operate for some purpose or other, all of which are laudable insofar as they are plans of unity, but not all of which attract the rank and file of beekeepers because of lack of interest in the things proposed, or because of lack of appreciation of the needs of the proposals. None of our state or county beekeepers' associations are as strong as we would like to see them and our national organization is far weaker than a national organization should be if it is to be representative of the American beekeeping industry. The one thing which seems to be needed is some plan whereby beekeepers everywhere may unite on *something*, and such a project seems not yet to have been found. To take intentionally an absolutely absurd example, if every beekeeper in the United States or even a quarter of them, should decide that on a given day and hour they would all fly kites or play marbles, such an event would mark a great step in the unity of the beekeeping industry; for once they would agree on something and would act together and that would be a help, no matter how unimportant the thing on which they unite. Obviously they do not unite on any marketing plan yet proposed. They refuse to unite in advocating federal legislation, and many other things, good and bad, which have been suggested have met with

cold responses. They even fail adequately to unite for their own education as beekeepers in those associations which are strictly educational, although they do better at this than in any other plan so far proposed. I wonder whether they cannot be induced to unite to some extent better than on some of the other plans in thanks and appreciation. I recently attended a meeting of beekeepers which was filled with "business" discussion and most of those present sleepily sat thru most of the program, but they all were alert when a plan was proposed whereby they could unite in honoring a great beekeeper of the past. It was the one bright moment of the meeting. I suggest that we try this instead of flying kites or skating, for there is more sense in it and we need it for our own sakes.

SOME NOTES ON SWARM CONTROL

D. L. Ginger, Langdon, Iowa

As Dr. Miller has said, "Swarm prevention is an unsolved problem and will probably continue to be such, as it seems to be a natural instinct of the bees for the perpetuation and increase of the species. However, there are a number of causes which tend to increase swarming and by removing these causes we can reduce swarming to a minimum."

The desirability of reducing swarming is a foregone conclusion as all beekeepers know that a maximum crop cannot be produced when swarming is allowed. A few of the most common causes of swarming are: (1) In the majority of cases by the crowded condition of the brood nest.

Comb entirely filled with worker brood.

(2) Lack of ventilation. (3) Hatching of a large number of drones due to an excess of drone cells in brood nest. (4) An old or failing queen. (5) A difference in the different races of bees. In studying the foregoing causes, we find that as long as the queen has plenty of room to deposit her eggs and the workers have place to deposit their honey and an abundance of empty space below their main hive, they seldom swarm.

Too small an entrance and no protection from the heat of the summer sun will usually hasten their swarming preparations. Old time beekeepers before the time of the movable form hive used to notice that the colonies with the most drones would swarm the most. This would be natural, since we now know that these big noisy fellows in addition to crowding the hive increase the heat of the colony and prevent ventilation of the hive. All students of beekeeping know that after a queen gets more than two or three years old she begins to decline and the workers rear another queen to supersede her or swarm out with her. Also quite frequently a colony will swarm out with a newly introduced queen or if it is late in the season they will supersede her if she has been injured in mailing or in introducing her. Among the more common races of bees the Carniolian and Caucausian bees are geenrally excessive swarmers, no ordinary preventive measures being sufficient.

Whe producing comb honey it is much more difficult to control swarming than in the production of extracted honey. But by using full sheets of Thin Surplus Foundation in all the sections the beekeeper can succeed more completely in controlling swarming than he can by the use of starters only. By far the large number of bees are kept in eight or ten frame standard hives so the most attention has been given to swarm control in these hives and perhaps the most common and the most popular method of swarm control for these hives is known as the "Modified Demaree System of Swarm Control" which requires a minimum of manipulation and seldom fails to prevent swarming.

This method is the raising of the brood to the third or fourth story leaving one frame of brood with the queen in the lower hive body and filling out with empty combs or full frames of foundation, then the queen excluder on this, and one or two extracting supers next and the brood on top. Judgment must be used in applying this method as experiments conducted by the Iowa Experiment Station shows that swarming is often controlled by this method at considerable reduction in surplus stored and should not be generally used except at the beginning of honey flow which will last three or four weeks or more.

