State of Iowa

1930

REPORT OF THE

State Apiarist

FOR

The Year Ending December 31, 1930

Also Report of the Convention of the Iowa Beekeepers' Association at Shenandoah, November 12-13, 1930

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 twelfth annual report of State Apiarist of Iowa for the year ending December 31, 1930.

F. B. PADDOCK, *State Apiarist.*

Ames, Iowa, December 15, 1930.

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REPORT OF THE STATE APIARIST

THE HONEYBEE'S PLACE IN THE SUN

Where is the person whose memories of childhood days does not include a swollen toe or a closed eye as a result of a bee sting? Isn't it too bad that those disagreeable recollections comes to us to challenge the thoughts of the goodness and the greatness of the honey bees? This insect has been closely associated with the development of the human race, it was present on this earth from the earliest recorded times of mankind making honey which was then a delicacy. The honey produced in those early ages was the only sweet available to man, little wonder that the peace and quiet dreamed by all was "the land of milk and honey." Then all desires would be satisfied. The honeybee has ever held the respect and reverence of man, it has been a symbol of leadership, industry and purity. The honeybee held a high place in the rituals developed by the early people of several countries. Honey was used in the ceremony of christening the babe, the maturity of the child was acknowleged with a service including the use of honey and marriage ceremonies included the free use of honey, even to the development of the term "honey-moon." It was the custom of newly weds to serve honey to all house guests for the period of one moon. Beeswax has been associated with the religious services of man from the earliest times and today the candles of pure beeswax are the symbol of purity of thought and purpose.

The political, social and economic development and habits of the bee colony organization have always been a matter of interest and study by the human race. Every effort has been made to diagnose and interpret this community life in terms of our own thoughts, likes and dislikes. The thought was expressed by the late Dallas Lore Sharp that after a careful study of the great organization of the honeybee, "the social scheme of the human race must be considered in the process of perfecting or else a crude experiment cast aside in the making."

A single pound of honey represents the lives of approximately three hundred bees, according to Dr. O. W. Park of the Iowa Experiment Station. "If it were possible for a single bee to gather enough nectar to produce a pound of honey, she would need to work all day long, 365 days in the year for more than 8 years to

accomplish the feat. To gather the necessary nectar this bee would travel approximately 75,000 miles or 3 times around the earth."

But this wholesome sweet, nature's own sweet, is available to any and all people in this state. Nectar is produced by nature in flowers as a natural resource to the state which is lost to the human as an article of healthful food unless the bee can convert it into honey. Nectar is unlike coal, oil and ores which remain good until the coming of the hand of man to convert them into use. Nectar in flowers is available but for a limited time, then gone never to return.

Honey production is an industry in Iowa. There are more than 18,000 people well distributed over the state who are interested in a honey crop. The value of the 1929 crop of Iowa was greater than that of any other state and in value of inter-state shipments of honey was 20% over the next state. Eighty per cent of the Iowa crop is sent to outside markets but home consumption has increased greatly in the last five years. There has been an increase in the tonnage of honey during the past decade but there is still a potential crop of ten times what is being realized at present, in the opinion of Dr. L. H. Pammel of Iowa State College. His estimate is based on the existing acreage of clovers and fruits.

The honey industry gives direct returns to the producers as a cash crop in the form of income from honey and beeswax to a total of over $3,000,000 annually. The possible income to the state can be made to yield many millions of dollars more each year. The indirect returns of the honey bee to agriculture in general are hard to estimate but are far in excess of the direct returns. Clover seed production is entirely dependent on the honeybees for pollination of the blooms. This condition was realized in a section of the sweet clover seed region last year when no seed was set and the honey crop was wanting. Fruits in general are the result of general pollination by the honeybee in its search for nectar to make into honey. Bees are being rented for pollination purposes to increase fruit yields of cherries, prunes, apricots, pears and apples by orchardists of New Jersey, New York, Michigan, Illinois, California and Oregon. The reason this problem is not more keenly felt in Iowa is because the fruit occurs in mixed plantings and there is such a general distribution of bees.

Honey production is on a sounder basis now than ever before in the history of the industry. Honey is not over produced but it is under-consumed and poorly distributed. This situation is changing with improved practices of marketing and there is every reason to anticipate a definite increase in the demand for honey. It is a neglected sweet in the present day diet of a public which is seeking wholesome food. The per capita consumption of the United States is two pounds and has not increased in the last fifteen years. During the same period the consumption of sugar has increased from 70 pounds to 128 pounds. If the consumption of honey had enjoyed the same increase as sugar there would be a search to all parts of the globe to meet the demand. It would mean an increase of 1.66 pounds to each person or 200,000,000 pounds more than is now being used in this country. Our export during the past year was only 11,000,000 pounds yet it was looked upon as a big item in relation to production. The consumption of honey in Iowa has been estimated at 5 pounds per capita due to the fact that bees are kept on so many farms and honey is a part of the farm production which is consumed in the household. The consumption of honey in Italy is 11 pounds, in England 27 pounds and in Germany 35 pounds. Twenty per cent of the United States production of honey is now being exported to these high consuming countries where the people have learned the value of honey as a food, where it is considered a necessity and not a luxury, where the true worth and real value of honey is realized.

Any increase in consumption of honey in this state would result in more returns to the farm for honey can be considered as a cash crop. Also any increase in honey consumption would lessen the need for sugar, much of which is imported to this country from foreign countries.

Interest in honey production is general throughout the state and there has been a definite increase in the industry during the past few years. A keen interest is being manifest by all producers in the possible factors which will bring about an increased efficiency of production. The cost of production is reduced as the yield per colony increases. The demonstration apiary work conducted throughout the state for the last ten years has shown how it is possible to increase production. The state production per colony has been 80 pounds but the yield of these demonstration colonies scattered over the state has averaged 156 pounds, almost double the present producer average. This means that the income per colony can be increased $7.00, a possible increase in state revenue of almost $2,000,000.

The potential honey crop of this state does not necessarily mean

that more producers should be engaged in the industry, nor that more colonies of bees should be employed in gathering the nectar but the first step is to increase the efficiency of production giving more profitable returns from each colony now operated. The principles advocated in the Iowa program of Increased Production are: (1) Better stock, requeen with improved race, as may be better adapted to state conditions; (2) More and better equipment, by discarding the box and barrel and replacing with modern hives and full sheets of foundation in the frames, and have on hand plenty of storage room for the bees since at present more honey is lost than is gathered because the producer does not provide room for the bees to store honey; (3) Better Management, winter only strong, healthy colonies which have ample stores and are given plenty of protection against winter and spring weather; reduce swarming as much as possible for it is a loss to real bees in an apiary and have them go to a hollow tree and there store honey only for themselves; detect disease in a colony early and eliminate carefully; (4) Market better by increasing local demand with a quality product, well prepared, graded and offered for public consumption.

There are three classes of producers: (a) those who consider the work as an avocation or recreation, (b) those who use honey production as a sideline which serves as an added source of income; (c) those who are commercial producers who devote their entire time to the work. There is an increase in the number of people in each class who are expanding their operations as rapidly as finances will permit. Ten years ago the commercial beekeepers could be counted on the fingers of one hand, today there are more than 200 people who are obtaining all or the major portion of their income from the production of honey.

These fields of production are opened to all classes of people. Most of those who want the work as an avocation are professional men, as lawyers, doctors and dentists. Such people are careful producers with a good understanding of the requirements of the work. The sideline beekeepers include ministers, clerks and office workers and there is here a great opportunity for development. A reasonable number of colonies well managed does not require an excessive amount of time and does yield good returns. Women are included in this group and are always successful producers for they are willing to give the necessary attention to details. Farm women and city women have plenty of opportunity in this production.

Boys and girls' clubs are working successfully in many other states with highly profitable production, returns to surprise mother and shame dad. Class or individual projects in Smith-Hughes vocational schools are highly successful in honey production. There is always the opportunity of securing a good, quick return from a moderate investment. Commercial production is attracting more people each year and like any other production, it is satisfactory when properly pursued.

REVIEW OF THE YEAR 1930

Now that bees are safely tucked away in their winter quarters it is time for us to relax and look back upon the season of 1930 to see what it has given us, how we have met its problems and perhaps from that make our plans how we are going to be able to better cope with the situation in the future. It is usually possible in the survey of the season at this time of the year to figure out how it would have been possible to have organized our work so as to obtain more satisfactory results. There are always some outstanding experiences in any season, and it is well to look to these to see if it is possible to profit by the experience of such happenings.

Bees went into winter of 1929-30 in rather poor condition. There was no honey flow so the colonies were short on bees and especially young bees which are so necessary to carry the colony over the winter and through the spring period successfully. There were a lot of colonies short on stores also, but beekeepers were loath to make any addition, trusting that the colonies would get through the winter and additional stores could then be given in the spring.

The winter was not abnormally severe, in fact, it was looked upon as being a rather decent winter for bees and most everyone reported very low winter losses. The general opinion was that the colonies came through the winter in fairly good condition especially considering the handicap with which they entered the period. However, it was shown very clearly this year that anyone can winter bees so far as the period of non-broodrearing is concerned but that the wintering problem in a large sense includes more than actually keeping the bees alive during the period when they are not active.

Conditions turned exceedingly severe during the early spring and it was found that some colonies perished for one reason or another. In some instances undoubtedly the difficulty was due to the fact that the colony population was made up almost entirely of old bees and they soon used up their reserve of available bee

Uneven colony production is unprofitable.

energy. In some instances colonies perished from lack of stores. We had several producers tell us that the spring weather was such that it was almost impossible for them to get feed to their colonies fast enough. It is exceedingly difficult to get bees to take up stores when the weather is cold; they cannot break the cluster to assimilate the additional food which is placed on the hive.

The spring was long and cold. Many days at a time it was not possible for bees to fly out and get the necessary supplies of water, nectar and pollen for the normal brood rearing requirement. Those colonies which did not perish seemed to struggle along barely doing better than breaking even. We had some producers who reported that their colonies were not any stronger at the beginning of the honey flow than they were when taken out of winter quarters. It is needless to say that under these conditions there was little difficulty with the swarming problem; it was taken care of automatically.

The colonies were only in fair condition when the honey flow started and fortunately the flow was later than normal in starting. There was more than the usual amount of yellow sweet clover over the state and it yielded nectar well, but of course the blooming period of this plant is relatively short. It was followed in turn by the small or white Dutch clover which yielded very well in many localities until the drouth hit later. Following on this was the flow of white sweet clover. Wherever basswood was present it yielded well this year for the short period. The honey flow over a large portion of the state was cut short by the usual drouth which was not only state-wide, but almost nation-wide. It was clearly demonstrated that white sweet clover is a drouth resisting plant; this year the honey yield continued long after the drouth was upon us. In fact sweet clover practically held its own for a normal season of nectar yield.

The early report for the honey crop in this state was exceedingly discouraging. Of course any surplus crop terminated earlier than usual due to the drouth. An extremely short crop was experienced in the southeastern part of the state and was very general except a few small spots where sweet clover was grown on some of the farms for pasture. Good returns were obtained in these localities in spite of surrounding failures. The crop was fair in the northeastern part of the state due to the fact that the drouth did not begin quite as early and white clover flow continued for a longer time. There was also a considerable amount of basswood in this territory. The western part of the state really had a fair crop, although the early reports indicated that it would be quite short. This section of the state is in the sweet clover belt. The interesting thing about the honey crop of this year is that it has been reported universally of superior quality. We cannot say why this is true, but it is probably due to the fact that all of the honey was gathered in a short time, yields were taken care of and for the most part taken off of the hive before there was any chance to mix the summer flow with any of the later flows.

Overhead can be reduced with even production colonies.

The fall flow of honey has been unusually good for most of the state. As a rule the larger portion of this state does not enjoy a fall honey flow, but probably nature was making an effort to compensate this year. The results of this fall honey flow are not excellent for the beekeeper. With nectar coming in most of the colonies have reared a large amount of brood which has insured a large population of young bees for the colonies going into this winter. Furthermore, most of the colonies are pretty well stocked

with stores as a result of the fall honey flow and as one producer expressed it "most of this fall honey flow was put where it will be immediately available to the bees for wintering." The only disagreeable feature is that fall honey flow is not ideal for winter stores, but if we can have reasonable winter weather the bees will come through in excellent shape. It must be said that the bees have gone into the winter in 1930-31 in excellent condition.

It is interesting that the poor results of the spring building-up period did not bring out any big demand for package bees. There is an interesting psychology prevalent among beekeepers, which is that if they have any bees in a colony they trust and hope that it will develop into a profitable producing colony. If the winter loss had been expressed at the beginning of the season these same producers would have been interested in purchasing package bees with which to fill up their equipment. There was a correspondingly low demand for queen replacement during the spring period. Of course it would have been more difficult than normal to get queens introduced successfully under the adverse spring conditions. The demand for queens during the fall was about average and probably compensated for the low demand during the spring. Producers seem to be very tempermental, absolutely restricting any effort of expenditure when conditions are abnormal, but when conditions are good they spend more freely.

POLLINATION

The problem of fruit pollination is being solved in many of the other states by carefully conducted experiments of placing bees in orchards at blooming time. There are many factors involved in this problem on both sides. The fruit grower needs the very best possible colony of bees in order to get maximum pollination. The question which is confronting the beekeeper now is how can this demand be met. Can it be supplied best by over-winter colonies from the apiary or will it be necessary to let the fruit grower ship packages of bees himself. As a matter of fact, some of the southern shippers are making a special appeal to fruit growers to purchase from them rather than rent bees locally. This will certainly result in urging the beekeeper on to supply a better article for use by the fruit grower. Those agencies which have to do with directing the beekeepers are keenly alert to the situation and are encouraging the beekeeper to direct his work so as to deliver the most to the fruit grower for the money which is secured.

There is an increasing interest in this work in Iowa. Two outstanding orchardists this year completed satisfactory arrangements with beekeepers for the use of bees in the pollination period, one in central Iowa and one in western Iowa. Fruit growers in Iowa in general do not have this problem as fruit growers in other states. This is probably due to the fact that there is a very general and even distribution of bees in the state at the present time. On the other hand there are not as large plantings of a single variety of fruit grown in this state as in some of the other states. However, the results of local work this year indicates that there can be very definite improvement by the co-operation of the beekeeper and the fruit grower.

The increased interest in stock improvement is extending over the state and many more inquiries are coming in about requeening colonies. The matter of stock improvement is extending beyond the old plan of getting only Italian bees in the colonies. More and more producers are becoming interested in the possibliity of some race other than the Italians which might give more satisfactory results under our Iowa conditions. It must be admitted that we have unusually severe conditions due to the combination of winter temperatures and spring conditions of temperature, moisture and wind. There is considerable interest in the Caucasian race of bees which originates in southern Russia where conditions are extremely severe and where only the hardy one can hope to survive. This race of bees is gray in color; they are exceedingly gentle; are excellent comb honey producers because the comb which they build is white and they have an excellent cap on their honey. The tendency to rob is almost lacking which would indeed be a welcome change from the Italians and would no doubt be a factor in reducing disease in apiaries. The Caucasian bee provisions its brood nests well for winter, which would be highly desirable for the producers of this state and due to several factors they are unusually good winterers. In addition to these points it is generally recognized that the tongue length of the Caucasian bee is approximately 25% greater than that of the Italian bee, which might be a very great factor for producers anywhere. In Russia the Caucasian bee is known as a pollinator of red clover, an item that has possibilities for the Iowa producer, for if red clover nectar would be made available it would mean a tremendous addition in the source of income for the bees. The fact is that all of the producers who have given this race of bees a fair trial are increasing their holdings of it. There are now several producers in the state who

have at least a hundred colonies headed with Caucasian queens. This race is not new to the United States, but has been used successfully for over a quarter of a century by one of the outstanding Rocky mountain producers, Mr. Herman Rauchfus. During the last ten years other large producers in the mountain states have become interested in this race of bees.

It was fully expected that the short crop of honey would make a big demand and a strong price, but disappointment came early. There was no "big-buyer" demand from the interests throughout the east where a large proportion of the crop is assembled and prepared for the consuming market of the industrial areas of the United States. It was a surprise at that time to the producers of the west to learn the real situation about the reduced "buying power" throughout the industrial areas. It looked for a time as though the honey market would stagnate; there was no movement in sight. What was to be done? Producers were advised immediately to turn their attention to the local demand. Wherever possible they were advised to put the honey into retail packages under proper conditions and to do everything possible to encourage the local consumption of honey. The results of this campaign have been beyond all expectations. These producers were keenly alert to the fact that it was necessary to put their product out in good shape; there was an unusual desire to supply a first class product to the consuming trade. Comb honey was graded in some instances and in all cases it was placed in a cellophane wrapper of some description. Section honey moved off rapidly beginning early in the season and a general report coming in now indicates that for the main part section honey is all sold out. Extracted honey was prepared carefully, placed in small packages with neat attractive labels and it has moved off better than usual. It is very evident that the consuming public can be interested in the use of honey. The demand is lying there dormant, ready to be worked by the producers throughout the state. It will undoubtedly be a good thing in the years ahead to know that consumers will take more honey if it is properly prepared for market and the demand is stimulated. There are several agencies that work on the increased consumption of honey, and it is only logical to believe that the population of Iowa can consume the honey which is produced in the state. Why should we ship out quantities of honey produced in Iowa and ship in honey produced in other states? No one gains by such an arrangement but railroads and commission houses. We

are fortunate in producing a fine quality of honey every year, and this honey is produced on a fairly good distribution over the state so to be made available in all of the stores where consumers can get it.

While the season of 1930 has been listed as an adverse season yet there are some outstanding lessons which we can gather from it. The value of good fall preparation was shown up very definitely. The necessity for careful spring management was self explanatory. The value of white sweet clover as a honey plant was proven beyond a doubt this year. The honey produced in this state can be largely consumed here if it is properly presented to the consuming public who is anxious to try out this wholesome, healthful food which is nature's own sweet.