The spring management of colonies is the same whether they are to be run for comb or extracted honey as the primary object of spring management is to get the colonies to the maximum number of field bees at the beginning of the main honey flow in that locality. In order to do that we must have our swarm control measures started the year before by having good young queens at the head of our colonies and by having an abundance of stores and plenty of room for egg laying, preferably a double hive body either left on over winter full of honey as in outdoor wintering methods or given about the time of fruit bloom. The impor-

tance of abundance of stores of honey or feed can be better realized when we stop to think that it takes on an average, a frame of honey to rear a frame of bees or to put it another way, it takes a cell full of honey to rear a single bee.

At the beginning of the main honey flow, the extracted honey producer can give his colonies the modified Demaree Treatment for swarm control as before described while the comb honey producer must use some other method. Only strong colonies should be run for section comb honey. These colonies are reduced to one hive body and two or three comb honey supers. This brood body is filled with the queen and the best frames of brood and all the bees on the other combs are shaken before the hive with the comb supers on and the combs are given to a colony too weak to run for comb honey and which is to be run for extracted honey.

When combs full of light honey are available another method is to give the colony one comb of brood and fill the remainder of the hive body with combs full of honey and two or three supers on top thus forcing the bees to remove the honey from the brood chamber to the supers in order to make room for the queen to lay. The bees seldom lay out under this plan because of the small amount of brood in the hive. As a rule colonies

Brood combs with too much drone brood.

run for comb honey should be examined every seven or eight days, and all queen cells, if any, should be removed. In case a colony does swarm, the parent colony should be moved and the swarm placed on the old stand with the parent colony at right angles to it. The supers being placed on the swarm colony and in six or seven days the parent colony is moved to a new stand which throws the entire field force to the swarm.

These methods are for the eight and ten frame hive, however, in the last few years the large hive such as the Jumbo and Modified Dadant hive have been coming more in favor. The inch and half spacing of the Modified Dadant frame seem to be an additional factor in swarm control. The extensive beekeepers who use them claim they can produce more honey at less expense than can be done in a smaller hive because they require less attention and less manipulation than any other type of hive and under extensive use an average of from three or five per cent of swarming is not uncommon.

VIEWPOINT OF SOUTHERN PACKAGE BEE SHIPPERS

H. A. Stabe, Baton Rouge, Louisiana

Within the last few years the package bee shipping industry has grown to large proportions. The northern beekeepers need bees in the early spring to build up their colonies for the honey flow or for increase. The southern beekeepers can well afford to sell and ship the bees at reasonable prices.

There are two classes or types of packages in which bees are sold. They are: First, the combless package, and second, the nucleus. The combless package consists of one or more pounds of bees together with a queen shipped in a screen case and usually fed en route on sugar syrup. The nucleus consists of one or more pounds of bees, one or more standard combs containing brood and honey, and a laying queen already introduced.

The advantages of the nucleus are quite obvious. The buyer gets just as many adult bees as he does in the combless package. In addition he gets brood, which usually makes an additional pound of bees, one or more drawn combs in standard frames and a queen already introduced and laying. Beginners, at least, experience less trouble in transferring the nucleus than the combless package.

The combless package has one great advantage over the nucleus. In the former case the danger of transmitting American foulbrood is reduced practically to zero. This is the main reason that many package shippers have changed from the nucleus to combless package and that some of the northern states have quarantined against shipments of bees on combs.

Beekeepers have all heard of the ravages of foulbrood and know something of the difficulties of treating colonies infected with American foulbrood. Wherever beekeepers gather, the conversation always turns to new methods of treating or controlling this disease. Foulbrood is just as bad in its ravages on colonies in the south as it is on colonies in the north. Therefore, it is to the advantage of southern beekeepers to get rid of foulbrood because colonies so infected produce no profit in honey or package bees. They have an additional reason in that, if they do not control foulbrood they will ruin their trade for the package bees produced by clean colonies.

In 1922, the beekeepers of Louisiana got together and were instrumental in having a bee disease law passed by the legislature. It was amended in 1924 and provides:

First: That all honey bees shipped into the state shall be accompanied by a certificate of inspection; Second, that the State Entomologist shall have full power to make and enforce such regulations as he deems necessary to eradicate any and all contagious diseases of honey bees; third, the State Entomologist and his agents shall have authority to enter any premises for the purpose of inspecting honey bees; fourth, that all colonies of honey bees must be registered with the State Entomologist by the owner; and fifth, that a tax of $.15 is to be levied on each and every colony of honey bees.

The State Entomologist, W. E. Anderson, has made only on regulation. It is: "Burn each and every colony that is found infected with foulbrood." And this regulation has been carried out to the letter. The owners are not reimbursed for their losses but all of them have cooperated with the inspectors in their work.

As a result of this regulation, the shipping district in north-central Louisiana, where the majority of the package shippers are located, has been absolutely cleaned up and during 1925, there were only 18 colonies in the state found infected with American foulbrood among more than 10,000 colonies inspected. All of these were destroyed by fire. The work was done towards evening. The bees were killed by sulphur fumes. Kerosene was poured over the hive and it was set on fire. Nothing was saved, no attempt being made to save the combs or hive bodies by treating.

Each package of bees shipped from Louisiana is accompanied by a certificate of inspection which certifies that the apiary from which it was produced has been inspected and found free from foulbrood. To our knowledge, not a single package of bees infected with American foulbrood has ever been shipped out of Louisiana since the present system of inspection has been started. The State Entomologist, the State Beekeepers' Association and the individual package bee shippers stand squarely behind each inspection certificate.

QUEEN REARING IN THE SOUTH

A. D. Worthington, Ames, Iowa

One of the prominent features of beekeeping in the south is the rearing of queens. There are many beekeepers devoting much or all of their time to the production of queens. With a home apiary for mating yard and several out yards from which to draw mating nuclei, swarm preventions loses its significance and an interesting and profitable business results. A long, slow, nectar flow in the early part of the season is common in many parts of the south and is ideal for the production of large queen cells and the rearing of vigorous queen bees.

The queen yard or mating yard is located near the breeder's home in a grove of trees or in an orchard. The trees and shrubs serve as shade for the colonies and as permanent markings for the queen when going out on her mating flight. In the center of the queen yard is a small building used as a "grafting house." This is a small building, only large enough for one man to work in conveniently with tools, and equipment necessary for grafting cells. The sides of the building are composed largely of window sashes providing an abundance of light. This building can easily be heated to proper temperature for grafting by means of an oil stove. Being centrally located the grafting house saves much time and labor as well as adding much to the comfort and convenience of the breeder.

The queen breeder requires a large number of mating nuclei to care for surplus queens until they are mated and ready to be sent to customers. There is a large variety of hives for this purpose. Up until the last few years the baby nuclei was used a great deal but the tendency now is to use a larger mating hive. The standard 3 frame and the 10 frame Langstroth hive divided into 3 compartments is the most common type of mating hive used. Serious trouble is often encountered when small nuclei are used. Swarming out with queens as they go out to mate is very common. Robbers often play havoc and often a poor bunch of queens are produced. The mating nuclei are made up by going to an outyard and removing from the strongest colonies combs of honey and brood with adhering bees and placing them in mating hives. These are then closed and carried back to queen yard.

Feeding is important to stimulate the cell builders, breeding colonies and mating nuclei. A thin syrup of one part water to one part sugar is fed the bees. The most popular type of feeders used are the Doolittle division board feeder and the Alexander Bottom feeder. Outdoor feeding is practiced especially in southern Alabama to prevent robbing. A thin syrup (9 parts of water to 1 part sugar) is placed in an open container about twenty or thirty yards from apiary giving the bees access to it during dearths. This was done frequently by beekeepers when the State inspectors were examining their apiary.

Ninety per cent of the commercial queen breeders in the south use some modification of the Doolittle cell cup method. Every breeder having a different method of handling his cell builders. The general method used is common as a whole or the different methods of handling the cell builders are all common in their fundamentals. The method most commonly followed is: The queen cells from which the royal jelly is to be taken together with the prepared cell cups and a frame of larvae just hatching from eggs is removed from the breeding colony and taken into the grafting house. The cell cups in the wooden cell holders are fastened to the bar. Two bars are used to the frame, usually having fifteen cells to the bar. A small bit of royal jelly is placed in each cell cup and larvae twenty-four to thirty-six hours old is carefully lifted from a cell and placed on the jelly.

After all cells on two bars are given a larvae they are then placed in the cell starter where they are left twenty-four hours. They are then removed and placed in the cell finisher. In nine days after placing them

in cell finisher the queen cells are removed and one placed in each mating nuclei. Nine days later the queens have hatched, mated and are laying. They are now ready to be caged and shipped.