LOOKING AHEAD FOR 1931

It is now time to begin planning our operations for the season of 1931. Let every producer be thoroughly prepared with the necessary knowledge so that he can enter the campaign of more efficient management of his colonies next year in order to get better returns from the investment of his bees and equipment. It is not possible for any one person to tell all producers how to manage their bees, it is only possible to point out the so-called landmarks along the way in order that the producer may have some indication with which to steer his course through the season's work. Producers are apt to feel that if they can secure just the necessary information from someone else that it will be possible for them to produce a crop of honey without any thinking on their part. It is not possible to secure a crop of honey from mismanagement or from good intentions. Every producer must go over his own problems carefully and map out the campaign that is suited for his conditions and circumstances. Think the system of management out clearly and do not pay attention to the success or failure of others even in the same vicinity. Get the facts as they may be available to you and then apply those facts to the conditions which prevail in your apiary. We are reminded of the saying of our good friend Dr. C. C. Miller when he said, "Do not worry about poor seasons, get your bees in the best possible condition and you will be surprised how many poor honey crops are experienced."

A statement was recently made by one of the outstanding scientists that the human race would soon become extinct due to its inability to meet the changes in surrounding conditions. We can see this very clearly in the matter of honey production. Condi-

tions are changing every year, but it is hard for many producers to appreciate that such a situation exists. They are so apt to attack the problem of production on the basis of attack used several years ago. One has only to look back over the last 15 or 20 years to see the tremendous changes which have come into honey production. At our annual meeting F. C. Pellett called our attention to the fact that when the Association was formed 19 years ago, all honey production was in the backyards with the exception of a few outyards which were maintained with a team and wagon. The automobile had not yet made its appearance in connection with honey production. It is necessary to recall conditions which existed such a short time ago in comparison with the conditions existing today to realize the tremendous change that has come about in the industry. It is only natural that the approach to honey production is changing from year to year and is vastly different now from even 10 or 15 years ago.

There are many items which should interest careful producers during the year of 1931. The Agricultural Extension Service will have available by the first of the year a completely revised and enlarged correspondence course which will be available to anyone interested. There never was a time in the history of the industry when it was necessary to have more accurate information concerning bees, their behavior, reactions and difficulties encountered in management, and the probable methods of solving these problems. It is felt that the correspondence course will make available to a large number of people the necessary information with which honey production can be made profitable. Those who are keeping bees already must concern themselves with increased efficiency of production.

The 21 radio talks given this year are available in printed form and will be sent to anyone free upon request. We know that many have listened each week, but we feel that many will want to have this information where it will be available for further study and reference. Requests for the talks have been received this year from almost ever state in the Union and from nine foreign countries. No effort which has been undertaken in behalf of honey production has received the response that has been given to this series of radio talks and the fact that they are available adds to the value of the series.

Beekeepers' meetings will be held in a good many counties during the winter and spring for the purpose of organizing for various

efforts for the coming season. Attention is called to the fact that a series of lantern slides on the "Biology of the Honey Bee" is now available for distribution and is of special value to gatherings that are interested in the natural history of this wonderful insect. Encourage the biology or agricultural teacher in your school to secure these slides for use in connection with school work or have the county agent get the slides to use at some evening community meeting. Another series of lantern slides will be available soon on "Honey Production," and such a set should be of interest to any beekeepers group wherever they meet within the state. This series can be obtained and if possible encourage your County Agent to secure this set of slides for use at some of your meetings.

We are planning during the season of 1931 to inaugurate a movement for model apiaries. There are some outstanding points which go to make up a model apiary, such as good equipment including foundation, improved stock in every hive, all colonies arranged neatly in rows, the absence of disease in the bees, and the system of management which is employed by the operation. We are now in the process of constructing a score card for use in determining the model apiaries of the state. It is our plan to list the apiaries of this class at the end of next season, and it is quite likely that at the next annual meeting of the Iowa Beekeepers' Association this list will be made public with due ceremony. We expect to be able in our work next year to score a good many apiaries in the state. This score card will have a good many educational features incorporated in it and it will be of interest to producers in general. A copy of this score card can be obtained free after the first of the year. Anyone who is interested in developing a model apiary to be recognized as such by agriculture in general should get in touch with us and secure copies of this score card.

Plans should be made now by every producer for stock improvement in his colonies. The value of a good queen can hardly be estimated, although experiments conducted here ten years ago indicated that a high type of queen was worth $18.00. It is interesting to note that some of the larger producers who are keenly interested in the items of increased efficiency in production are paying more attention to the quality and age of their queen. We have in mind one of the live producers in the commercial producing section of this state who says that it is absolutely necessary to get a high type of queen in every colony in order to produce honey to the best advantage. We recall a statement of another large producer

in the southwestern part of the state who said, "I seem to get my big crop of honey from the colonies which have first-year queens in them." We are not in a position to say definitely that it would pay to have new queens in every colony every year, but we have always maintained that any queen should be replaced the minute it is determined that her performance is not equal to the average of the yards. We would suggest that producers give a fair trial to perhaps the Caucasian bee or the Carnolian bee. It is a little more difficult to introduce a new race into the colonies. For that reason we would suggest the use of the nucleus method of introducing queens; this method is simple, safe and sure. We cannot give directions here, but have a sheet prepared which will be sent to anyone who is interested in using this method of queen introduction. As a matter of fact we heard one large beekeeper say that the replacement of queens was such a problem with him that he was going to adopt the nucleus method entirely in his apiaries.

Plans are already under way for continuing the work of the demonstration apiary in a good many counties next year. The benefits of this line of work are many. It is possible through this endeavor to show by actual practice that the methods of beekeep-

Using a middle entrance with queen restricted below. Yield in 1930 by this method averaged 200 pounds. Apiary of J. M. Edwards, Cedar Heights.

ing management which we have advocated for several years can really apply to any territory with increased returns. The records of 1929 show that the increased yield of the demonstration colonies over the state yield was almost 12,000 pounds. This would mean a direct increased return to the producers connected with the demonstration apiaries of over $2,000, above what had been received by them in years past. The demonstration apiary project is obtained in a county through the Farm Bureau Office. Producers are urged to interest themselves in this educational effort. Determine if the work is to be put on in your county or not. If it is, make it part of your program during 1931 to keep in touch with these demonstration apiaries. Find out when the meetings are to be held and plan to be there. Perhaps you can take part in these meetings and assist in making them a success to the benefit of your fellow men in your community. If this is not to be conducted in your county, perhaps it will be possible for you and some of the neighbor producers to interest the County Agent in including this work in his program for next year. After ten years of demonstration apiary work we feel that it is fundamentally sound and productive of most excellent results. A summary of the work up to this year shows that 94 counties have had this work and over 38,000 beekeepers have attended the meetings. The demonstration apiaries are means of controlling disease and have opened the way for later successful disease control campaigns within the community. There has been an increase in the quality and appearance of honey sold throughout the state. The demonstration apiary work has shown how to cut the cost of production of honey, and the project has been responsible for an increase in the consumption of honey, and above all it has developed a spirit of co-operation among honey producers.

The disease control work will be extended during 1931. It should be remembered that this is not the *one* problem of the honey producers, but is one of a good many problems. The importance of this problem has been over-rated in the mind of the average producer who may feel that there is nothing more to honey production. It is not the cause to an effect, but simply one of the contributing causes. The area clean-up work will be continued as the fundamental throughout the state; general or miscellaneous inspection will be done only where it is necessary. The results that have been obtained over a period of ten years shows that this type of work is the one which secures the results. At the last legisla-

ture provisions were made for the county allotment of local funds. Work was conducted under this arrangement during the past year in Ida and Black Hawk counties, and results of the work in these counties has been highly satisfactory and it is expected that the work will continue during 1931. Already Fayette county has appropriated funds for local work in that county during 1931 and it is expected that at least two more counties will report soon that funds will be available for this type of work. During the last year area clean-up work was conducted in some counties on a township basis, where it was realized that the funds were so limited that it was not wise to attempt a county-wide program. The character of the work was just as thorough as in the county-wide and the results have been very satisfactory to the producers. Of course there will always be the educational work in behalf of disease control in connection with the demonstration apiary work and this factor is securing very fine results in this state.

The past season showed up very clearly that it is possible to increase the consumption of honey in this state. When the crop was gathered early last fall it soon became evident that there would be no out-of-state demand so producers were urged at once to expend every energy in preparing their honey to the best of their ability for local market and to develop every possible customer for the honey. It has been shown very definitely that there is a big field open to honey producers, for people want honey. The consuming public, represented by the house wife, is interested in learning about honey and in knowing how to use honey. They have lost sight of the fact that honey is such a healthful food; that it is "Nature's Own Sweet," that it does not need any preparation in order to feed the family; that it contains the necessary minerals for body functions; that it can be used to advantage in connection with other foods which are served daily in the home. The Home Economics Department of Iowa State College has prepared a large number of recipes for the use of honey and these are free upon request. It was very interesting to note the wonderful window displays of honey at the Midwest Horticultural Exposition at Shenandoah. The window which secured first award showed very definitely the uses of honey for some 31 dishes which were on display in which honey had been used in the preparation. Last week in Minnesota we came in contact with one community where honey was used extensively to the amount of approximately 70 pounds per person per year. It was said that these people enjoyed the best

of health and were pleased to use honey in the many ways that it is possible to use it. The work of the American Honey Institute is beginning to give very definite results and every producer is urged to consider fully what this means and to appreciate the wonderful good which this organization is doing for honey production. The contact which the institute has made with consuming possibilities in this country are beyond the belief of the average mind. The foods people in general have overlooked honey as an article for human consumption, but they are gladly turning to appreciate its value and glad to recommend and encourage the use of honey.

We can look ahead to 1931 as a year that has every reasonable prospect of success for the honey producer of Iowa. It should be the biggest year in the history of the industry but the realization of this will depend on the efforts and activities of individual producers. It will be interesting to check up a year from now and determine what the producers have made of the opportunity which 1931 is sure to offer them.

INSPECTION

Considerable scouting work was done quite early in the season this year with very good results, for in a good many instances colonies were found where the bees had died out over the winter as a direct result of the presence of disease. This type of inspection is exceedingly valuable since it removes from the field such dead colonies which would be a source of infection as soon as it is possible for bees to start flight and the resulting robbing.

Inspection of colonies started as soon as possible after the bees were set out of the cellar. This is a good time to do work as most beekeepers are busily engaged in checking over their colonies as soon as possible after taking them out of the cellar. Sometimes disease is found among such colonies and in every intsance it is recommended that such diseased bees and equipment be destroyed, for at that time of the season a few bees in a diseased hive are of practically no value. If such colonies are left in the yard they soon become extinct because they cannot withstand the severe spring conditions and they are then a dangerous source of spreading the disease through entire yards.

Additional funds were made available so that it was possible to employ two additional helpers during the months of April, May, and June. This made possible considerable additional inspection work in some of the counties where it was necessary to do regulatory work, not on the basis of clean-up or even intensive cam-

paigns. A portion of one part-time inspector formerly used was dispensed with because of the demand for educational work, and the combination of inspection and demonstration apiary work.

Careful inspections were made in Woodbury and West Pottawattamie counties to continue the area clean-up work which has been undertaken there during the past two years. Intensive work was started in Monona county which borders on the present territory where area clean-up work has been conducted. Local funds were made available in accordance with the provision of the revised foulbrood law in Ida and Black Hawk counties. Intensive work has been conducted in Ida county for five years, but with the provision of occasional funds it is possible to undertake a more complete area clean-up of the county. Considerable new territory was visited for the first time and the need of careful follow-up work in the county was shown this year when an outbreak of disease was discovered in commercial yards where the inspection service has been consistent during the past five years and apparently the disease was non-existent. A careful search throughout the season failed to reveal the possible source of infection in this locality. The cost to one beekeeper alone to fight the disease this year was five times the amount of local appropriations made by the county. The results of the work in Ida county are highly satisfactory to both the inspection officials and to the beekeepers of the county.

Inspection work has been conducted in Black Hawk county during the past four years, but this year a local appropriation made it possible to inaugurate an area clean-up campaign. A very careful survey shows that there were three times as many people holding colonies of bees as was known by any one concerned with honey production in the county. The disease situation was very bad; approximately 50 per cent of the hives in the county were empty from disease. There was a general lack of knowledge on the part of these holders in regard to disease and to how to handle the situation. Under these conditions it was necessary for the inspectors to put in a great deal of time on educational work and to actually treat or destroy in a good many instances. The cooperation was most excellent and the results which have been secured are most gratifying to the inspection officials and to the beekeepers of the county.

Intensive work was conducted in Washington county where commercial interests were threatened and with a continued spread of disease. The work showed a rather high per cent of infection, but

with a careful recheck which has been made, it is hoped that satisfactory results are obtained.

Work in Van Buren county was conducted in two townships on the area clean-up basis; every producer in the two townships was visited and the bees carefully checked. In most instances, where the work is being conducted for the first time, the producers prefer to treat their disease rather than to destroy it. For this reason, the records show a relatively high per cent of treatment and a low per cent of destruction of such colonies. It has been the history of the work in other counties that the disease was treated by the owner for a year or two and after that time all disease was destroyed.

Rather intensive work has been conducted in Fayette county following three very successful years of cooperative educational inspection work. It was shown by the records in this county a large proportion of disease found was destroyed. Local funds have already been appropriated in this county for an area clean-up campaign next year and with the ground work which has been laid it is fully expected that a very successful season will be experienced.

Considerable regulatory work was done in Bremer, Cherokee, O'Brien, Guthrie, Ringgold, Davis, and Winnebago counties. No organized local campaigns are under way in these counties, but it is hoped that the situation will be appreciated by local producers and that it will be possible to organize area campaigns at a later date. Inspection work has been conducted in Cherokee county for four years and the amount of disease present was relatively small. In O'Brien county the disease was rather prevalent and more attention will be needed in this territory. The work in Guthrie county has been continued for several years and while the disease is comparatively small, yet this territory needs more careful attention. An interesting situation developed in Winnebago county where every diseased colony found was destroyed. It is to be hoped that the producers in these counties will avail themselves of this initial work and continue an effort to develop intensive local campaigns.

The inspection work was conducted in conjunction with the demonstration apiary work in several counties, particularly Chickasaw, Clinton, Dallas, and Jefferson. The campaign has been conducted for several years in Chickasaw county with satisfactory results. The same is true with Dallas county where some out-

standing results have been obtained through demonstration work for the control of disease. The work was new in Clinton county this year, but the results have been highly satisfactory. A large proportion of the disease found was destroyed, which indicated a very fine local spirit and cooperation. An attempt was made to start demonstration work in Jefferson county, but the disease situation was such that it was necessary to devote the entire time to that problem rather than to results on yield. The records indicate that a large proportion of the disease here was treated and a small per cent was destroyed but a recheck shows apparently satisfactory results. It will be necessary for one or two seasons to elapse in order to know the real value of this effort. Fortunately the work is to be continued in these counties next year and it is hoped that satisfactory progress will develop.

There are some very evident conclusions which have come out of the inspection work. An outstanding item is the fact that demonstration apiary work is in reality laying the foundation for disease control work. Through the demonstration apiary project, it is possible to bring to the attention of the beekeepers in a forceful manner the need for an effort in the control of disease. The beekeepers have learned through the demonstration apiary work what disease is and how difficult it is to eradicate it so it is possible to crystallize a very definite campaign of the demonstration apiary project. There is a very definite advantage gained in starting the work in a county through demonstration apiary work. Of course, there is a certain amount of disease eradication work undertaken in a good many counties in conjunction with the demonstration apiary work which it is a matter of self-protection. After the demonstration work is attempted in a locality where disease is prevalent it is necessary to inspect enough in the territory to protect the demonstration apiaries. Considerable inspection work is done on this basis but the results have been so satisfactory that the effort has been more than justified.

It is rather difficult to break into a county on inspection work and attempt to organize an area clean-up campaign without a considerable amount of educational effort. It is sometimes possible to encourage this effort through rather careful inspections in a county over a period of three or four years. On the whole the beekeepers are becoming more interested in disease control and campaigns are easier to get under way. The matter of local support is of tremendous assistance in putting across a campaign for disease control work. The small state appropriation which is possible cannot meet more than the organization requirements. The local work should be supported to a large extent by local funds.

Wherever inspection work is new the producers invariably want to salvage everything possible out of the diseased material. Experience has shown in every case that it is not practicable to attempt to salvage very much, and beekeepers soon willingly agree on the disease material.

The cooperation on the part of the beekeepers in regard to disease eradication work is most excellent in this state. The work is conducted in Iowa on an educational basis in accordance with the law which is peculiar among the laws of the states, but the results which have been secured indicate to the inspection force the value of the law and the value of the method of approach in the work. It is the general experience that, when a beekeeper learns that disease is in his bees or in his empty hives, he is willing to undertake any reasonable measure to correct the situation. It is only through such cooperation that the maximum results can be obtained and it is to be hoped that the wonderful cooperation of the past can be continued in the future.

SUMMARY

County	Colonies	Diseased	Treated	Destroyed	Reinspected	Incomplete
Adair	139	34				
Black Hawk	1,517	416	187	81	95	
Boone	95				160	
Bremer	260	47	50	20	209	
Cherokee	283	15		15	217	
Chickasaw	331	22	1	23	299	
Clinton	437	40	2	26	428	
Dallas	443	50	3	47	52	
Davis	52	2			107	
Decatur	204	15	14	3	220	
Dubuque	220					
Fayette	748	188	23	146		
Fremont	250	7				
Grundy	34	2		1	59	
Guthrie	375	62		40	40	
Humboldt	40	40		77		
Ida	2,115	147		12	232	
Jefferson	232	127	115		161	
Lee	172	48	4		65	
Marion	65			6		
Monona	2,007	58				
O'Brien	293	122		7		
Polk	76	7		2		
Pottawattamie	420	7			10	
Ringgold	284	27				
Sac	95	6	6		52	
Shelby	53	10	10		42	
Story	120	30	30		78	
Van Buren	499	197	73	5	29	
Warren	58	10		5		
Washington	1,358	167	2	93	1,245	
Winnebago	249	61		61		
Woodbury	855	117	76	25		
Wright	113				113	
Totals	14,491	2,091	596	704	4,056	

BEEKEEPERS' CONVENTION

The nineteenth annual convention of the Iowa Beekeepers' Association was held at Shenandoah, November 12-13, 1930.

OFFICERS OF THE CURRENT SEASON

President—N. I. Lyle.....
Vice President—E. G. Brown.....Sheldon
Secretary-Treasurer—F. B. Paddock.....Sioux City
Director—N. Williamson.....Ames
Director—J. G. Jessup.....Bronson
Director—Harry A. Pease.....Council Bluffs
Director—L. J. Gartner.....Shenandoah
.....Titonka

PAPERS READ BEFORE THE CONVENTION

TREND OF THE TIME

By Frank C. Pellett, Hamilton, Illinois

The first convention of this organization was held in the old Savery Hotel in Des Moines in December, 1912. This is the eighteenth consecutive convention and accordingly the eighteenth time that I have been honored by a place on your program. It is a bit hard to bring a new and fresh message to the same group so many times. It is my purpose today to review briefly the trends which affect our business and try to see what the result is likely to be in order that we may make our plans to fit the conditions.

I do not care to go far back in point of time seeking a background for this discussion. Some of you were present at that first meeting and have had a part in the affairs of this organization since that time. You are as familiar as I with the changes that have taken place. Now we find ourselves living in a very different world than the one we occupied then. The automobile was just coming into use and few beekeepers could afford them. The man who had one was looked upon with envy or suspicion depending upon the viewpoint. Horses took the beeman to his outyards and hauled home the honey. The range of operations was limited to the distance which could be economically travelled daily with a horse drawn vehicle.

There were few commercial beekeepers in Iowa then, measured by the scale of present day production methods. The leaders were present at that meeting but no one could foresee the radical changes to which we were so soon to be called upon to adjust ourselves. The radio was not to come into use for several years and the wildest imagination could not then picture the time when direct advertising by word of mouth to millions of listeners would be carried on as it is today. Betty Crocker's personal message to a million housewives telling the story of honey over the National hookup last week was an undreamed of possibility.

Looking back over that brief space of time we find that we were using the same kind of hives, the same kind of bees, the same methods of production and management then as now. It is true that the spread of sweet clover over the Western Plains has opened up a vast expanse of new territory where large scale honey production has greatly increased the volume of our product going to market, but there is little change in the system of management by which it is produced.

The changes that have come have been such as largely to increase

the opportunity for contact among our people. The automobile makes a journey of five hundred miles as simple as one of twenty miles was then. The radio puts us in touch with the activities of all the world and enables the presidential candidate to present his case to the individual voter in the most remote neighborhood. It likewise offers the advertiser opportunity to present the merits of his product in similar manner.

These changes have meant vastly increased opportunity for those who have foreseen the possibilities and who have taken advantage of them. They have meant disaster to those who continued to follow the old trails and ignored the revolution in human living conditions.

The greatest change that has come to us as individual honey producers is in marketing conditions. Then most of us sold our crops through local grocers and direct to a retail trade in the territory in which we lived. Only a few sold to the wholesale trade. We knew the grocers as individuals who had continued in the business in which they had grown up. They were our neighbors and our friends. Now many of these local grocers have been replaced by chain stores whose buying is done at a central office in some large city. If we offer them honey they ask for prices on a carload, perhaps, and we must sell in competition with the large producer of the West whose outfit consists of a thousand colonies in a locality where his average yield may be as much as 200 pounds per colony. No longer do we compete only with our near neighbors in the market. This trend is making it increasingly difficult for the small producer who has but a ton or two of honey to sell.

The competition between the various foods is increasingly severe. The human stomach is limited in its capacity and once it is filled there is no market for more until the time for another meal. New and varied kinds of sweets clamor for attention. Modern advertising has come to be a big business, spreading its story over full pages of space in several colors at enormous cost. A single insertion of a page advertisement in one of the magazines of large circulation thus costs thousands of dollars. The small beekeeper is thus out of the market so far as general advertising is concerned. It is only those commodities which are able to attract public attention that are really prosperous. The small food producing industry can only hope to survive by means of cooperative advertising. Honey is a satisfactory sideline to the baking advertising because it goes well with rolls or biscuits. By interesting the consumer in the combination of bread and honey the baker can sell more bread. The manufacturer of baking powder can work with the beekeepers in similar manner because his product profits from the increased use of honey.

The organization of the American Honey Institute offers the one way out for the beekeepers. That institution is securing cooperative advertising of untold value. To secure it directly would cost so much that the industry could not possibly pay the bill. We profit by the cooperative effort of others who help us in order to help themselves. The Kellogg advertising is a good example of this kind of cooperation. No one questions but that it has paid the Kellogg Company to feature their products in connection with honey and with fruit, but it has helped the beekeeper and fruit grower quite as much as it has them.

Betty Crocker's nation-wide radio programs last week reached untold numbers of housewives, but such a contact would not be possible without some central office to supply information and to offer cooperation. No one can estimate the service which the American Honey Institute has already rendered to the beekeeping industry at a time when the export markets are closed to our products. The Institute is thus making hundreds of contacts every one of which helps to make an outlet for some beekeeper's honey. The Institute is badly in need of funds and unless the beekeepers come to its support will be compelled to curtail its activities or suspend operations. Should this happen it will be disastrous to

the industry in the present state of the market. If each beekeeper will contribute one dollar for the support of the Institute for each ton of honey which he produces there will be ample funds and the money will be returned to him with good interest in the increased demand and better prices for his product.

THE TARIFF

The results of recent tariff activity have been disastrous for the beekeeper. We are producing more honey than the present American markets require. We have therefore been exporting it to Europe and depending upon foreign countries to consume our surplus. Millions of pounds have gone to Germany and thus relieved our domestic markets of the burden of this excess production. No sooner did we raise our tariff barriers against foreign countries than a world-wide agitation began for retaliation against American products. We cannot blame anyone but ourselves for this condition. At a time when the world was in greatest need of free exchange of commodities we have succeeded in establishing undue restrictions which instead of helping our condition have made it much worse. The result of the recent election was in part a protest against this action.

Germany has established a high tariff against American honey and the millions of pounds which formerly went to her market are now piled up in our warehouses looking for an outlet. England is agitating a similar tariff which is likely to be adopted and if so will further reduce our market for honey and beeswax as well as manufactured comb foundation. Manufacturers of comb foundation formerly had a good export trade in Canada which is now cut off by Canadian tariff. They further propose to establish a tariff against American publications which will restrict the circulation of all American magazines including bee publications in Canada. In our anxiety to shut out the last possible bit of foreign competition from our markets we have encouraged them to shut us out of their markets in similar manner very much to our own disadvantage.

We have had much agitation in recent years concerning certified honey and proposed to permit only honey from disease free apiaries to go to market. France is the one foreign country which so far takes official notice of such proposals. There has recently been adopted a regulation refusing entrance to France of foreign honey without a certificate from an authorized inspector that it is from apiaries where no disease is present. Thus we have further restriction on the shipment of American honey to foreign markets for it is manifestly impossible for dealers to furnish such a certificate.

THE BEESWAX SITUATION

The future outlook for American beeswax is equally gloomy. In recent years numerous synthetic waxes have begun to appear in the markets. Both mineral waxes which are the by-products of manufacture and vegetable waxes which are gathered from wild palms in tropical countries are coming into competition with beeswax. The price of beeswax has been declining rapidly in recent months as a result of this competition as well as because of the generally unsatisfactory business conditions.

There is now in the market a good mineral wax having much the same physical properties as beeswax which sells at twelve cents per pound. This wax serves the needs of many industrial users and of course it will replace beeswax for purposes which it serves equally well. Beeswax has qualities lacking in other waxes and as long as the product remains pure will remain in demand for those peculiar advantages. However, the present tendency to mix beeswax with other waxes is destroying whatever of advantage beeswax still maintains. The pure food law which protects honey from adulteration does not apply to beeswax except as

it is used in the food or drug trade and it is accordingly easy for those who would profit by adulteration of our product to escape punishment at the hands of the law. Under these conditions we can hardly expect that beeswax will regain and maintain its former high price.

THE FUTURE

Although the breaks have been against us in recent times, I have not lost faith in beekeeping. We need an active and aggressive leadership which will recognize the serious conditions by which we are confronted and will face them promptly and fearlessly. We must take steps to reestablish a demand in our own market to replace what we have lost abroad. We must support the American Honey Institute to an extent which will enable them to take advantage of every possible avenue of cooperative advertising and at the same time enable us to help those who help us. We are compelled to act together in the present situation if we are to prosper and regain the lost ground.

By means of larger outfits, by keeping more bees and making use of labor saving machinery it is possible to meet the handicap of falling prices. Many beemen who formerly had two or three hundred colonies now have five hundred or a thousand and are meeting present economic conditions by a larger output at less cost per pound.

The trend toward commercial beekeeping is especially noticeable in the sweet clover region from western Iowa to the Rocky Mountains, with Nebraska and the Dakotas in the lead.

As an industry if we meet the new conditions by the use of new methods; if we produce more pounds at less cost per pound; if we use the radio and newspapers to inform the public of the value of our product and give the consumer the full value of his dollar in the retail market, we will retain our place in the sun and honey producers will prosper in the future as they have in the past.

THE RECENT DROUTH AND THE EFFECTS ON THE BEEKEEPING INDUSTRY

E. R. Root, Medina, Ohio

During the past summer and early fall, I have covered something like 5,000 miles of travel in the East and in the West. Judging from what I saw and from what I could gather from those with whom I talked, the general press has overstated the effects of the drouth in the states west of the Mississippi, and underestimated the effects in the territory along the Ohio river on both sides, particularly on the south side in Kentucky, then on into West Virginia, Virginia and Maryland. These last three states suffered the most. The effects of the drouth was not so severe in New York, Michigan, Wisconsin, Minnesota, and North Dakota. The season was spotted, some good and some bad.

The New England states were not hurt much except around Cape Cod. Everything looked green in comparison to Ohio. The state of New York had drouths in spots, as did Michigan and Wisconsin. Ohio was badly hit, but managed to get a little honey from sweet clover in the northwest; but the southern part of the state was much like Kentucky, hard hit.

In the western states, the farmers were more scared than hurt. The drouth, it is true, set them back and delayed the harvesting of the crops, but late rains, while they did not come in time, helped materially. The West is more accustomed to drouths than we of the Central States. In some portions, dry farming is practiced. In most of the central west, the farmers are better prepared to receive a drouth. Their crops will stand it better, especially kaffir corn.

So much for the farmer, but what about the beekeeper? The latter, whenever there is a drouth, is much more seriously affected than the farmer. A light drouth will cut down the honey crop and a severe one, such as was had in the territory mentioned, will cut it off entirely,

leaving the colonies in a starving condition. On the other hand, in either case, the farmer will get something, especially in the western states.

In that portion of the country, east of the Mississippi and below the northern tier of states, the honey crop was almost a total failure, if we except certain favored spots where some honey was secured.

In the nearly fifty years that I have been connected with the bee business, I do not remember a season that was so poor for honey. Even in the northern tier of states, the yield of honey was spotted from good to very poor. In Kansas and Missouri, the yield of honey was much below the average but good in regions where sweet clover is grown, especially in the Mississippi valley.

Speaking of sweet clover reminds me that this was about the only white honey source in the east and where there was none of this legume, there was no honey. In short, sweet clover was a godsend to the beekeeper east as well as west.

Late summer and early fall rains have resulted in a fine fall crop in nearly all the territory affected by the drouth except southern Pennsylvania and Maryland. Colonies in the east, where there have been fall rains, were never in better shape for wintering, reports show. Some beekeepers have extracted considerable fall honey.

There is one crumb of comfort that we can get from this extraordinary drouth the past summer. Had there been a normal or average yield of honey in the drouth stricken areas, the general market on honey would have gone lower than it is. While the Rocky Mountain beekeepers will not have their usual crop, they will be the beneficiaries, especially because there will be a better demand for their product even though the price in carlots did not take an upward trend.

It is not impossible that we may have another dry season, although it is to be hoped it will not be so severe. There is a current belief that "next year will be the reverse of this one," and therefore very wet. An examination of the width of the annual rings or year's growth of trees that have been cut down, does not bear out that statement. These extremes may or may not according to this study go in cycles.

The obvious lesson to be learned from severe dry seasons is to grow crops that will stand drouths and by the same token the commercial beekeeper should get sweet clover in his territory or migrate to a locality where it does grow.

THE 1930 INSPECTION CAMPAIGN

Howard Shipton, Ames, Iowa

The inspection work began in March this season. We have found it convenient to do considerable work as soon as bees have been set out of the cellars in the spring. Beekeepers are usually checking over their colonies a few days after they have been set out which is an ideal time to make inspection. Quite often some disease is found which has been overlooked by the owner the fall before. Experienced beekeepers usually prefer to destroy the diseased colonies at this time so as to eliminate any further spread of the infection. Such colonies are very dangerous as disease is often spread through entire yards by robbing or drifting bees. American foulbrood would be easier controlled if beekeepers gave prevention more thought and spent less time and money trying to save the bees in a few diseased colonies which are of little actual value. I do not consider it advisable to open packed colonies for inspection unless they appear to be in a weakened condition. This usually can be determined by observing the flight at the hive entrance. If a colony is weak, the packing should be removed so that an examination can be made. Quite often they are found to be queenless or diseased.

This season I have done inspection work in nine counties. Beekeepers were successful in getting county appropriations for the inspection work in Ida, Black Hawk, and Fayette counties. The fund was not allowed in Fayette county until late in the season and will be available for the work next spring. Two additional inspectors were added to the force and worked during April, May and June.

Black Hawk and Ida counties were thoroughly covered. A complete canvass was made among the farmers in these counties so as to locate the bees. In Black Hawk county there were about twenty who were known to keep bees. When we had finished inspection we had the names of two hundred and ten beekeepers in the county. The disease situation was very bad and about 50 per cent of the hives were empty. Very few beekeepers were familiar with disease and contributed their loss to moths or poor wintering. Some had become discouraged and had given up trying to keep bees. Both American and European foulbrood were found in the county and in some localities mixed diseases were found. Both diseases were found in some yards and beekeepers were badly confused. Inspection was made slow on account of box hives and poor equipment. Educational work in conjunction with the inspection was also carried on. I have found that very few beekeepers are successful in handling disease for the first time. To eradicate disease is a job for an experienced beekeeper and if he has already spent a few hard earned dollars fighting American foulbrood, a more thorough clean-up can be expected. In counties where the work is being done for the first time, I do most of the clean-up work with the help of the owner. Future cooperation from the beekeepers depends a great deal on the success of the inspection during the first year. Cooperation can be expected from those who are successful but seldom from those who fail. It will require several years of inspection carried on in connection with the educational program to bring disease under control. From previous experience we

Disease is readily spread when apiary operations are careless.

have found that most of the soap box beekeepers and those who practically have no interest in beekeeping drop out as soon as inspection is started. Those who are interested usually make better beekeepers. As we have no box hive law in Iowa, it is necessary to eliminate them as much as possible through the educational work. This has proved very successful in counties where the inspection work has been carried on for several years.

In Ida county there was quite a serious outbreak of American foulbrood this spring in the apiaries of two commercial beekeepers. One of the beekeepers who is located near Holstein bought thirty colonies of bees in box hives and moved them in from another county. The bees were supposed to have been free of disease at the time they were bought,

but when I made inspection later they were found to be badly infected with American foulbrood. The bees were moved by truck and set out in a yard with about one hundred clean colonies. The bees drifted badly after being moved and carried the infection into a large number of the other colonies. All of the infected colonies were destroyed so as to prevent further spread of the disease. The other apiary is located near Ida Grove and had been free of disease for two years. A large number

The problem of disease control is very difficult in the hands of careless and indifferent producers.

of colonies were found with American foulbrood this summer. We were unable to locate the source of the infection as other bees in the immediate neighborhood were clean. Several inspections were made during the season and as the beekeeper is very thorough, it is expected that the disease will soon be eradicated.

Our work was extended south into Monona county during the spring. Seven townships were covered in the northern part of the county. Disease was found to have a strong foothold in all townships inspected. The county has a large acreage of clover and possibilities appear to be excellent for the commercial beekeeper as soon as disease can be controlled. It is hoped that we will be able to continue the inspection there during next season.

Some scattered inspection was also done in Woodbury, Fremont, West Pottawattamie, O'Brien, Winnebago, and Kossuth counties. As there was not sufficient funds to carry the work on in a general way, the inspection was confined mostly to assisting individual beekeepers who had made special requests for inspection.

APIARY INSPECTION IN MISSOURI

By Dr. K. C. Sullivan, State Apiarist of Missouri

Not so many years ago when I was a youngster on a farm in the Ozarks of southern Missouri, I became interested in the honey bee, and that interest has continued up to the present time. Just how long that interest will continue is hard to say, but there is something about the honey bee that is always fascinating and when one's interest is once aroused it usually lasts.

As I remember I was just ten years old. My father purchased from a neighbor a few miles away two colonies, or hives, as they were called, of bees. These bees were in hollow logs, real gum logs, and I think

they were the largest that I have ever seen. The tree from which those hollow gum hives were sawed, without doubt, started growth a hundred years before I was born.

Each log was about four feet high and through the center was a pair of cross sticks to which I will allude later. Inch boards were securely nailed on both the bottom and the top and several V-shaped notches were sawed out of the bottom edge to provide an entrance and exit for the bees. The bees were hauled home in an ordinary wagon during a fairly crisp winter day. That was considered the safest time of the year in which to haul such animals as the honey bee about.

When the warm days of spring came the bees from these log hives started work and they labored industriously. Along in the latter part of May each colony swarmed. The cow bells rang and the tin pans roared. The first swarm, evidently badly frightened, departed for a more tropical clime, and the neighbors returned to their labors. The next swarm to issue, however, was captured and with the aid of gloves, mosquito netting, a clean white sheet, peach leaves, other impedimenta and much excitement, they were safely drummed into a modern eight-framed hive.

The greatest excitement, however, came later in the season when my father decided that it was time to rob the colonies which were housed in the old gum logs. A dark night in early August was selected. It was evidently considered safest to slip up on them during their slumbers.

Some rags were rolled up and tightly tied. One end was fired in order to produce a smoke. Pant legs were tied down, coat sleeves fixed likewise, and mosquito netting and gloves were brought into use.

By the aid of a hammer the top was pried off, then an effort was made to get a generous amount of smoke down through the combs. A long, slender corn knife, the distal end of which had been bent to nearly a right angle, was then brought into play and every comb cut loose as far down as the cross bars. The combs were lifted out and dumped into a dish pan. It was a messy job, but despite the fact that much young brood was destroyed and bees drowned, enough honey was obtained to last for a considerable period.