The cell starter is a strong colony dequeened and all unsealed brood removed. The combs of unsealed brood are taken out and bees shaken at the entrance. The combs of brood are replaced with honey and a division board feeder filled with sugar syrup. In twenty-four hours after being made queenless the bees are ready to accept grafted cells. The "Accepted" cells are removed every twenty-four hours and replaced with a new batch of grafted cells. This starter is kept strong by replenishing from time to time with young bees, by placing combs of hatching brood in it and by shaking combs of bees at entrance. The cell finisher is a strong two-story colony with queen excluder between stories. The lower story contains the queen with empty combs and one or two combs of unsealed brood. The balance of the brood is raised to the upper story. The cell finisher is fed daily being sure that syrup is in the feeder at all times. The "accepted" cells are placed in the second story between combs of hatching bees.

Great care is taken by the beekeeper in handling the queen cells, not to jar, chill, or damage them in any way. The queen cells, grafted cells and combs of brood used for grafting is carefully protected in cool weather. A flannel cloth being placed around them in carrying them to and fro in the apiary.

Another method used by a commercial breeder and one that has proved to be quite successful is as follows: The starter is a strong colony dequeened and all brood removed. The brood being replaced with combs of honey and a Doolittle feeder filled with syrup. In the center of the hive is then placed a comb of eggs just beginning to hatch into larvae which was taken from the breeding queen. Twenty-four hours later the comb of young larvae are removed from starter and carried to grafting house. The larvae are scooped out of the cells with the spoon end of grafting needle and one placed in each cell cup. It will be found that the colony on being queenless, broodless and fed, will lavishly feed young brood and young larvae will be floating in "pap" which will allow them to be removed easily accompanied with enough royal jelly to serve the purpose of the jelly placed in cell cups before hand as previously mentioned in the other method. After cells are grafted the batch is then placed in the opening in starter where the comb of brood was removed from. The remainder of the method is the same as that used in previously mentioned method.

Drones are reared in large numbers in colonies especially prepared for that purpose. All colonies in mating yard are of good stock. Any colony being brought in from out yard is equipped with a drone trap. The queen breeder's only method in selecting drones is first, rear abundance of drones in drone breeders; second, keep all colonies but breeders as free of drones as possible, and third, see that all colonies in a radius of 6 miles are requeened with your stock of queens.

There are reliable beekeepers, crooked beekeepers, and beekeepers that are not capable of rearing good queens advertising queens for sale.

Therefore it is necessary for the northern beekeeper to use the following precautions in ordering queens. First, buy queens from reliable breeders; second, be sure that he has certificate stating that his yard is free of disease, and third, state in your letter that you will accept only queens reared in his apiary.

WHY WINTER PROTECTION?

By O. W. Park, Ames, Iowa

Most of the outstanding honey producers of this country who are located in regions where the temperature often falls below freezing, follow some method of winter protection. Each year sees new converts to the practice and, with rare exceptions, once given a thorough trial it is always followed. Failures are usually traceable to the employment of improper methods. Some fail to secure maximum benefits from the protection they do give because they provide it only through the three or four coldest months. This is a serious mistake. It is hoped that the following discussion may be helpful in pointing the way to greater success in wintering bees in Iowa.

Phillips and Demuth (1) have said: "The causes of the death of individual bees or a colony of bees in winter, barring unusual accidents, are only two in number: Inadequate stores and excessive heat production." With the former, this paper has nothing to do; with the latter, a great deal.

To begin with, we must find out just what is meant by *excessive heat production*. As here used, excessive means unnecessary. Under ideal conditions, brood-rearing ends during the month of October in Iowa and begins about the first of March. A normal broodless colony at hive temperatures between 57 and 69 degrees F.* does not form a cluster but the bees remain quiet on the combs. At 57 degrees, they form a cluster and as the temperature of the air falls, the bees generate more and more heat, maintaining a minimum cluster temperature of 57 degrees. At just what place on the thermometer scale the generation of heat should be called excessive or unnecessary, is hard to determine; but a discussion of the meager data available on this point may give us a clew to its approximate location.

Minimum Heat Production

A certain minimum amount of heat is liberated in connection with the carrying on of the life processes of the individual even when in a quiescent state. Milner and Demuth (2) found that a colony containing 9,635 bees, or approximately two pounds of bees, gave off an average of 68.8 calories of heat per day during a ten-day period when the bees were in a quiescent state. According to figures given by Dye (3), this amount of heat would be lost through the walls of an ordinary unprotected hive if the temperature of the outside air were only 2 degrees lower than that within the hive. In other words, the amount of heat liberated by the quiescent cluster in carrying on life processes, is just enough to keep the hive at an optimum temperature without effort on the part of the bees, when the temperature of the atmosphere is about 2 degrees

*The Fahrenheit temperature scale is used exclusively in this paper.

lower than that of the air inside the hive. Phillips and Demuth (4) found that bees do the least amount of work when the temperature of the air immediately surrounding them (inside the hive) stands at 57 degrees. Then an atmospheric temperature of about 55 degrees should be ideal for the conservation of bee energy during the broodless period.