After it was all over, and the honey safely away from the badly disorganized and probably disheartened colony, the younger generation was allowed to partake to their heart's content of the spoils. Sleep that night was erratic and spasmodic. It was several days before a natural appetite for one of the finest food that man knows returned.

One cannot but help sympathize with the honey bee and oft times wonder just how it has been able to survive all the vicissitudes which man has heaped upon it, however, methods of beekeeping have changed. We are appreciating the value of the honey bee more and more, and now instead of hindering its progress, we are trying to help, and to see that it is given a proper chance to utilize its natural instincts of helpfulness to the fullest extent.

Undoubtedly the recent work which has been done having to do with the value of the honey bee as a carrier of pollen in our orchards has done much to bring the honey bee to the front. We are at last beginning to realize that probably without the aid of the honey bee, civilization as we know it today would be an impossibility. No one can begin to estimate the value of the work which the honey bee has done in the establishing and prepetuation of many of our most valuable agricultural plants.

Unfortunately the honey bee, like practically every other animal or plant, has its natural enemies and in some cases these enemies have almost become too great for the bee to cope with.

Without doubt the ravages of American foulbrood has greatly hindered the progress of beekeeping throughout North America. The persistence of this disease has been so great that not only have we spent much time and money in investigating its cause and activity in the laboratory and

elsewhere, but we have gone so far as to enact laws which have to do with its control and eradication.

Just how successful these laws have been has depended entirely upon the support which they have received by the general public and by the beekeepers, in particular. Where apiary inspection laws have been properly supported and wisely administered they have done much good and have been well worth while.

Today I wish to tell you something regarding the conditions in Missouri and problems which confront us.

It was about 1910, I believe, when a few of the more progressive beekeepers of my native state succeeded in convincing the legislature that an apiary inspection law was necessary in order to protect the welfare of the beekeeper and to insure the proper progress of the beekeeping industry, however, the beekeeper did not, it seems, convince the general assembly that a good sized sum of money was necessary in order to carry out and enforce such a law.

Nevertheless a very small appropriation was obtained, a state apiarist was appointed and he did the best that he could under the conditions. The funds, however, were soon exhausted, and the work ceased.

Practically nothing was done from that time until 1925 when a law was enacted placing bees on the taxable list, and which required each county assessor to record each colony in his county. Then due to the fact that bees were taxed and were serving as a source of revenue, the general assembly felt bound to appropriate money for the use of bee inspection work. Some money was appropriated but the amount was so small that little could be accomplished.

The theory of taxing bees was all right, but it did not work out in practice. In many counties the assessors failed to list them, in others they were only partially listed, and the revenue derived was rather meager. Bees are still taxed in Missouri, but the revenue derived is entirely inadequate to meet the needs of an efficient inspection service.

In 1927 the beekeepers of Missouri prevailed upon the general assembly to amend the old inspection law in such a way as to broaden its scope, and also in such a way as to make the inspection work self supporting. The main feature of the law was a registration fee of fifteen cents per colony which was to be paid annually, and which was to be collected by the state apiarist. It was thought that the revenue derived from such a fee would be sufficient to carry on the inspection work in a fitting manner, also that the work would be self supporting and thereby eliminate the possibility of having to depend upon appropriation by the general assembly from revenues from the state treasury.

When the law went into effect a state apiarist was named, and he made a valiant effort to see that the law was properly enforced, and administered. The first year the fee idea worked very nicely, that is the beekeepers on the whole paid the registration fee, but it soon became apparent that a colony of bees could not be inspected for fifteen cents, with the result that many beekeepers paid the fee, and received no service in return in so far as inspection was concerned. The same condition prevailed the second year.

I wish to say, however, that a great deal of good work was done, and much accomplished with the money which was collected. The only trouble was that the fees did not produce enough revenue to go around; to enable the state apiarist and his deputies to inspect all of the colonies in the state.

As a result of this condition, which the state apiarist could not in any way prevent, considerable criticism developed, and this criticism crystalized to some extent at the meeting of the 1929 general assembly.

It looked for a time as if the entire apiary inspection act would be repealed, but the bill providing for the repeal of the act was caught in the rush of the last few days of the session, and as a result, it is still in effect.

In Missouri, departments of the state government may be empowered by the legislature to collect fees and these fees may be used for the enforcing and the administering of laws for which that particular department is responsible. However, in order that this may be legally done, it is necessary that the legislature reappropriate these fees each biennium.

In each case of the apiary inspection fees the 1929 session of the general assembly reappropriated only $2,000.00 therefore, regardless of the amount which the state apiarist might collect, only $2,000.00 of the amount could be legally spent. As a result of this action, no effort was made in 1929 to collect the registration fee. During the biennium, however, 1929-1930, almost $2,000.00 in fee was sent in voluntarily, and these funds were used for inspection work.

In September, 1929, I became state plant commissioner in Missouri, and along with it I also inherited the title of state apiarist without compensation, a kind of honorary title, you might say. It was therefore, up to me to utilize what remained of the $2,000.00 to the best advantage, and this we endeavored to do.

There are several ways of carrying on apiary inspection work, and in every case the value of the work done depends to a very great extent upon the efficiency of the individual doing the inspecting.

Without doubt, the area clean-up method of inspecting if followed up year after year is the method by which the most lasting results can be obtained, and it was decided that this method would be followed in so far as the funds would permit. We wanted to demonstrate, if at all possible, the value of this method of carrying on inspection work.

The beekeepers of Holt county, Missouri, requested that the work be carried on in that county. Holt county is located in northwest Missouri, and is one of the outstanding honey producing counties in the state. A deputy was appointed and he began work in Holt county about the middle of May. He spent approximately ten weeks in the county and during that period he inspected nearly fifteen hundred colonies of bees. We think that he saw every colony in the county, at least we hope he did. The beekeepers of Holt county gave fine cooperation, only one individual out of the 150 beekeepers in the county offered any resistance whatever to the inspection work. It is interesting to note that this individual had at one time been a deputy inspector.

The number of colonies found to be infested with American foulbrood was 157, or about 11 per cent. These infected colonies with the exception of 21 were either burned or treated by the inspector. Where they were treated the inspector stayed on the job and saw that the work was properly done. In other words, we tried to do a thorough job. The 21 infected colonies which were neither burned or treated were in boxes in an isolated yard. If funds are available they will be cleaned up this coming spring.

We consider the work which was done in Holt county as being worth while, and most of the beekeepers of the county seem to feel the same way about it. At the present time the beekeepers of a number of counties in Missouri are demanding the same service, and if possible they should receive it.

At the present time, however, there is considerable doubt as to the status of the inspection work. Missouri is a large state, and it will take a great deal of money to carry on the work as it should be done.

It is very likely that that part of the apiary inspection law which provides for the fifteen cents registration fee will be repealed, as it is now evident that this method of collecting revenue for carrying on the work has not proven successful. It may work in some places where conditions are different, but it has failed to work successfully in Missouri. I am of the opinion that it would work in an area where all of the beekeepers are commercial beekeepers, but in an area where there are hundreds of beekeepers who have from one to a half dozen colonies

kept primarily to produce honey just for home use, and who are not greatly interested in the work, the registration fee plan meets opposition.

There is no question regarding the value of inspection work. It is necessary to control the brood diseases, especially American foulbrood in order to succeed in the bee business, and it seems that in order to free an area of American foulbrood, and keep it free, legal measures are necessary. It is also necessary and very important that sufficient funds are available to carry on the work in an efficient and thorough manner, not only for one year, but for a long period of years.

It is our hope that this coming year, the inspection work in Missouri can be placed on a stable foundation, and that the coming legislature, which convenes this coming January, will see fit to give the work adequate support. Adequate financial support is the keynote to successful inspection work, whether it be in Missouri, in Iowa, or in any other state. The beekeeping industry is becoming more important each year here in the Mississippi valley, and it deserves support and encouragement. Getting this support is sometimes discouraging, but it will eventually come.

CALIFORNIA CONTRA FOULBROOD

Frank E. Todd, Sacramento, California

INTRODUCTION

Bee disease eradication on a wholesale scale was attempted for the first time in California in 1928. To appreciate what was attempted, let us look at a map. You will note that California is nearly as wide as Iowa and its length would stretch from Des Moines nearly to New Orleans. Its 10,000 beekeepers with 375,000 colonies are scattered over deserts, sea coast, mountains, broad irrigated valleys and high plateaus. To give equal service to each of these is a stupendous undertaking; however, its success can best be judged by results.

Bee inspection laws are on the statute books of nearly every state. Yet the methods used in this work are extremely variable as is also true of success attained in this work. Progress towards disease eradication is apparently made only in those states where burning diseased colonies is practiced. We know of no equally effective work being done by any other method. Of course other factors such as organization, finance and cooperation enter into the effectiveness of this work. Much of California's progress is attributed to the adoption of the burning method and the splendid cooperation of her beekeepers.

The inspection work in California has been spectacular because it embodies state-wide application of methods used on a smaller scale in other states, and because the results have been carefully tabulated and published.

California inspection has been greatly improved because of state control, proper viewpoint, whole hearted cooperation, and the use of methods which are eradication methods in fact.

VIEWPOINTS—STATE AND BEEKEEPER

The bee industry is an asset to California. It forms the chief livelihood for several thousand California citizens, adds directly from a million and a half to two million dollars to the annual income of the commonwealth, and conserves annually about eight hundred carloads of a natural resource which otherwise would go to waste. It is valued as a chief pollination agent for California's fruit and vegetable industries, at probably ten times its income value. Thus is justified state interest in the welfare of the bee industry.

The beekeeper has a just demand for state protection of his property. It is well known that the careless handling of infected colonies is a chief aid to foulbrood spread. Infected equipment may be interchanged. Honey from diseased colonies may be exposed to other bees accidentally or placed on the market wilfully. Unprotected diseased colonies may

die out and their remaining stores be robbed by other bees. So subtle and uncontrollable is this menace of spread of foulbrood that any colony within a three-mile radius of an exposure may become infected. Helpless is the beekeeper in his efforts to protect his property against this disease as long as it exists in his neighborhood. His welfare supports his just demand for state protection of his property.

Proper viewpoint is essential to obtaining proper finance, as well as legislative action. Thus we have a state interest and an individual interest, and on such a basis we have obtained adequate finance and state-wide recognition of beekeeping problems.

COOPERATION

With finance, aim and method provided for, whole-hearted cooperation is the secret of our progress. Without this cooperation of the beekeepers with the Inspection Service, we could get nowhere.

No small factor in the development of this spirit of cooperation has been the growing reaction against uninspected bees and honey. Bees on combs were first prohibited entry into one state after another which seriously suppressed interstate migratory beekeeping. Next, some states put on honey certification requirements which could not be met without a thoroughgoing inspection service. The next to come over the horizon was more drastic requirements for the interstate shipment of package bees and more recently still is France's demand for honey certification for export shipments. The necessity for action has become increasingly evident. Either bees must be cleaned up or we must expect interstate shipment of honey to be severely regulated.

The Inspection Service, state and county, has enjoyed the whole-hearted support of at least 95 per cent of the beekeepers in the state. At first some were skeptical of the ability of the Service to handle this work and also of the effectiveness of the burning method, but when once the beekeepers began to experience a miraculous reduction of disease in their yards, their skepticism passed into solid support. Such cooperation is the secret of successful inspection work.

California has been in the news many times during the past three years over the disease question. Misinterpretation seems to have gotten abroad somehow that the beekeeper is tied hand and foot, which is not the case.

Beekeepers are expected to look after their disease. When they find disease themselves, they can take care of it as they see fit, however, when it is found by inspection service, it is expected to be burned. By this procedure it is the badly neglected yards where the loss has been the heaviest, while in the yard of the careful beekeeper practically no disease had to be burned. The neglected yards that have spread disease for us in the past are the same yards that now cause our sharp controversy. If they cannot be cleaned up what good is an inspection service?

STATE CONTROL VS. COUNTY CONTROL

A bee inspection law has been on the California statute books since 1883, however, the optional county system was not changed to a state supervised system until 1927. General supervision of bee inspection work is now in the hands of the director of agriculture. In each of 51 counties the agricultural commissioner provides local supervision, inspectors and includes funds for this work in his budget.

While records are lacking on the progress which was made under the county system, it is generally conceded that it failed to stem the spread of A. F. B. and likewise failed to eradicate American foulbrood from any section of the state. This may have been due to the methods used and lack of a central organization, but at any rate it appears to be a fact, that it did not work out to general satisfaction.

The dissatisfaction with the county system of inspection was by no means universal as many counties fought against making a change. However, today after three years' experience with state supervision,

these objectors are among the strong supporters of the present system. The reason is because of the very noticeable improvement in disease conditions in their yards and neighborhoods.

CHOICE OF METHODS

There are two schools of thought in bee inspection work which may be described as follows:

(1) *Control*: The viewpoint taken is that disease cannot be eliminated so beekeepers should be educated to keep bee disease under control. This school advocated that foulbrood should be "shaken" every year as it appears, similar to the way we spray fruit trees every year. Perhaps where no inspection service is available this viewpoint is justified, but it is questionable whether or not honey from such areas should not be regulated when entering other states, as some of it would be produced in diseased colonies and might spread infection.

(2) *Eradication*: This school takes the view that disease can be eliminated by the use of bacteriologically sound methods as has been done with the yellow fever, Texas fever, malaria and tuberculosis in cattle, foot and mouth disease, and citrus canker. This school advocated killing the bees and burning the bees, brood, combs, honey and disinfecting hive bodies, supers, covers and bottom boards of all infected colonies.

California took the eradication viewpoint and adopted the burning method.

That this procedure has cut the cost of production of honey may be demonstrated by one item. California beekeepers under the shaking treatment had annually no less than 15,000 diseased colonies to shake, prior to 1927, when the new law began operation. This required labor and the purchase of foundation for the shaking of these 15,000. After only two years of burning we find there were but 3,800 diseased colonies, *even if they were to be shaken*, or a possible cost item for labor and foundation for but 3,800 colonies. Therefore California beekeepers have saved the cost of labor and foundation for the shaking of 11,200 diseased colonies this year. Our progress indicates that this figure will be lower next year. This is but one item in the lowered cost of production of honey resulting from a practical program of foulbrood eradication.

Since California beekeepers are in the business for profit rather than education, they joined the eradication school, and results show that they have profited thereby. Until all states adopt similar viewpoints they are of course in constant danger of reinfection from outside sources. The time has arrived when there should be no longer a question what to do. Yet it seems impossible to get the same support from our publications for burning, which has demonstrated its worth, as has been given to solutions and shaking neither of which has proved to be of equal effectiveness.

ERADICATION METHODS IN FACT

California bee law states: "Inspectors shall require such person or persons to eradicate such disease within a certain time to be specified in said notice."

"Eradication" is defined in the dictionary as to "destroy utterly."

The inspectors were, therefore, faced with a problem of determining what "eradication" meant. It was generally known that shaking bees might reduce infection for a time, but American foulbrood had a way of re-appearing. The disease could hardly be considered eradicated if the honey from infected hives, which is the vehicle on which the causative bacteria ride, was not treated. The boiling of such honey under the shaking treatment is not the general practice. To specify the time in which one can eradicate disease by the shaking treatment is impossible, unless one considers hiding the infection temporary, as eradication.

It appeared that there was only one way to carry out this mandate, and that was to in fact eradicate all infections found. Burning appeared as the most practical method of, in fact, eradicating disease, so the burning method was adopted.

The comparative results of the application of the burning method speaks for itself as presented in the following table:

California Bee Inspection Summary for Year 1928-30*

Year	Apiaries			Colonies		
	Inspected	A. F. B. Infected		Inspected	A. F. B. Infected	
		No.	%		No.	%
1928	8,440	3,395	40.21	281,388	14,160	5
1929	9,527	1,962	20.5	311,845	7,619	2.44
*1930	8,112	1,286	15.8	273,674	3,765	1.375

*To November first only.

CONCLUSIONS

These figures indicate real progress towards eradication. They do not demonstrate that complete eradication has as yet been accomplished. The reduction of disease has paid the industry, in reducing cost of production and in meeting the more drastic regulations which are almost constantly appearing. The final chapter has yet to be written. Comparative results indicate that even if disease is never entirely eradicated from our borders, a great burden has nevertheless been taken from the shoulders of the industry by the drastic steps taken.

It is already noticeable in our meeting that the stage so long occupied by foulbrood is now being occupied by more constructive items, such as marketing and advertising. Beekeepers are beginning to work for themselves rather than for old man Foulbrood.

THE OHIO PLAN FOR BEE DISEASE ERADICATION

Chas. A. Reese, Columbus, Ohio

Beekeepers have attempted for more than five decades to conquer American foulbrood, the largest overhead in honey production. According to all available information they have only succeeded in spreading it to nearly every locality where bees are kept for profit. Yet, with such existing conditions a few beekeepers will persistently publicly declare they have been successful in their attempts to control disease within their apiaries. Not to admit failure in their efforts may be considered a human characteristic. Just as soon as this minority realizes their folly, and forget all attempts to control American foulbrood and strive for its complete eradication this menacing situation in their apiaries will quickly decline and even before they realize it, it will be past history. Of course, it should be understood, in changing any policy which has been so firmly entrenched in the minds of many beekeepers, there will be certain groups who resent any reform and immediately declare the advocate for such a change a radical.

In Ohio, a few years ago, any such attempt to change from a treating policy to one of burning infected bees and materials would have been more or less disastrous. However, by a continued persistent educational campaign, carefully bringing to mind the repeated failures of a treating policy and especially emphasizing the net returns from an absolute destruction of infected materials under the supervision of a trained operator, together with a number of demonstrative areas, progressive beekeepers were quick to realize such a procedure is the cheapest and quickest means of completely eradicating American foulbrood. By a gradual course of action in enforcing the burning policy it soon indicated that this was the primary means of attaining a marked decline of diseased colonies in any community or area. One point must not be over-

looked, and that is the absolute certainty and positive necessity for all clean-up work in any infected apiary, whether it contains one colony or several, to be in complete charge of one who is trained in the fundamentals of bacteriology. Early experience has proven that in more than 90 per cent of the cases where the beekeepers were permitted to dispose of the infected materials by the usual prescribed methods of control, they not only made a complete failure, but invariably infected the greater share of the disease free colonies. It was quite evident there were some discrepancies somewhere. The difficulty was either in the procedure through misapplication on the part of the beekeeper or misplaced confidence on the part of the inspector. Preliminary investigation indicated that most beekeepers modified any recommended control, and a close observation on the activities of the inspector proved that this was an excellent loop-hole for them to shirk their work, and place the entire startling responsibility on to the beekeeper. A close check also revealed the most startling fact that very few beekeepers were capable of handling the disease situation within their apiary. Consequently, in any program of successful bee disease eradication work, the only sure method by which the work will be done properly is for the inspector to take complete charge.

In the regular bee disease eradication program in Ohio, such a policy was inaugurated in the season of 1930. Up until this time, conditions were not of such a nature that a program of this kind could be followed without considerable difficulty. In previous years in a number of areas, such a procedure was inaugurated and upon reinspection for several seasons disease had decreased to nearly a minimum, and only a very small number of infected colonies were found in a few commercial apiaries where combs from diseased colonies were accidentally scattered through the extracting supers by careless helpers. One of the most satisfactory features has been the voluntary action of most of the commercial beekeepers in adopting the same method of cleanup practices used by the inspectors. As soon as a colony infected with American foulbrood is found, it is killed with cyanogas, and the bees and contaminated materials are destroyed by burning in a pit. In several of our commercial establishments where it has been the general practice to salvage all infected materials, bees, and honey, and disinfecting the combs with alcohol or water formalin solutions, the owners soon discovered there was no decrease in diseased colonies from season to season, but on the contrary a steady increase. Facing such a condition, this group either completely destroyed the heavily infected apiaries, or abandoned the use of such materials.

In one area consisting of a township where there is the greatest concentration of bees in the state, the inspection of nearly a thousand colonies disclosed 8½% infection. In the season just completed, a recheck of all the bees in this area was made, and only five colonies were found to be diseased. The majority of the beekeepers have reached the conclusion that the old methods of shaking and salvaging infected materials is both an expensive and dangerous practice, and it can be said with a great deal of satisfaction that the beekeeping public of Ohio also realizes that the old policy of miscellaneous inspection and instruction of individuals in bee disease control is quite futile. Another condition which may be considered a change in the attitude of those who have bees toward that of complete eradication is the repeated requests for inspection and a clean-up of disease in the various localities and areas of the state. Such requests have reached such a magnitude that it is impossible for those in charge to comply with their desires because of the inadequate financial resources.

Having well in mind the attitude of any legislative body in providing funds for such a project, it is necessary to seek other means of financial aid. Consequently, in 1929 during the legislative session, this part of the state government was asked to enact a supplementary section to the

Ohio Apiary Inspection Law which would permit the appropriation of funds and the appointment of an inspector within those counties in which it was deemed necessary. This was done without any great dissension on the part of that body of the state government, and beginning this past season it was possible to call upon the county officials to assist in combating diseases in their respective counties. The law is in no way mandatory upon the county officials, but leaves it entirely up to their own volition. Consequently, any program on bee disease eradication in any given county is entirely dependent upon the attitude of the beekeepers. It also has been the means of bringing together the close cooperation of this group with the horticultural societies and other farm organizations. Such groups now have taken an active interest in the suppression of bee diseases and not only have petitioned the county officials, but called on them for the purpose of obtaining funds. In no way have the commissioners been asked to appropriate any great sum, but only a sufficient amount to properly and systematically cover the county. While the law does not specifically declare that the state must contribute, it is interpreted by the state officials that funds from this source should be expended in those counties where provisions have been made to inaugurate a cleanup program. Such funds are expended in the form of labor. In other words, another inspector employed by the state works in cooperation with the county inspector. County inspectors are invested with the same powers as the state inspectors and the law requires the approval of their appointment by the Director of Agriculture. They work under the direct supervision of the State Apiarist. Thereby the disease work is uniform and all units operate under the same policy. In 1930, the first season of operation under this law, funds were provided by 23 counties, ranging in amounts from $50 to $600. In a few counties it was more or less of an experiment on the part of the officials to determine the necessity of such work in their counties. State funds for the same season were expended only in these counties and the results of the season have been quite satisfactory, not only to those in direct charge, but to the public in general. While definite statements have not been received from all counties, this satisfaction may be best indicated by the action of county commissioners in 33 counties, appropriating more than $19,000 to support the work for 1931. It is quite probable that more than two-thirds of the entire area of the state comprising most of the best beekeeping areas, will be given a thorough inspection for bee disease this coming season.

The present bee disease eradication program is not only becoming popular as indicated by the funds being provided, but the public is becoming greatly interested and now realize that a greater value is derived from bees in their community than the honey which is produced and harvested by the beekeeper. This is judged by the activities on the part of horticultural societies, seed improvement associations, as well as local farm bureaus and granges who are taking an active part in securing funds for this purpose. In several instances it is through the instigation of such organizations that funds were secured. From the enforcement officer's point of view, this arrangement is the most satisfactory that has so far been suggested in this state. The work is much more efficient, costs have been greatly reduced, and there is a closer cooperation among all interests concerned.

The summary of the work for 1930 indicates that more than three times as many bees were inspected at less than half the cost per colony over any previous season. A total of $7,212.19 was expended from the sum of $7,550.00 as appropriated by the various counties. A total of 52,973 colonies were inspected in the 5,059 apiaries visited. In 1,649 apiaries, 7,236 colonies were found infected with American foulbrood, the same being destroyed by the inspectors.

RESULTS OF A QUESTIONNAIRE ON WINTERING

J. A. Munro, Entomologist, North Dakota Experiment Station, Fargo

The results of a questionnaire on wintering, sent out during 1929 to beekeepers of the state, practically all of whom were members of the North Dakota Beekeepers' Association, have proven interesting. The questions related to the method of wintering as practiced by the individual. Incidentally a few of the questions touched on requeening and other phases of beekeeping. Of a total of 118 questionnaires mailed out, sixty-eight of them were filled in, in varying degrees of completeness, and returned to this office. The writer wishes to express his appreciation to those who cooperated in this survey.

The following are the questions together with a summary of the replies:

No. 1. *How Do You Winter Your Bees?* Fifty-six replied that they wintered their bees in cellars; seven winter in packing cases out of doors, and one wintered his bees in a building above ground with packing around the hives. Four did not answer this question.

No. 2. (a) *Approximate Date of Placing Bees in Winter Quarters?*
(b) *Other Important Facts Relating to Winter and Spring Care.*
In answer to part (a) there was wide variation in the dates given. The dates listed for placing bees into cellar quarters ranging all the way from November 1st to December 20th; the greater majority of dates

North Dakota Honey Producers at the Short Course at Fargo, North Dakota.

given, however, centered around November 15th. Of those who practiced wintering bees in packing cases out doors six answers were received; most of which ranged from October 15th to 20th.

In answer to part (b), other important facts relating to winter and spring care, the following comments appeared: have the apiary in the protection of a windbreak; see that the cellar is cool before placing the bees in it; keep the cellar dry, ventilated and dark during the cellaring period; have the colonies well provided with stores previous to placing them in winter quarters; examine the cellar from time to time to check on temperatures; reduce the size of the hive entrance in fall; and

clean the bottom boards and gradually enlarge the size of the entrance in the spring.

No. 3. *What Winter Loss Do You Have?* In answer to this question fifty-three gave figures on loss sustained; forty-seven for cellar wintering, and six for outdoor wintering in packing cases. The figures given by those who practiced cellar wintering ranged all the way from 0 to 40% loss and the outdoor wintering figures ranged from 0 to 50% loss. The average for cellar wintering was 4.17% loss and for outdoor wintering 26.15% loss. It is apparent from the above that certain individuals have had complete success with either method of wintering, whereas, others have lost heavily.

No. 4. *Have You Checked on Winter Loss of Hive Weight? If So, What Results?* Only twelve beekeepers answered this question and all figures were based on loss of weight for cellar wintering; that is, the actual period from the time the colonies were placed in the cellar quarters in the fall and until they were moved out the following spring. The figures ranged from eight pounds to twenty-five pounds loss; the average being fifteen and one-quarter pounds loss.

No. 5. *State Difficulties You Have Had in Wintering Bees.* In several instances the cooperator listed more than one difficulty encountered, but in this summary only the difficulties of prime importance are considered. Sixteen stated high temperatures in their cellars during the wintering period. Eight cited lack of stores as the most serious problem. Seven mentioned mold and moisture. Seven stated that they had no difficulties at all. Six, that disturbance of the bees, either by mice, skunks, or in other ways, caused the greatest trouble. Three mentioned dysentry. Three cited lack of cellar ventilation. Two had greatest difficulty in maintaining a sufficiently high temperature in their cellars. Two who practiced outdoor wintering mentioned the danger of snow and ice blocking the hive entrances. One said queenlessness constituted his greatest problem in wintering bees. One mentioned "leaving bees out too long." He had left his bees outdoors until November 30th. Another stated "placing bees indoors too soon;" November 5 was the date he had placed his bees in the cellar. One pointed out that snow and ice blocking the air intake to his cellar was his chief problem. One said that he usually set his bees outdoors too early in the spring with the result that cold weather afterwards caused chilling or neglect of the brood. One stated that his chief difficulty was in moving his hives to summer stands after unpacking. He said that many of the bees became confused at the time of unpacking and as a result went into the wrong hives. Eight failed to answer this question.

No. 6. *Do You Practice Uniting Colonies at the Close of the Honey Flow and Dividing Same the Following Spring?* A study of the answers showed that thirty-seven neither unite colonies in the fall or divide same in the spring. Fourteen stated that they always unite weak colonies but did not make a practice of uniting colonies of normal strength. Four said that they made a regular practice of dividing some of their colonies in spring for the purpose of making increase. Thirteen did not answer this question.

No. 7. *What Is Your Method of Requeening: Requeening Yearly, Requeening Every Two Years, Requeening Only on Account of Old or Failing Queens?* Twenty-six reported that they requeened only on account of old or failing queens or to improve the quality of their stock. Sixteen made a practice of requeening yearly and sixteen said that they requeened their colonies every two years. One mentioned that his was a hit or miss method; that his colonies requeened themselves when the old queen escaped with a swarm. Nine did not answer this question.

No. 8. *Have You Ever Practiced Killing Bees in the Fall and Restocking the Hives in the Spring? If So, What Results?* Of a total number of fifty-eight answering this question only four had had experi-

ence with killing bees in the fall. From the reports received the following comments were gleaned for and against killing colonies in the fall and restocking with packages. Advantages listed: That the cost involved in killing bees in the fall and restocking the empty hives in the spring is no greater than wintering, requeening, and replacing normal loss. That packages are equipped with young queens and as a result there is less swarming as compared with overwintered colonies. Disadvantages

Apiary and honey house of the North Dakota Agricultural Experiment Station.

listed: That killing bees is a difficult and disagreeable job. That some of the combs contain brood and pollen and as a result the honey is darker in color. That the honey is usually difficult to extract from the combs due to cold weather prevailing at the time. That a general practice of killing bees in the fall would result in an extra amount of honey produced which would tend to depress the honey market. That there is a certain hazard in depending entirely upon package bees for restocking purposes.

*THE WINTER ACTIVITY IN THE HONEYBEE CLUSTER

By C. L. Corkins, Laramie, Wyoming

Beekeepers pretty generally are familiar with the present accepted theory of the activity within the winter cluster of bees. Briefly, it is that as outside temperatures decline below about 55° F. to 57° F. the bees are forced to the production of heat by an increase of muscular activity, which is accompanied, quite naturally, with a correspondingly greater consumption of honey. It has been thought that in unprotected colonies, when the outdoor temperature was around zero F. or sub-zero F., the bees were induced to expend an enormous amount of energy in excess of normal conditions close to the clustering temperature, and that great winter losses resulted from this unnecessary expenditure of their reserve

*Contribution of the Wyoming Experiment Station, Laramie, Wyoming.

strength. As a consequence, beekeepers have attempted to cut down this activity by large amounts of packing and cellar wintering.

On the other hand, many successful commercial beekeepers of the intermountain region and, I presume, elsewhere, have not practiced nearly such heavy insulation as has been generally recommended, or have given no additional protection to their colonies during winter beyond a good windbreak. It has been observed many times that very poorly protected colonies in make-shift hives or boxes have satisfactorily passed the winter in our rigorous climate, and, in some cases, better than very heavily insulated colonies.

This seemingly paradoxical situation has caused beekeeper and research worker alike to wonder if there might be some factors of the winter activity of the honeybee cluster that were not yet well understood. As a consequence, the Wyoming Agricultural Experiment Station started a project in 1925 which had for its purpose the investigation of the fundamental principles of the winter activity of the honeybee colony. The first step in the project was completed during the past winter, and the findings of the first four years of investigation are at the present time in the process of publication as a station technical bulletin. It is possible here to give only a very brief popular account of the results, leaving out a critical discussion of the date upon which the conclusions were based.

As a first step in the project, it was decided to make an investigation of the activity of normally wintered colonies outdoors during the months of December, January and February. This is the phase of the problem which has been completed.

The four most popular methods of wintering bees outdoors in this region were used. One group was placed in packing cases, some with six inches of sawdust on the sides and seven on the top, while others were given six inches of such insulation to the bottoms also. A second group was given no protection in addition to the ordinary hive body. A third group was tar-paper packed with normal ventilation. The fourth group was tar-paper packed with upward ventilation. This upward ventilation effected a real circulation of air through the hive, as a one-inch auger hole was bored near the top of the front side of the second hive body, while the normal winter entrance was left open below. All colonies were wintered in two hive bodies, as this practice is necessary in our region to provide sufficient stores for the long period of spring brood rearing when there is little or no nectar coming in from the field.

Both Italian and Caucasian bees were used in the experiment, and we can dismiss these racial considerations by the statement that their winter cluster activity seems to be generally similar. This was especially true of their temperature reactions, although some minor differences may be disclosed by our critical and more precise study of their activity under controlled temperature conditions.

As a measure of the winter activity of the honeybee colony under normal outdoor conditions, two methods were used. First, daily weight losses were determined for each colony by the use of delicate scales. This method was possible in our extremely dry climate, whereas it has been most unsatisfactory for previous investigators working in humid climates. Second, the temperature reactions were determined by the use of electrical resistance thermometers, known as thermo-couples. From 21 to 33 such precision thermometers were placed in each colony.

First, considering the daily loss in weight for periods of cold as opposed to periods of mild weather, a summary of all colonies for all four years showed 84.4 per cent greater daily consumption for periods when the mean outdoor temperature was 28° F. or above than for all periods when the mean outdoor temperature was 15° F. or below. In the case of the warm periods, there were some few flights, but these were brief, lasting for only a few hours in the morning. Otherwise, during the mild periods the bees were presumably favored by ideal outdoor temperatures.

On the other hand, the cold periods were marked by zero and sub-zero weather, down to as low as 41° F. below zero. During the entire four winters there never was a single observation of a greater honey consumption during such cold weather that any ways nearly approached the higher rate of consumption during temperatures of so-called minimum activity for the winter cluster.

If cold weather greatly increases the activity within the winter cluster of bees, unprotected colonies should show a much greater honey consumption during the three coldest winter months than well packed colonies. For this reason the following table is included here, as it is very significant.

Summary of Daily Loss in Weight in Ounces per Ounce of Bees for Various Types of Protection for the Three Winter Months

Year	Packed Top and Sides	Packed, Top Sides and Bottom	Unpacked	Tarpaper Without Upward Ventilation	Tarpaper With Upward Ventilation
1926-27	0.0221		0.0472	0.0428	0.0371
1927-28		0.0340	0.0310		0.0265
1928-29		0.0418	0.0316—0.0301	0.0295	0.0306
1929-30			0.0311	0.0268	0.0427

For the most part, these figures speak for themselves. The only place where packed colonies showed an advantage was where the bottom packing was omitted. The packed colonies with bottom packing consumed slightly more honey than others. This needs explanation. In the first place, it should be noted that the packed colony with a low daily rate of honey consumption showed the advantage during the mild periods of the winter, rather than the cold. During these warm periods, the insulation prevented the cluster from warming up and breaking so that cluster making and breaking activity was held to a minimum. But in the case of the packed colonies with bottom packing, they had no such protection that during the coldest weather no definite winter cluster was formed, and during the cold weather they consumed more honey than unprotected colonies, as a general rule. This indicated that it is highly possible to pack the bees too heavily.

A study of the average daily consumption by months also was very interesting. There is usually a very marked difference in the mean monthly temperature here for the three or four coldest months. In every case the consumption for the coldest months was very markedly lower than for the months with a higher mean temperature.

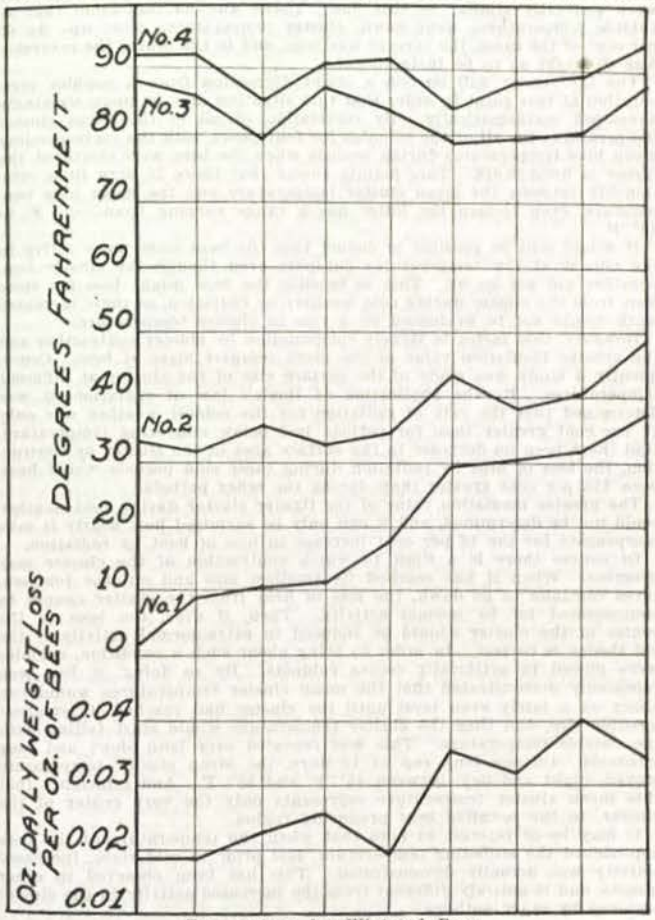
Other interesting points were developed in the studies of the daily loss in weight of the colonies, but the foregoing are the most important from a practical standpoint.