During the period when brood is present, a uniform temperature of about 93 degrees is maintained in the brood-nest. If brood-rearing occurs out of season, there is an unnecessary expenditure of energy to the extent of the amount of heat energy required to raise the temperature of the brood-nest from 57 to 93 degrees, and to maintain it at that level. In the case of normal brood-rearing, however, there should be an allowance made for that certain minimum amount of heat liberated in connection with the life processes of the individual. On this point there appears to be a total lack of data; but it is to be expected that the amount so liberated would be somewhat greater under brood-rearing conditions than when in a quiescent state.

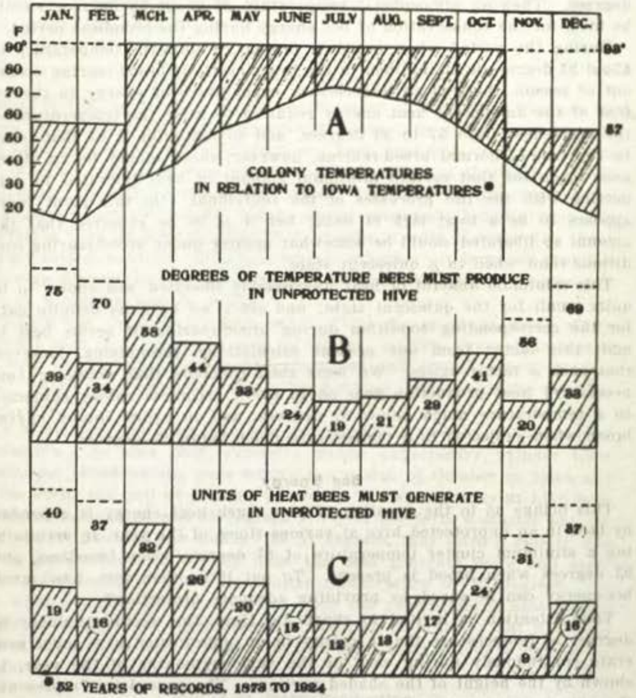
This minimum amount of heat unavoidably liberated was shown to be quite small for the quiescent state; and since we have no definite data for the corresponding condition during brood-rearing, it seems best to omit this factor from our present calculations, recognizing, however, that such a factor exists. We must then conclude that excessive (unnecessary) heat production goes on in every broodless colony subjected to a temperature much below 57 degrees, and in every colony having brood when subjected to a temperature much below 93 degrees.

Bee Energy

This brings us to the question of how much heat energy is expended by bees in an unprotected hive at various times of the year, in maintaining a minimum cluster temperature of 57 degrees when broodless, and 93 degrees when brood is present. To put it another way, how much bee-energy can be saved by providing adequate protection?

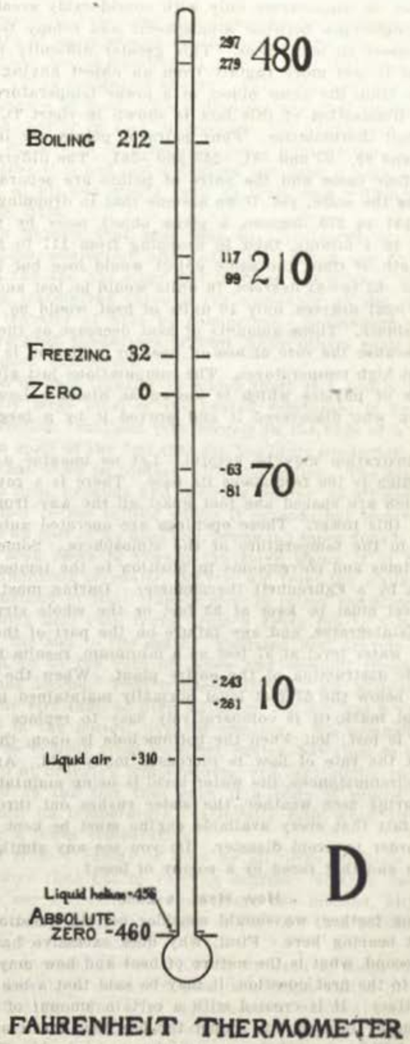
Your attention is invited to chart A. Here, the average number of degrees of temperature that a colony in an unprotected hive must generate continuously during each of the various months of the year, is shown by the height of the shaded portions. The curved line represents the average temperature for fifty-two years of records for the State of Iowa, 1873 to 1924. The upper limit of the shaded portions is the minimum temperature maintained by the bees and depends upon the presence or absence of brood, being 93 degrees during that part of the year when brood is being reared and 57 degrees during the broodless period.