Passing now to the temperature investigations, it is to be remembered that previous investigations have found that as outside temperatures went down below the clustering temperature, the cluster temperature went up. It was for this reason that the theory of the winter activity of the honey-bee cluster, stated at the beginning, was erected. In our investigations here, this was not found to be the case. There, perhaps, are two reasons why our results are different from those of other investigators. In the first place, our winter temperatures covered a wider range and were much colder, permitting observation at practically all temperature ranges to which bees are ordinarily subjected, down to 41° F. below zero. In the second place, our investigations covered a longer period of time than others, and the data were more extensive and more exhaustively analyzed mathematically.

At any rate, the cluster temperature was found to remain remarkably

constant regardless of the temperature range outdoors. A summary of the cluster temperatures for all colonies for all four years shows that when the mean outdoor temperatures were 15° F. or below that the mean cluster temperatures were only 1.4° F. higher than during periods when the mean outdoor temperatures were 28° F. or above. In the warmer group, the temperature of the clusters was always taken when the outdoor temperature was low enough to produce a definite cluster. The greatest mean inversion of temperature found for any year in any colony was 5.7° F.

A very typical temperature curve is shown in the accompanying cut. This is for an unprotected colony during 1928-29. Eight periods of from



Temperature for Wintered Bees

5 to 12 days' duration are represented at each point on the vertical lines of the graph. Each temperature, as well as the daily loss in weight on the bottom curve, is a mean for all of the days in each period. The periods are arbitrarily arranged in order from the coldest to the warmest. Curve number one is the mean outdoor temperature. Curve number two is the mean hive temperature computed from the mean of the five coldest points in the bee-free spaces of the hive. Curve number three is the mean cluster temperature, computed from the mean of the five warmest spots inside the cluster. Curve number four is the mean maximum cluster temperature, computed from the warmest spot in the cluster. Similar curves were plotted for all colonies in the experiment, and all were generally similar to this one. There was no indication that as outside temperatures went down, cluster temperatures went up. In 69 per cent of the cases, the reverse was true, and in the others the inversion was so slight as to be insignificant.

The lay reader will pardon a slight digression from a popular presentation at this point in order that this situation may be more strikingly developed mathematically. By correlation of all of the mean cluster temperatures for all of the colonies for four years with the corresponding mean hive temperatures during periods when the bees were clustered, the factor is 0.053±0.026. This plainly shows that there is very little relationship between the mean cluster temperature and the mean hive temperature, even though the latter has a range varying from —2° F. to 40° F.

It would still be possible to deduct that the bees were more active in the cluster at low temperatures outdoors even though the cluster temperature did not go up. This is because the bees might lose far more heat from the cluster during cold weather by radiation, so thefr increased work would not be evidenced by a rise in cluster temperature.

However, this factor is largely compensated by cluster contraction and the greater insulation value of the more compact mass of bees. Consequently a study was made of the surface size of the cluster at different temperatures. By the application of Boyle's law of radiation, it was determined that the rate of radiation for the coldest weather was only 18 per cent greater than for periods just below clustering temperature. Had there been no decrease in the surface area of the cluster by contraction, the loss of heat by radiation during these cold periods would have been 158 per cent greater than during the other periods.

The greater insulation value of the tighter cluster during cold weather could not be determined, and it can only be surmised how nearly it may compensate for the 18 per cent increase in loss of heat by radiation.

Of course there is a limit to which contraction of the cluster may progress. When it has reached its smallest size and outdoor temperatures continue to go down, the loss of heat from the cluster cannot be compensated for by normal activity. Then, if ever, the bees in the center of the cluster should be induced to extra-normal activity if the old theory is correct. In order to bring about such a condition, colonies were placed in artificially cooled cabinets. By so doing, it has been repeatedly demonstrated that the mean cluster temperatures would run along on a fairly even level until the cluster had reached its smallest possible size, and then the cluster temperature would start falling with the outside temperature. This was repeated over both short and long intervals. On one long run of 13 days, the mean cluster temperature stayed, night and day, between 45° F. and 58° F. And remember that this mean cluster temperature represents only the very center of the cluster, in the so-called heat producing region.

It may be of interest to note that when the temperature of the bees approached the stiffening temperature, just prior to cold rigor, increased activity was actually demonstrated. This has been observed in other insects, and is entirely different from the increased activity in the cluster assumed by other authors.

This study of the rate of radiation of heat from the honeybee cluster suggests that a natural law may be involved, which may be stated as follows: As external temperatures decline below the clustering temperature, the cluster of bees contracts, thereby reducing the surface area from which loss of heat takes place, bringing about a fairly constant rate of radiation down to the point of minimum contraction of the cluster.

Because of these findings and others, which by the nature of this article must be omitted, I must disagree with previous investigators and conclude that as external temperatures decline below the clustering temperature, the activity of the honeybee in the cluster is not materially increased or possibly is not increased at all.

It is not to be interpreted that we can dispense with all winter protection to the bee colonies in cold climates. We must recognize the fact that if there are protracted periods of sub-zero weather, the bees will use up their reserve supply of honey within the cluster. Because the external temperatures during such a period may be below the minimum critical temperature for life, which is 30.25° F., according to Pirsch, the bees cannot leave the cluster which has contracted away from their food supply and replenish their stores. Likewise, regardless of this fact, there will be periods when the loss of heat from the cluster cannot be further reduced by the contraction of the cluster, and its loss will be greater than its compensation by the activity of the bees. Consequently they perish. Unfortunately, no such periods of weather were available during the course of these experiments. The apparent resistance to cold which the bees displayed was, indeed, remarkable. One unpacked colony out of the entire series died during January of 1930. Another unpacked colony setting beside it, and presumed to be generally similar to it, showed no ill effects of the cold. It is not clear whether the long, cold period, alone, caused the demise of this colony, or if there were other contributing factors. It is likely, however, that there was real danger to unpacked colonies at this time, although none were lost out of the general apiary under similar conditions. During this critical period of 16 days' duration, all but three days had sub-zero minimums, one of which dropped to —41° F. The mean minimum temperature for this period was —12.2° F., and the mean maximum 18.3° F. One day remained sub-zero for 24 hours. The highest temperature, during the period, was 30° F. That all but one of the unpacked colonies survived such a severe and long period of cold weather was truly astounding.

The different understanding of the reaction of the winter cluster to cold weather resulting from these data harmonizes with practical experience in wintering bees in the intermountain region. In relatively few instances have the commercial beekeepers packed their bees in accordance with U. S. government recommendations. On the whole, they have used far less winter insulation, and, in some instances, none at all, than has been advised in the majority of publications upon the wintering of bees. Each commercial beekeeper has arrived at his own requirements by trial and error, and from the standpoint of protection from cold alone they have doubtless come closer to the ideal than had they followed the recommendations set forth.

These findings also intensify the importance of other recognized standards essential to the successful wintering of bees. It is certain that too much stress cannot be placed upon the supply of a sufficient quantity of the best quality of stores, from the standpoint of freedom from dextrine and the propensity to granulate, properly placed in the hives; the provision of young queens; the establishment of a normal colony of good strength containing both old and young bees; sufficient ventilation of the colony at all times; and protection by a good windbreak from the prevailing winds. In addition to these, there is indication that attention should be given to the prevention of unnecessary flights, especially during the fall and early spring periods. This point needs further investigation and an inquiry into practical ways and means.

PREPARING BEES FOR WINTER

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At the approach of cold weather it will be noticed that all nature prepares itself for the winter. Birds migrate to the south where they will find food and shelter for the cold months. Certain insects and other animals prepare to hibernate, but not so the honeybee. It cannot migrate to escape the cold, neither does it hibernate, in the true sense of the word. It must live within a properly protected place with an adequate store of honey to survive the winter.

Bees belong to a group known as social insects, and as such live in colonies. A normal colony or hive of bees, during the fall months, consists of many thousands of worker bees and one queen. The drones are usually eliminated at the close of the honey harvest.

Ordinarily a hive of bees will have sufficient honey on hand to maintain itself through the wintering period. It is according to the instinct of the honeybee to provide for this during summer. When there is not enough honey present it is usually due to too much of it having been removed by the beekeeper.

Bees are responsive to temperatures. While the temperature within the hive is maintained at about 96° F. the queen lays eggs and brood-rearing continues undisturbed. At the approach of cold weather in the fall brood-rearing ceases. When the temperature lowers to 57° F. the bees assemble to form a hollow, spherical shaped cluster in the hive. This cluster is formed for the purpose of conserving the natural body heat of the bees and is maintained as long as the temperature surrounding the bees is 57° or lower.

Throughout the wintering period the bees feed on honey which is well known as a heat or energy producing food. The temperature of the cluster is maintained by the muscular activity of the bees and this activity is furnished by the honey which the bees consume. It should be the aim of the beekeeper to prepare his bees in the fall so they will winter over with a minimum expenditure of energy.

From a practical standpoint, the life of a bee has been compared to the life of a dry cell battery. Either one has a certain amount of available energy and when that is spent the battery or the bee may be regarded as dead. This would seem to explain why a honeybee lives but a month or two during the busy summer season. The bees, of a colony that is properly cared for, will live the full five or six months of winter and will be ready to take part in hive activities in the spring.

PROTECTION

Proper protection consists in insulating the bees against the cold. This protection is usually furnished by placing the hives in a cellar for the wintering period or by placing a quantity of packing around each hive outdoors. Placing the hives in a cellar simply means that the owner considers his whole apiary as a unit and furnishes insulation or protection by one operation; whereas, putting the hives in packing cases outdoors really means that the owner must consider each hive as a unit.

AMOUNT OF STORES REQUIRED

As to the amount of honey a colony will need, it is generally recommended to leave at least 50 pounds in the hive previous to placing it in winter quarters. It may not need all of this to carry it through until natural sources in the spring are readily available, but it is a safe assurance against starvation to leave at least this amount. The important thing to keep in mind is that the colony will consume the amount it needs. If there is not enough readily accessible to the bees the colony will starve, but if there is a surplus amount this will be held over and the beekeeper may recover it in the honey harvest of the following season.

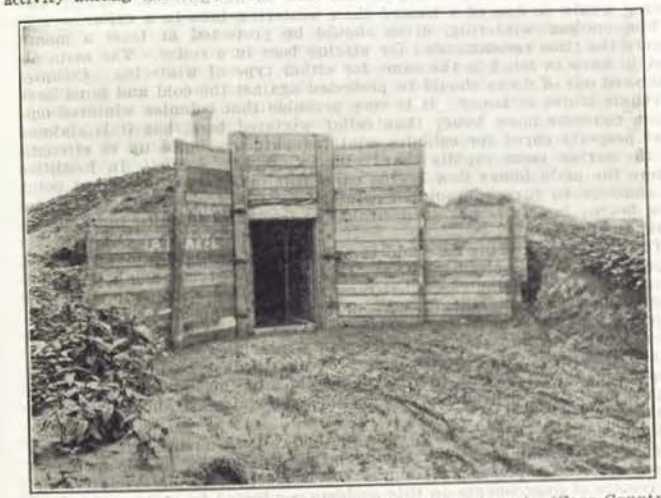
The beekeeper should assure himself that there is a sufficient amount of honey present in the hives or else that there is a reserve supply set aside to give the colonies in case there is a shortage of stores in the hives later on. It is advisable, however, to see to it that the colony is provided with ample stores before placing it in winter quarters. If the honey supply is inadequate or of poor quality for wintering bees this lack may be supplemented by feeding the bees sugar syrup at the cessation of brood-rearing in the fall.

Normal colonies having plenty of young bees is a requisite for good wintering. Any colony that is headed by a young, vigorous queen should be all right in this respect.

During the fall months the beekeeper should see to it that the entrance of each hive is reduced in size. This will serve a double purpose. First, it will assist the bees to maintain a proper hive temperature and second, it will help the colony to defend itself against robber bees. A good shelter belt of trees is also a requisite for the apiary during the period that it is exposed to inclement weather.

CELLAR WINTERING

For this section of the country most beekeepers make a practice of wintering their bees in cellars. Any well constructed cellar will serve the purpose, provided it will hold at a fairly constant temperature of 40° F. to 45° F. throughout the wintering period. Extremes of temperature, either above 45° F. or below 40° F., are conducive to over activity among the bees, or in other words, "bad wintering." The cellar



A well constructed cellar owned by Robert Kain, Amenia (Cass County) North Dakota. Cellar is 70x14x6½, opens north.

should be kept dark at all times because bees become restless if sunlight is admitted to their wintering quarters. The ordinary type of cellar beneath a house may be adapted to winter bees by partitioning off a section and darkening the windows of the part in which the bees are wintering. Beekeepers should guard against over crowding as over crowding may bring about high temperatures. Usually hives are placed in rows on a support which will raise them several inches above the

cellar floor and stacked up in tiers about four hives high. An alley way should be left between the rows, wide enough so that the hives are readily accessible. A limited amount of ventilation should be provided.

In North Dakota bees are moved to cellars during November; the exact date depending on the type of weather prevailing at the time. For most seasons best results are obtained by moving colonies in between November 10th and 15th. The usual recommendation is to move them in at the end of the last spell of warm weather suitable for bee flight. The colonies should be disturbed as little as possible while moving them as disturbance causes the bees to become overly active. When moving the hives indoors it is of interest to weigh each hive. This will enable the beekeeper to form a fair estimate of the stores consumed during the cellar period, provided a record is made of each hive weight again at the time of moving them outdoors in spring. An excessive amount of honey consumed by the bees during the wintering period is an indication of poor wintering conditions. Hives are usually moved from the cellar to their outdoor locations during the latter part of March.

Although the great majority of beekeepers in this latitude practice cellar wintering and best results have been obtained by this method, nevertheless a certain amount of interest has been accorded outdoor wintering. This type of wintering calls for protection of the hives with a good layer of insulation material such as flax chaff, planer shavings, dry leaves and so forth. It may be said that where a good cellar is not available or where the owner must be away for the winter and cannot arrange for someone to look after his bees in his absence, outdoor wintering would be less of a hazard than wintering bees in a cellar.

For outdoor wintering, hives should be protected at least a month before the time recommended for placing bees in a cellar. The main object to keep in mind is the same for either type of wintering. Colonies wintered out of doors should be protected against the cold and must have adequate stores of honey. It is very probable that colonies wintered outdoors consume more honey than cellar wintered bees, but it is claimed that properly cared for colonies wintered outdoors build up to strength in the spring more rapidly than cellar wintered colonies. In localities where the main honey flow begins early this may be an important point to consider in favor of outdoor wintering. However, where the honey flow begins late it is not so desirable to have the colonies build up so early in the season.

The type of wintering case and the packing or insulation material used depends largely on circumstances. Lumber is most commonly used for construction of packing cases, but tar paper or other weather proof paper tacked over a frame, chicken wire or other materials may be employed, provided they will hold the packing in place. Lumber usually makes a more permanent and satisfactory type of wintering case.

In constructing the case, provision or space must be allowed for the proper amount of packing to all exposed sides of the hives. The amount of packing to use depends largely on the material used and the severity of the climate.

When deciding upon the proper method of wintering bees, whether indoors or out, the beekeeper should be guided largely by his own past experience, the experience of successful beekeepers in his vicinity, and the results of experiments on this problem conducted by state and federal research workers.

HOW BEES WINTER

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BIOLOGY

If most any beekeeper should be confronted with the question, "How do bees survive the winter?" the answer would probably be "They just live through, that's all." Few people engaged in the production of honey have a true conception of how the bees withstand the rigors of our

northern winters. No doubt if more apiarists had a real appreciation of the difficulties which the bees encounter and how they have to overcome these difficulties there would be greater effort to assist the bees in their struggle to carry over the winter. When we talk about a colony with a large population of young bees, when we talk about sufficient stores of good quality and when we talk about protection, the average mind does not conceive of any relationship between these items and the wintering over of bees. Bees always have been present and probably always will be present, is their line of argument and why fuss about all this complicated system of wintering bees. But those of us who are close to the problem of increasing the efficiency of production have come to look upon the wintering period in a large sense as the foundation for successful honey production.

The case of one beekeeper recently came to our attention, who had come to the conclusion that his colonies could not profit by a honey flow unless they were properly prepared and this preparation began early in the fall of the preceding year. There are some who argue that bees under natural conditions such as those in trees and houses never die out during the winter. This may be true in the main but when man places the bees under artificial conditions in hives with no insulation and takes too much of their honey from them, it is hardly fair to expect the bees to overcome such a handicap. Remember that a good colony of bees must gather around 400 pounds of honey to meet its own needs for existence.

The long period of adverse conditions, such as our winter is met in different ways by different animals. Some hibernate and under these conditions the food is stored up in the body and the processes necessary to maintain life are kept at a very low ebb. A typical example of this type is our friend the bear. There are cases among some of the close relatives of the honey bee, such as the bumble, where all of the individuals of the colony die with the exception of the queen, which is able to hibernate and survive low temperatures. Ants, on the other hand, hibernate in a mass during the extreme cold weather. Some creatures migrate from the colder climates to the warmer regions but this type of wintering is largely restricted to those species which fly and can make their shift in a minimum of time. It would be a rather difficult proposition for some of the animals which summer in the north to walk to the south for the winter. The only other method of meeting the situation is to stay in the northern climate and be prepared for the weather as it comes. This is what a large majority of the creatures do, including the honey bees and man.

It can be noted throughout nature that where the creature remains under the severe winter conditions, it is necessary to supply an exceedingly large amount of food and to give as much protection as possible. As a matter of fact, that is what all of us are doing. We are filling our basements with food supplies with which to fight the winter temperatures by giving extra energy to our bodies and we are laying in fuel with which to keep the house up to the summer temperature. When we go out of doors we are well protected from the wind and cold by exceedingly heavy garments. The honey bee undertakes to store ample food with which to carry over the winter and under natural conditions this is usually accomplished but where man steps in, there is apt to be a shortage of food for colony use. The honey bee is peculiar among the insects in that it does store against these adverse conditions, and upon that habit rests the honey production industry as practiced by man. The food supplies which we have placed in our cellars are for maintaining energy to carry our necessary activities and this is supplemented by the devices used to moderate temperatures. Now the honey bee cannot, strictly speaking, put coal into the cellar nor can it grow additional fur as do some of the animals nor can it put on additional

clothing as does man. It must depend upon another set-up of these fundamentals.

It is a matter of common observation among producers that as the fall period advances, the bees may be seen chinking up the cracks of the hives with a material called propolis. This is carried so far by the Caucasion race of bees that they actually reduce their entrance to a very small opening to further protect themselves against the winter winds creeping into their house. This is undoubtedly quite necessary in the native home of the Caucasion bees on the windswept steppes of southern Russia. On the other hand, our common bee, the Italian, originated in a more sunny climate and does not show this instinct to as great an extent as the Caucasion race. It is also noted by producers that the bees become less active as the fall season advances with its ever lowering temperature. The community and cooperative effort within the organization of the honey bee has been developed to such a high degree that as an individual conditions do not count for much. The adult bee, for instance, cannot withstand very low temperatures for a very long period of time. Individually it is not capable of correcting temperature enough to maintain itself against even moderately low temperatures.

It has been determined that, as the temperature lowers, the bees become less active and at the approach of a temperature determined to be 57 degrees Fahrenheit, the bees organize themselves very definitely to protect against any temperature lower than this. This organization is known as the cluster. If we could maintain our temperature conditions exactly at 57 degrees throughout the winter, regardless of outside influences, the bees would keep their activities practically nil; not much different from hibernation. However, as the temperature lowers below 57 degrees, it is necessary for the bees to become active against the cold by manufacturing heat of their own. In theory this cluster is a sphere or ball of bees. The outside shell, also called the rind, is made up of three layers of bees which are inter woven as shingles on a roof. Of course, this sphere is only theoretical because it must be maintained in the spaces between the combs and cannot continue as an actual shell on account of the combs at regular intervals. Here again it is exceedingly fortunate that beeswax is such a slow conductor of heat and assists the bees in their effort to maintain temperatures throughout the winter period. A cluster may be said to incorporate three frames, four or five frames. It is necessary to visualize this theoretical construction in the hive under actual conditions. The interesting thing is that normally this cluster of bees approximates the theoretical sphere, that is, if it is evidenced from inspection at the top that the bees are covering five frames, it is only reasonable to suppose that the cluster is the same diameter in the opposite direction or toward the bottom board.

This shell of the cluster serves a double purpose. It prevents the cold air from making direct contact with the bees inside and conversely it tends to prevent the dissipation of heat from the inside to the outside. As the weather becomes extremely cold, the size of the cluster is reduced so that the surface exposed is much less and, therefore, more efficient in retaining the heat of the cluster. A point of vital importance to the producer is the realization of the fact that this cluster, while it retains the typical formation, can move only in certain directions within the hive. It can move forward or backward and upward but it cannot move sideways. This is of extreme importance in connection with the problem of stores. Colonies have been found dead in the spring with plenty of stores in the outside frames, because the temperatures were so low that the cluster could not move sideways to get the stores. Therefore, they had to perish. Also when two Langstroth hive bodies are used, it is common for the cluster to move up in the second story during the winter and leave stores in outside frames in the lower story. The cluster is usually formed so as to just include a small rim of stores, but cannot take place on full combs of honey.

Inside of the shell of the cluster we have a very interesting organization. A large number of bees can be found lying in the empty cells and they are there as nearly motionless as possible. It is evident that their main objective is to conserve their energy to the greatest possible extent. There are other bees inside of the cluster that are quite actively engaged in a definite set of movements which has as its function the creation of heat. They are reality the furnaces with which the cluster is warmed. The amount of heat produced will depend on the requirements as they may be augmented by the form of packing, which they receive from the beekeeper. It must not be assumed that the bees maintain their respective stations as outlined for a long period of time for there is a division of labor throughout the winter just as there is in the summer. It must be evident to anyone that the bees in the outer layer of the shell would soon become so numb that they would drop off and be of no serivce to the colony. There is a constant interchange of the bees in the layers of the shell of the cluster. There is also an interchange of the bees from rest to the manufacture of heat and from these occupations to that of work in the shell.

It can be seen then that the organization of the bees to withstand the winter temperature consists of a protection against temperature and the creation of heat within this protection, which also works to conserve the temperature that it manufactured. This temperature which is made by the bees is at an expenditure of stores consumed and an expenditure of energy on the part of the bees involved in the work. It should be evident why so much importance is placed on young bees which have plenty of energy and stores of good quality, as that is necessary for the production of heat, and protection in an effort to reduce the load which the bees must carry themselves. The efficiency of this cluster is recorded in an experiment conducted by the Bee Culture Laboratory a few years ago when it was found that there was a difference of 68 degrees between the thermometer recording temperature inside the center of the cluster and the one recording the outside temperature. These thermometers were in reality less than 4½ inches apart.

The temperature maintained within the cluster under normal conditions is not very high, simply enough to meet the requirements of the bees in their activity. Under abnormal conditions the temperature may go quite high. Cases have been observed where conditions were purposely made abnormal, when the cluster temperature was raised high enough the queen began to lay eggs and brood was developed. This, of course, was severe drain on the colony and resulted in untimely death of all of the bees in the hive. In further experiments conducted by the U. S. Department of Agriculture the following summary was made: "The energy produced by the bees was greater, according to body weight, than that produced by man when working at hard manual labor. Even assuming that the work of the period were equally divided among the bees, the energy output per unit of body weight is higher than that of the average laborer. When we take into consideration that usually the bees do not have such favorable conditions in winter as the experimental bees had, it is clear that the energy output is enormous in the average colony of the average apiary." It should be evident from this discussion that, if the bees get through the winter, they do it by their own hard labor. Work is expensive to them, especially when kept under the artificial conditions.

This discussion has dealt entirely with temperatures, incidentally mentioning the factors of young bees, stores and protection. There is another factor which is extremely important in Iowa and shows up very definitely in the practice of wintering. This item is moisture. Moisture will accumulate in the hive from two sources, as by-product of the effort of the bees to maintain temperature through the consumption of stores and dampness will get into the hive through the entrance from the outside air. A great amount of moisture will be found on the sides of the hive if conditions are imperfect for maintaining heat and the labors

of the bees are excessive. In fact, cases have been reported here in Iowa where the bees were found dead encased in a block of ice. It is not entirely a matter of temperature but also a problem of moisture. This moisture can be overcome in part by correct conditions for the bees in their effort of meeting the temperature condition. One beekeeper reported that winter packing was unnecessary since he had found his bees sweat so hard in the early spring that water ran out of the entrance of the hives. He did not know that this water was coming from melting ice inside the hive where the bees had perished in their attempt to survive the winter under the handicaps which he had imposed on them.

COLONY POPULATION

An attempt has been made to emphasize the fact that the bees themselves must actually make the necessary temperature by which they can survive the winter and such manufacture of temperature means expenditure of bee energy and a consumption of stores. These items are basic in any consideration of the problem of wintering.

There is another fundamental which must be considered at this time in order to fully appreciate the necessity for colony population. It has been said that an adult bee is like a dry cell in that upon beginning life it is endowed with a definite amount of energy and when this is expended the death of the bee follows. The honey bee as an individual differs from the individuals of a good many other animals in that its tissues cannot be revitalized. The strain of work on the system is accumulative and the action is positive. Most people think when they are considering the honey bee that there is no particular restriction on the life of the individual. Just a few days ago I was talking with a group of people, some of them were honey producers; all expressed considerable surprise that if a bee works to full capacity its length of life is 42 days. This length of life must be increased of course to carry the population and the colony through the winter. In order to lengthen the life of the bees it is necessary therefore to reduce the labors or the energy expended for each individual. That is just what we are attempting to do in building up a large colony population for there is a division of labor and the total overhead of the colony is divided among the large number of individuals with a result that the strain on each individual is less than if a small number of individuals were required to carry the same load. If should be evident that if a given amount of work is to be done and if it is divided equally that 15,000 bees will not have to work as hard individually as though there were only 10,000 bees. This takes care of one of the items of a large colony population.

There is also another item which is often referred to but not fully appreciated which is that the colony population should be made up of as young bees as possible at the beginning of the winter. We may say for example that a bee coming into adult life has 1,000 units of energy which is its total amount to be expended. If this bee starts its activities in July and does the customary amount of housework we can say for example that 200 units of energy will be consumed in this way. If the honey flow continues these bees may undertake field work and it is possible that they might expend another 200 units of energy gathering honey. The activities during the fall are lessened and it is reasonable to assume that during the period the bees will expend 100 units of energy. It is easy to see that if winter conditions are not ideal that this individual might be called upon to expend 500 units of energy during the winter period. By a simple process of mathematics in our example this bee would die because its supply of units of energy are expended. Therefore there would be no energy and no bees left with which to build up in the spring for the colony to gather honey in the summer. Now, of course, it is possible to vary this example, but the points that we want to bring out are these: If the bees are reared late in the fall there will be at least a saving of the hive work of 200 units of energy and there will probably be saved 200 units of energy in the field work, which in reality is a large

proportion. If the other two items should remain the same it is evident that these bees would come through the winter with energy to establish a colony in the spring. We go farther in this example and make every effort to reduce the expenditure of the winter from 500 down to 200 or 300 units. This would bring the individual bees into the spring period with still a large amount of energy with which to build up and prepare the colony with the honey flow.

The items which have been given above are fundamental but it is true that they will vary according to local conditions. They should serve as an example to illustrate the point which we are attempting to make clear at this time. Late reared bees are those developed after the honey flow and before the first frost, the ones which will actually be in the hive the next spring to start off the colony. It should be evident from what has been said that there will normally be a large death rate of bees during the late fall and early winter which is sometimes spoken of as a natural death rate from old worn out bees. Most producers are not seriously concerned or disturbed with such a death rate for if the manipulations have been properly taken care of, the colony contains a sufficient number of young vigorous bees with which to start off the colony in the following spring.

Mention was made of the fact that the bees can be reared in the fall by the introduction of young queens and in some localities where there is a fall honey flow brooding will develop sufficiently under normal conditions. This year seems to have been an exceptionally good year for fall brood rearing and in recent trips that have been made among producers it has been a matter of common comment that a considerable amount of brood was being reared. One large producer even expressed the fear that the colonies might contain too many young bees. Bees reared late in the fall start the winter with a big per cent of available energy and if winter conditions are at all favorable it is possible for them to come into the spring with a reserve energy when there is a demand for heavy expenditure. Many producers overlook the fact that demands are very heavy on the colony population during the spring. During the winter when the colony is only confronted with maintaining the living temperature of 57° the situation is not difficult but during the spring when it is necessary to maintain 94° for brood rearing the strain on the colony is very much increased. It is interesting to note that beekeepers are becoming aware of the necessity for efficient honey production. One of the items in efficient honey production is to build up a good colony in the fall and take care of it through the winter so that it is can start properly with its activities the next spring. Once in a while we find a beekeeper who maintains that too large a colony will consume too much stores over the winter, but most of us would prefer to leave that to the bees, let them be the judge. The fact remains that it is hard to get too large a colony with which to start the brooding up period in the spring.

STORES

It has been shown that bees manufacture the temperature needed to protect themselves against the cold of winter by the consumption of stores which they convert into heat. The stores then serve as the fuel of winter activities. This heat produced by the bees is a form of energy the same as is any other heat and it is fortunate that honey is high in heat producing ability. Therefore it is a very efficient material for the bees to use. Mention has been made of the fact that under natural conditions the bees are usually frugal enough to supply themselves with the honey which will be needed to carry them over the winter period, and the difficulty comes when some of our producers are too anxious to make a big crop and take away too much honey. Of course we all make mistakes and occasionally someone will figure on more honeyflow later than is actually gathered by the bees.

Under our system of management of taking away from the bees it is

absolutely necessary to make a careful inspection in the fall to determine that sufficient stores are present for the colony to over winter. The rule has been given that five pounds of honey are necessary to carry one pound of bees over the winter or from the end of the fall honey flow to the beginning of the spring honey flow. This may not mean very much to the average producer until it is translated into everyday terms. The average producing colony in the fall should contain from 5 to 6 pounds of bees so that the amount of honey required then is a matter of mathematics. An experiment conducted here at Ames proved that under normal conditions 54 pounds of honey were consumed by the colony during the winter period. Now there is another interesting thing which is suggested among the bees; they take out an "insurance policy" showing us that they are exceedingly thrifty. This policy is 15 pounds of reserve stores and whenever the supplies in the colony reach that stage the activities of the colony, especially for brood rearing in the spring, are very much restricted. One of the large producers made a statement recently something like this: "Last spring it seemed as though we could not get feed to the bees fast enough; they were on the edge of starvation throughout most of the spring." This shows, of course, the need of leaving plenty of stores in the fall so that the bees will not be hampered in any way during the spring. And it also shows that the continuous heavy demand which is made on the stores by the colonies during the brood-rearing period.

It is necessary for the beekeeper to assume responsibility for the above amount of stores for every colony of bees. It doesn't make any difference what type of equipment is being used, the fact remains that the fundamentals of the bee behavior and the activity of the colony are the same. It has become a general practice where the beekeeper is using the 10-frame Langstroth hive that another hive body filled with stores is placed on the colony in the late fall if the colony is to be wintered out-of-doors and protected. Where cellar wintering is practiced the management consists of rearranging the brood chamber in one story making sure that sufficient stores are present to carry the colony through the actual period of confinement and then another hive body of stores is held in reserve to place on the colony when it is taken out of the cellar in the spring. Where large hives are used it is necessary to examine the brood nest and recondition it with frames of honey to make up the necessary amount of stores which will be needed. There is a question in our mind as to the amount of stores supplied for these needs by placing a shallow super of honey on top of the ten-frame Langstroth hive. It may be that our conditions in Iowa are extremely severe and require more stores than in other sections of the country, the fact remains that we know what our consumption is and must supply that amount for every colony if we expect it to give the maximum return.

All honeys are equal in their food value but they are not equal in the amount of materials which are sometimes called "gums" or of other impurities. The fall honeys generally speaking contain more undigestible matter than the summer honeys and therefore many beekeepers practice saving some of their best honey for use in the colony for the winter period. As a rule honey from trees contain more undigestible matter from the honey obtained from clover. This item is extremely important during the winter period because when the bees consume stores the undigestible matter is accumulated until flight is possible. It should be evident to anyone that when the bees are restricted in their flight as they are in the winter time and if they are called upon to consume stores heavily or excessively that there is an extreme accumulation of the undigestible material in their bodies. This extreme condition results in what is known as dysentary in the colony during the late winter or early spring. It is for this reason that the January flight is so important to outdoor wintered bees, and it is for this reason that bees become so restless at the end of the cellar period when they have consumed so much stores and have an accumulation of undigested matter which is causing unrest. It should be evident then that conditions should be made the very best so that the bees will be able to keep down their consumption of stores and furthermore that the stores should be of the best quality so as to reduce the amount of accumulated undigestible matter.

There is still another important matter in regard to stores and that is the location of them. Reference has been made to the fact that the winter cluster could not move sideways in the hive at temperatures below 57 degrees. Therefore the stores in the hive should be so placed that they will be available to the colony population in the period of low temperature which means that they should be above the cluster. In the case of a large hive extra stores supplied to the colony should be placed as close to the cluster as possible and not in the outside combs of the hive.

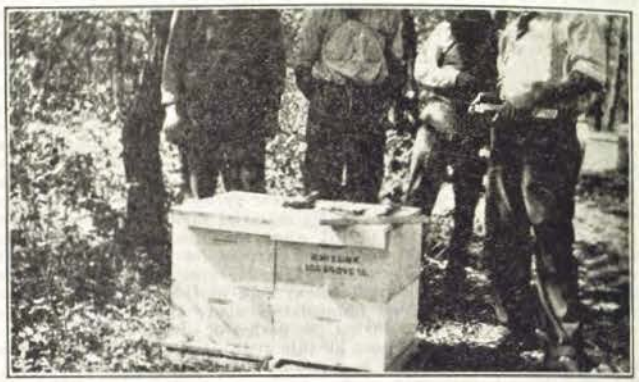
If there should be a deficiency of stores it is necessary for the beekeeper to make up the difference. Some prefer to add frames of honey which of course represents the ideal food for the bees, while some prefer to feed honey which has been extracted. It is necessary to make sure that such honey has been produced by disease-free colonies. It does not pay to give the bees undesirable honey at this time of the year so many beekeepers are in favor of feeding a sugar syrup for the fall. It is true that sugar syrup has no undigestible material in it and therefore represents an ideal feed for the period when the bees are confined. Sugar syrup apparently does not serve the purpose for brood rearing in the spring. Morley Pettit of Ontario, Canada, practices feeding a small amount of sugar syrup to each colony late in the season. The reason for this is that it is stored immediately above the cluster in a place where it will be consumed during the period of confinement.

If sugar syrup is to be used at this time of the year to make up a deficiency of stores it should be made by using six pounds of sugar and four pounds of water. This makes a very heavy syrup and unless it is properly prepared and given to the bees readily it will granulate. Some even use a syrup made of equal parts of sugar and water. Measure out the water, bring it to a boil and remove it from the fire. Add the sugar slowly and agitate until the sugar is entirely dissolved. The syrup will be taken up more readily by the bees if given to them while a little warm. The ordinary honey pail makes a very fine feeder. For half and half syrup, four holes can be punched in the lid of the pail the size of a six-penny nail, these holes should be distributed over the cover. The pail is then inverted over the frames and the drip will be taken up by the bees. Feeding should be done rather late in the evening and if a 5-pound pail of syrup is given the average colony will take it up during the night. This will keep down any tendency to robbing.

PROTECTION

We have made an effort in this discussion to describe the situation so that you would be enabled to construct a mental picture of this cluster of bees hanging between the combs of honey showing all the bees inside of this with the work of creating heat or their desire to conserve energy by remaining motionless within the cells when they have an opportunity to do so. We have made an effort to show how this cluster of bees is restricted in its movement throughout the winter, when temperatures are below 57°. An effort has been made to impress on producers that since the colonies must stay in this climate over the winter and combat the low temperatures which prevail, that there is a need for a large number of young bees in populous colonies in order to carry the load of making the necessary degrees of heat which will maintain the living temperature for the bees. It has been shown further that in order for the bees to manufacture this heat that plenty of good stores are necessary for them to maintain the necessary temperature with which to survive the winter.