In chart B, the shaded portions shown in chart A have been brought down to a common base line in order to make comparisons less difficult. This chart shows at a glance the number of degrees of temperature the bees must produce at the different times of the year. Of the four broodless months, November requires the production of the smallest number of degrees of temperature, 20, while January requires the largest number, or 39 degrees. We have been accustomed to think of the winter as the *only* time when bees need protection, but our chart shows clearly that a colony without protection in March must produce 58 degrees which is half again as many as in January. Even April demands 5 degrees more than January, while May (that mild month of bees and blossoms) requires the production of 33 degrees which is only one less than February,



six less than January, and is exactly the same number of degrees as for December.

But that is not all. Perhaps you have had occasion to take a sack of flour from a shelf located two feet above the floor and put it on the next shelf which was one foot higher. And perhaps you had another sack which had to be lifted from the five-foot shelf to the six-foot shelf. The weight and the distance through which it was raised were the same in both cases but considerably greater *effort* was required in the latter case. On a day in December when the temperature is 24 degrees above zero, a broodless colony is maintaining its 57 degrees of temperature without much difficulty. It loses heat slowly because the temperature being maintained is relatively low. But, on a day in May when the temperature is 60, a colony rearing brood is able to maintain the neces-



sary 93 degrees of temperature only with considerably greater difficulty, although the difference between atmospheric and colony temperature is exactly 33 degrees in both cases. This greater difficulty is due to the fact that heat is lost more rapidly from an object having a high temperature than from the same object at a lower temperature.

A striking illustration of this fact is shown in chart D, the diagram of a Fahrenheit thermometer. Four pairs of points are indicated: 297 and 279, 117 and 99, -63 and -81, -243 and -261. The difference is 18 degrees in all four cases and the pairs of points are separated by equal intervals along the scale; yet, if we assume that in dropping from a temperature of 297 to 279 degrees, a given object loses by radiation 480 units of heat in 1 minute, then in dropping from 117 to 99 degrees in the same length of time, the same object would lose but 210 units; in dropping from -63 to -81 degrees, 70 units would be lost and in dropping from -243 to -261 degrees, only 10 units of heat would be lost during a period of 1 minute. These amounts of heat decrease as the temperature is lowered, because the *rate* of loss of heat by radiation is much slower at low than at high temperatures. The computations just given are based upon the law of physics which is known as Stefan's Law (5) named after the man who discovered it and proved it by a large number of experiments.

Another illustration may be helpful. Let us imagine a water tower the top of which is 100 feet above its base. There is a row of two-inch openings which are spaced one foot apart all the way from the bottom to the top of this tower. These openings are operated automatically by the changes in the temperature of the atmosphere. Some one hole is open at all times and corresponds in position to the temperature of the air as shown by a Fahrenheit thermometer. During most of the year, the water level must be kept at 93 feet or the whole structure slowly but surely disintegrates, and any failure on the part of the engineer to maintain the water level at 57 feet as a minimum, results in the sudden and automatic destruction of the entire plant. When the open hole is only slightly below the 57 foot level normally maintained in winter, say at the 50 foot mark, it is comparatively easy to replace the water as rapidly as it is lost; but when the bottom hole is open, the pressure is so great that the rate of flow is increased many fold. And when, under unusual circumstances, the water level is being maintained at the 93 foot mark during zero weather, the water rushes out through the bottom hole so fast that every available engine must be kept going at full capacity in order to avoid disaster. Do you see any similarity between this situation and that faced by a colony of bees?

How Heat Is Lost

Before going farther, we should consider certain questions that have an important bearing here. First, why does excessive heat production kill bees? Second, what is the nature of heat and how may it be lost?

In answer to the first question, it may be said that a bee is much like a dry-cell battery. It is created with a certain amount of energy. The faster this energy is used, the sooner the bee dies, for it appears that a bee cannot rebuild warn-out tissue as higher animals do. The bee's food is its sole source of heat, and this heat can be released only through the expenditure of some energy on the part of the bee.

Considering the second question, it may be said that heat is a positive sort of thing. It is a form of energy. Cold is a negative thing and is simply the absence of heat. We ordinarily say that liquid air is very cold, but as a matter of fact, it contains 150 degrees of heat. Liquid helium, when evaporated in a vacuum, has a temperature of -456 degrees which means that if it had just 4 degrees less than it does have, it would have no heat at all and would then be truly cold within the scientific meaning of the term.

We learn in physics that heat may be transferred or lost in three ways: conduction, convection and radiation. When one end of an iron rod is held in the fire, the other end becomes hot after a while showing that heat was transferred through the substance of the rod. This illustrates the transfer of heat by conduction. Substances such as iron and copper are good conductors of heat while others such as wood and air are very poor conductors.

That method of heat transfer in which there is a bodily movement of a comparatively large mass of the heated substance, is known as convection. Convection functions very largely in the case of a room heated by a stove. In spite of the fact that air is a poor conductor, air particles will take up heat when in contact with hot bodies. The air nearest the stove takes up heat, expands and becomes lighter, as all gasses do when heated, and rises to the ceiling where it spreads out toward the walls. There it gives up part of its heat and, becoming more dense, sinks toward the floor and soon flows in toward the stove where it is heated again and is again displaced by cooler, heavier air from the walls and floor.

The third method of heat transference is called radiation. It is the method by which heat rays travel from a grate fire to a body in front of it, or from the sun to the earth. Radiated heat travels at the same speed as light or at the rate of seven and one-half times around the the earth in one second. That it passes through air without heating it, is shown by the fact that, at high altitudes, the air has a very low temperature even in the hottest days of summer. We commonly think of radiated heat as coming from very hot bodies, but such is not the case. All bodies even at ordinary temperatures, are continually radiating heat. This is proved by the fact that even if a body is placed in the best vacuum possible, its temperature continually falls when surrounded by a body having a lower temperature.

Heat is lost from a colony of bees by all three methods operating at one and the same time but to varying degrees. It then becomes necessary to center our discussion around some one method, although in so doing we must not entirely lose sight of the fact that both of the others are functioning to some extent.

We may now consider the part played by each of these three methods in the loss of heat by a colony of bees in a single-walled hive having no additional protection. The only substances in contact with the cluster of bees are air, beeswax and wood, all of which are very poor conductors.

so we are forced to the conclusion that conduction must play a very minor part in the loss of heat by a cluster of bees.

The part played by convection depends very largely upon the number, size and location of openings in the hive. If more than one opening is present, if even one opening is large, and especially if there is one at or near the top of the hive, the loss of heat will be very rapid. In fact, it seems probable that in such cases, which are altogether too common in practice, more heat may be lost by convection than by the other two methods combined. But, in order to make out the best case possible for the unprotected hive, let us assume that the hive under consideration is tight except for one three-eighths inch hole near the bottom. Convection currents will then be reduced to a point where, for the sake of the present discussion, they may be neglected while we do a little figuring on the loss of heat due to radiation, the only remaining method by which heat may be lost.

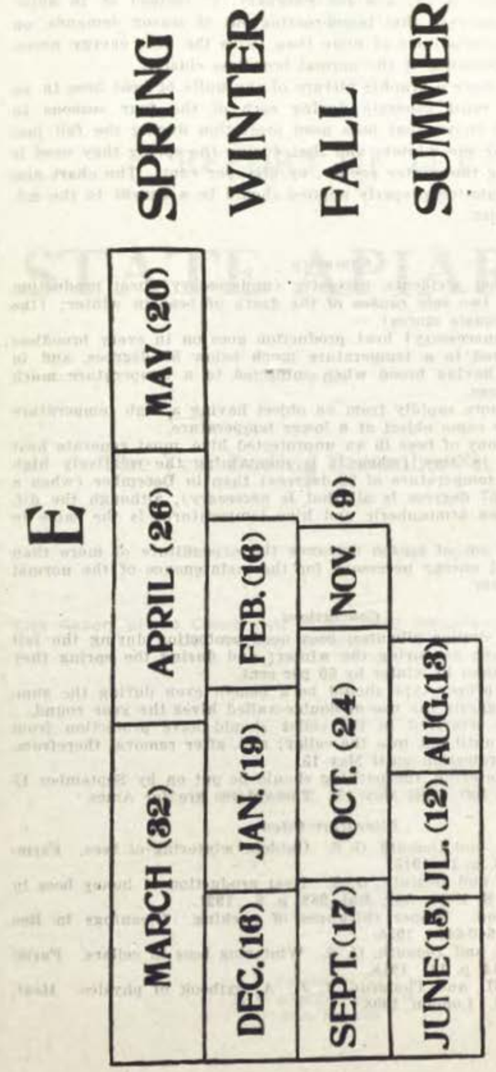
Stefan's Law

Formerly it was supposed that the rate of heat loss by radiation was in direct proportion to the difference in temperature between the heated body and that of its surroundings, but Stefan proved that this rate is in proportion to the difference between the fourth powers of the two temperatures involved when these temperatures are reduced to what is known as the "Absolute" temperature scale.

Stefan's law* enables us to translate and combine the data presented in charts A and B into the results shown in chart C. Here we have our data reduced to a comparison of the number of units of heat the bees must generate continuously each month in order to maintain the necessary colony temperature at all times, just as the engines in the water tower illustration were called upon to maintain the water level at the proper height at all times. Referring again to December and May, we see that in an unprotected hive the colony must maintain a continual output of 16 units of heat per unit of time during December, while in May, 20 units are necessary in spite of the fact that the temperature differences are identical, i. e., 33 degrees. This clearly indicates that bees need protection in May even more than in December. As a matter of fact, March, April, October, May, January and September, in the order named, all require the expenditure of more heat than either December or February which tie for seventh place.

Just a word should be said regarding the influence of the rearing of brood out of season, upon the amount of heat generated at such times. Since the brood-rearing temperature, 93 degrees, is 36 degrees higher than that of the winter cluster, then, in a colony rearing brood out of season, the degrees of temperature to be produced in November would be 56 instead of 20 (see chart B); in December, 69 instead of 33; in January, 75 instead of 39; and in February, 70 instead of 34. These figures translated into terms of heat units required, as shown in chart C, give for November, 31 instead of 9; for December, 37 instead of 16; for

*Stefan's law gives accurate results only for perfect radiators, so it is unlikely that radiation by a colony of bees would follow the law exactly but nearly enough to make the law serviceable in connection with the problem under consideration.



COMPARING THE SEASONS AS TO HEAT BEES MUST GENERATE IN UNPROTECTED HIVE IN IOWA

January, 40 instead of 19; and for February, 37 instead of 16 units. Thus it will be observed that brood-rearing out of season demands, on the average, the expenditure of more than twice the heat energy necessary for the maintenance of the normal broodless cluster.

In chart E, we have a graphic picture of the units of heat bees in an unprotected hive must generate during each of the four seasons in Iowa. This chart shows that bees need protection during the fall just as badly as during the winter; and that during the spring they need it worse than during the winter proper, by fifty per cent. The chart also indicates that insulation properly applied should be a benefit to the colony even in summer.

Summary

a. Barring unusual accidents, excessive (unnecessary) heat production is one of the two sole causes of the death of bees in winter; (the other is inadequate stores).
b. Excessive (unnecessary) heat production goes on in every broodless colony subjected to a temperature much below 57 degrees, and in every colony having brood when subjected to a temperature much below 93 degrees.
c. Heat is lost more rapidly from an object having a high temperature than from the same object at a lower temperature.
d. In Iowa a colony of bees in an unprotected hive, must generate heat more rapidly in May (when it is mantaining the relatively high brood-rearing temperature of 93 degrees) than in December (when a minimum of 57 degrees is all that is necessary), although the difference between atmospheric and hive temperatures is the same in both cases.
e. Brood-rearing out of season demands the expenditure of more than twice the heat energy necessary for the maintenance of the normal broodless cluster.

Conclusions

a. In Iowa and similar climates, bees need protection during the fall equally as much as during the winter; and during the spring they need it more than in winter by 50 per cent.
b. Insulation of proper type should be a benefit even during the summer. This suggests the use of double-walled hives the year round.
c. Bees that are wintered in the cellar should have protection from September 15 until put into the cellar; and, after removal therefrom, should have protection until May 15.
d. In outdoor wintering, the packing should be put on by September 15 and should be left until May 15. These dates are for Ames.

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F. B. PADDOCK, STATE APIARIST
Ames, Iowa

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