The real crux of the winter problem is after all the matter of protection which serves as the overcoat of the colony. It serves to reduce the load which the bees must carry in order to maintain colony life over this long and unfavorable period. Protection is the beekeepers' aid in helping to correct the winter temperature so that the bees of the colony will not have to work so hard in making the necessary degrees of heat and use up units of their valuable energy which is needed so much in the spring. As a result of reduced heat production the consumption of stores is reduced and following this the accumulation of impurities is less. Protection is the means which the beekeeper can use to full



Set two (2-story) colonies together, make the tunnel.

advantage in helping to overcome or correct any deficiency in colony population as well as age of bees and any deficiency in colony of stores with which the colonies enter the winter period.

Protection is the keystone to the arch of wintering. The winter period is rightly called a period of conservation; it should not be interpreted as merely a period of struggle for existence during the cold months. The objective of the winter period is to bring through to the spring and ready for active work, as large a percentage as possible of the population of bees developed in the fall. The objective of wintering should be to bring through a first class colony of bees ready to handle the load which is required in the spring. Too many beekeepers today are satisfied with wintering, if there are any live bees in the colony together with the queen. A handful of bees in the spring will not carry an overload of duties during the brood-rearing period and cannot be compared to a colony of bees full of reserve power with which to build up during the spring in anticipation of the honey flow. Why expect bees to overcome temperature differences without some assistance when it is a general rule of animal life to be aided for winter? Some may insist that bees living over the winter under natural conditions survive even though they do not receive aid from man. We cannot say how many survive and we cannot measure how well they survive; furthermore the bees use only such places as afford better protection from winter temperatures than the hive provided by man. The hive now used is a convenient tool for the harvesting of honey reduced to the least cumbersome style.

There are two general types of protection which may be used for helping bees through the winter period. They are indoor or cellar wintering, and the use of outdoor protection, in one form or another.

Cellar protection of bees was first used and until a few years ago was the only method employed. In areas where low temperatures prevail it was the common practice to put bees in the cellar. In other districts where cellars seemed unnecessary the bees were left to depend on their own resources. The results were not at all satisfactory in the large territory

Surround colonies with heavy felt tar paper.

lying between the areas of protection and those of no protection. In areas of uniformly low temperature throughout the winter, cellars have been highly satisfactory. The cellar has its limitations, although their use is sound practice and must depend upon local factors as to whether they should be used in preference to outdoor protection.

OUTDOOR PROTECTION

Where bees are to be wintered outside it is extremely important that some form of windbreak be available. Of course a natural one is much to be desired and it can often be found on the Iowa farms. Where a tree windbreak is not handy it is possible to locate the bees on a south or southeast slope in such a manner that they will be protected from much of the prevailing wind. Wind is present a great deal of the time in Iowa and is of considerable importance in the winter problem of bees. There are two types of artificial windbreaks, permanent and collapsible. The former would seem preferable whenever the apiary is likely to remain in one location for more than one year. A good shelter can be made by nailing boards of one by twelve inch (1x12) dimensions upright on a frame of 2x4 material. The frame must be securely placed in the ground so that it will withstand the wind pressure. The boards should be placed one inch apart which will permit a slight amount of air to pass through and so aid in the wind break effect. The height of such a windbreak may well be 8 feet. A windbreak is of greatest value in the spring but of immense value throughout the year. The prevailing wind must be determined for each locality but on the whole it is from the northwest, so that the windbreak should be constructed on the north and west side of the apiary.

It is necessary to provide a suitable covering for the hive for real outdoor protection of bees. The packing case method of wintering developed rather recently is especially serviceable for small beekeepers. With only a few colonies it is difficult to afford proper cellar facilities. Furthermore bees need a protection in this state over a long period of time, so the outdoor type of winter protection seems advisable. It has

Pack in ample fine chaff or straw.

been said that anyone can winter bees; the problem in Iowa is the spring brooding up period. It has been shown in experiments conducted at Ames that bees need protection less during the months of December, January and February when only 57° is necessary to maintain life than they do during March, April and May when 94° is necessary for brood-rearing. As a matter of fact protection is needed almost as much during the fall period, especially during that time when brood is being reared as they do during the actual period of winter.

The tar paper case has proved very popular in Iowa during the last 5 to 10 years. It was evolved by Mr. John E. Jessup, who is now commercially producing honey in the Council Bluffs area. This type of case has been selected by the majority of the cooperators, in connection with the demonstration apiary work which has been conducted throughout the state in a large number of counties during the last twelve years. The advantage of this type of winter protection is its low initial cost. The disadvantage is that in the spring period it is not as satisfactory as the wooden or Iowa packing case. When colonies must be examined in the spring it is necessary to remove so much of the packing that ample protection may not be afforded during the spring. In the operation of the Iowa case the packing material is removed to the inner cover when all the colony manipulations are easy and the case and material remains to serve as a needed protection until swarming is at hand if desired.

It was my privilege to see last spring a very fine example of the value of winter protection in the field under actual conditions. One yard was visited which had been carefully packed with the tar paper case after it had been manipulated according to the suggestions given in this article. An examination was made on April 10th of these colonies at which time it was found that there were seven Langstroth frames almost filled with brood in each case. This certainly meant a tremendous potential colony population with which to gather nectar during the honey flow ahead. Later in the afternoon a visit was made to a beekeeper who has modern equipment, believes in good queens and other items of modern production but for some unknown reason was sold on the idea that bees did not need winter protection. An examination of the colonies in his yard showed a small part of brood in two frames; the entire amount not equalling over two-thirds of one frame of brood. The colony population was very meager, the struggle was severe to keep up the temperature required for this brood rearing without any protection during the cold wind of spring. The question then is "does winter protection pay?" It would seem to us "Yes" by a large majority when we can find that colonies without protection have about two-thirds of a frame of brood struggling for an existence as compared to a colony nice and snug boiling over with population and containing seven frames of potential bees

with which to gather honey. As a matter of fact the packed yard was visited a month later in the season and at that time 300 pounds of surplus honey was in the supers on these hives. It was not possible to check the other yard, but anyone familiar with honey production knows that it takes a colony of bees worth while to gather 300 pounds of surplus honey. In our opinion there is nothing which will pay better in connection with beekeeping than to give every colony of bees the best possible attention during the winter and as has been said, protection is one of the biggest factors in the winter program.

Wooden or permanent packing cases have not been used by beekeepers in the last 15 years as frequently as they should be due in part to faulty construction of the early models. The case which has been developed here at Iowa State College known as the Iowa Packing Case does overcome some of the undesirable features of the early types. The chief objection to a permanent packing case is its initial cost which seems high but the ultimate cost is not any greater, if as great, as the temporary case such as the tar paper. The permanent case is perhaps better adapted to backyard beekeeping where the bees will undoubtedly be kept in the same location throughout the year. The tar paper case has proved very satisfactory in large commercial yards as well as the small back lot apiary. The details of the tar paper case giving an estimate of the materials and a detailed statement as to the method of packing and similar statement as for the Iowa case are found in Bulletin No. 141 of the Agricultural Extension Service. This publication is free and will be gladly sent to anyone upon request. A blueprint is available for the construction of the Iowa case; this gives accurate bill of lumber and all details of construction. This is also free to anyone who is

Tie the top on securely and bid adieu.

interested in the construction of a case for the protection of their bees.

In order that the cases may serve to the fullest it is well to pack bees during the first two weeks of October. This is especially true if the colonies need feeding for it is a simple matter to feed bees in the cases. Bees in packing cases are warm and will take up stores more readily and prepare it properly for winter use. Colonies are packed up even to the inner cover and the feed pails are then inverted over the holes in the inner cover. Feeding in the packing case eliminates the necessity of supers to inclose the feeding pails and in such cases with good pail feeders robbing is not likely to get started.

The cases should face the south or the east and should be level or slightly inclined to the front. Packing may be started just after sundown or early in the morning for at that time the bees are less active. If a little smoke is used the bees will not be inclined to leave the hive. The case may be entirely assembled and the packing material can be placed in even with the top of the rack before the colonies are moved. After smoking and removing the outer cover, lift the colony to the top of the case corner. Rest the hive and insert the tunnel. Lower the colony front and ahead with one person guiding it and one person lowering at the rear end. Place the two center colonies first and then the end one on either side of these. The packing may be placed around the colonies at any time, even days later if it is more convenient. Be sure the tunnels fit securely so that the packing will not settle into them and stop up the bee entrance causing the colony to smother.

A careful series of experiments conducted at the Minnesota Experiment Station indicated that bees given outdoor protection gather the most honey during the following year. The bees given cellar protection were second in production and bees given the protection of double walled hives and other miscellaneous types of protection followed in the list. The type of protection is not the important thing. The important thing is to give some type of protection either outdoor or indoor as cellars.

CELLAR PROTECTION

Methods of cellar wintering practiced throughout the northern territory seems to have been rather unsatisfactory. This is probably due to the fact that insufficient attention has been given to the details of cellar construction and cellar operation. Cellaring can be made more practical and satisfactory if the necessary attention is given to it. The results would be much more satisfactory if as much attention were given to it as outdoor protection. The placing of the bees in a cellar is only another way of putting insulation about the hives, the only difference being that in the cellar all of the hives are protected alike and protection is placed about the apiary instead of around the hives in groups or singly. The policy which applies to successful outdoor wintering applies equally to the protection of bees in the cellar. It is urged, that more attention be given to wintering bees in the cellar and to study the available literature on the subject.

Before deciding whether or not bees are to be wintered in the cellar some factors must be considered, such as the prevailing climate in the territory, the average amount of winter stores which are available to the bees and the location of the apiary in regard to natural protection such as windbreaks. Cellar wintering is quite satisfactory in localities where the average temperature in the winter months falls as low as 15° below zero. In localities where the normal stores for the bees are not of first quality it is safer to winter bees out-of-doors, which will provide for at least one period of cleansing flight. This is a big factor in determining the territory for the practice of cellar wintering. Where cellar wintering is practiced it is not necessary to leave so much honey with the bees during the time they are in the cellar, and it is not necessary during that period to leave additional room for the rearing of brood. During the coldest part of the winter the bees need a special protection from cold and wind although enough good stores must be in the hive to insure them heat production in good condition. Probably a large part of the failure of beekeepers in practicing cellar wintering is due to the fact that before and after the bees are in the cellar the important factors of stores and breeding room have not been adequately supplied. Before the bees are put into the cellar they must have room for breeding and stores in abundance and after they are taken out of the cellar these two factors must be present in greatly increased abundance. Producers in Woodbury county carefully select a hive body of good sealed honey for every colony placed in the cellar to serve as spring food and brood rearing room.

As a type of protection cellars cannot be condemned in any way, but it is necessary to realize the limitation and their application. Cellar wintering of bees will always be a sound practice and therefore can be used where the local factors make it better than any other type of protection. The comparative value of the two methods of wintering bees depends upon several factors. The outstanding objection to cellar storage is the fall and spring exposure of the bees. From the time when the colonies can be put into cases to the time they can be put in the cellar there are many days of low temperature which call for high food consumption and energy expenditure. The real period of hardship in Iowa is during the spring when low temperatures and high winds prevail. Colonies sometimes removed from the cellar in good condition have dwindled and even perished before good weather conditions would permit building up. It is not uncommon that conditions are too severe to even permit the supplying of extra food to the bees, for it is sometimes so cold that bees cannot leave their cluster to get stores that may be supplied by the producer either as frames of honey or in pails of feed. The spring period with its coincident brood rearing when the temperature must be 94° instead of 57° which is the living temperature, is a time of excessive labor for the colony population when the bee energy is expended at a terrific rate. Cellar wintered colonies with their enforced handicap can not be expected to do as well as bees out-of-doors. Many beekeepers are successful in wintering cellared bees, but the winter problem is not half solved when the colonies are in the cellar. The bees create and expend more heat, which means energy, in May than in December, January or February. Extensive experiments conducted in several states indicate clearly that more honey can be produced by colonies wintered in packing cases than in cellars.

Adjusting the brood nest to one story for cellar wintering.

It is more difficult to give brief directions for cellar wintering of bees than for outdoor wintering. If the cellar is constructed so as to give proper insulation to the bees inside; if the food is of correct amount and quality and if the temperature and ventilation of the cellar are well regulated, excellent results may be obtained from cellar wintering. A considerable saving may be made in the honey consumed, although saving the stores is a minor consideration in the problem of wintering.

There are some fundamental points that should be considered in the construction of a cellar for keeping bees through the winter. It is necessary to get the ceiling of the cellar below the frost line, for without this provision it is impossible to maintain a uniform temperature high enough to protect the bees properly. The capacity of the cellar should be such as to provide approximately 15 cubic feet of space per colony. If too much space is provided the bees have great difficulty in maintaining a proper cellar temperature. A temperature of 40 to 45 degrees is usually considered best for a cellar. We have found in our

observations here at Ames that 42 degrees seemed to be the ideal temperature for at that time there was apparently no activity of the bees in the colony but they were remaining motionless in the cluster. It would be advantageous to raise the temperature to 50° except for the fact that higher temperatures usually cause more humidity in the cellar. This causes activity on the part of the bees. Sufficient ventilation must be provided to prevent condensation of the moisture when the cellar temperature is 45° and if this is done the beekeeper may be sure that the ventilation is adequate to provide the necessary oxygen and to eliminate the carbon dioxide generated by the bees. Light should be excluded and the colonies left absolutely undisturbed for the entire period that they are in the cellars. Many cellars are over ventilated and better results are secured when this is reduced for ventilation comes through the walls and the ceiling all the time.

Many beekeepers use the cellars under their residences but as a rule better results come from specially constructed cellars. These may be built in a hillside with relative little expense and will give good results only in case they are heavily protected on all sides. A good entrance is perhaps the most difficult part of construction for it must be carefully insulated as any other part. Double doors with insulated material well packed between is usually the best method for protecting the door at this weak point. Drainage of the cellar must be provided if the location is apt to be damp.

There is a growing tendency to place bees in cellars earlier than was formerly practiced and it is usually good practice wherever cellar wintering is feasible. Put bees in after a good flight about the middle of November; to wait until later is usually dangerous. After a good flight and the bees have again clustered, the hive should be carried in with as little disturbance as possible. They may be piled as high as convenient and should be separated only enough to convenient passages of the bees from one colony to another. It is probably true that in those areas where cellar wintering is practiced there are a few days after November 17th or 18th when bees will be able to fly. A high temperature of 45 to 50 degrees during the afternoon is necessary for flight. Some beekeepers are caught every year waiting for a good flight day which never comes and find themselves with their bees out during the early part of December.

During the winter dead bees should be removed from the floor as well as from the bottom boards with a minimum of disturbance and a careful watch should be kept that the bees do not become disturbed by too high or too low a temperature. A reliable thermometer is practically necessary for good wintering and the use of a good sling psychrometer to determine the relative humidity in the cellar is recommended. One of the difficulties of cellar wintering is the fact that the bees must be watched to prevent the introduction of some disastrous conditions.

Since bees in a good cellar require little ventilation practically no attention need to be paid to this subject if the cellar has been properly built. If the temperature of the cellar tends to fall too low it is advisable to reduce the entrance of the hive, for with a greater difference between the temperatures within and without the hive there is a tendency for the bees to become over active in heat production. In any cellar fit for the wintering of bees it will neither be necessary or desirable to ventilate the hive itself as sometimes has been recommended. The ventilation of the hive in the cellar is not so much for the elimination of foul air as for the escape of moisture, therefore the amount of ventilation needed for the hive depends upon the humidity of the air within the cellar. If the temperature of the cellar is kept high enough there will be no condensation of moisture in the hive, and if the water is ever observed on the covers of the hive it is conclusive proof that the cellar is too cold for the bees. If the cellar is so cold that condensed moisture shows on the bottoms of the hives steps should be taken at once to raise the temperature.

Work in or about the bee cellar while the bees are confined should be done with the least possible disturbance of the bees. A little handling or jarring of the hive may be sufficient excitement to increase the temperature of the cluster to the point where brood rearing begins. This is especially true in late winter. It is by far the wisest plan therefore, to stay out of the cellar during the winter except on a few occasions where a little work such as cleaning out makes the visit seem needed. Care should be taken not to jar the hives or to allow light to strike the entrances. Of course, if bees are being wintered in the cellar which has the right temperature a little disturbance does no big harm, but there is no reason why bees should be disturbed in the winter time and the beekeeper should not run any risk of starting brood rearing.

Do what you do right. Do not try to beat the game. You may kid yourself that you have put your bees away for winter but that will not keep them warm some morning when it's 15° below.

QUEENS AND PACKAGE BEES FROM SOUTH TO NORTH

N. I. Lyle, Sheldon, Iowa

It is generally conceded that the queen is half the colony, but I maintain she is all the colony. Other factors are mere incidentals compared to her. Therefore we will first discuss the queen and the factors entering in the production, marketing, shipping, introduction and successful establishing of the queen mother. In breeding we must remember that like begets like; therefore the breeding queens must be of superior stock. By queens I mean breeders for the production of both virgins and drones.

Shaking bees through strainer. This removes drones and results in higher percentage of young bees.

The breeding queen must be pure-bred, no matter what the breed or strain the queen must be pure and purely mated. Not only should she be mated to a drone of the same breed, as pure Italian to pure Italian, but the drone should be of the same particular strain as the queen to be mated. Drone breeding queens should be as desirable stock as the queen breeder; in other words every drone colony should be good enough to graft queen cells. The workers in both queen and drone breeding colonies should be gentle, good size and desirable shape. The queens must be heavy layers and of heavy producing stock and it is desirable that parentage of breeding queens be known. The colonies they head should be good producers on both the light, steady flows of the south and the sharp, heavy flows of the north. It is desirable to have a working agreement between queen breeder and honey producer where outstanding individuals are returned to the queen breeder at the end of the honey season so they may be tested for either queen or drone breeders.

The mechanical features of queen breeding will be left to text books where they belong. However a discussion of factors in queen production will not be amiss. After we have desirable breeding stock the market queens must be properly reared especially the larve must be of the right age. The better breeders use the youngest possible larvae and select only those that are heavily fed. If there is insufficient honey flow the breeding colony is fed, preferably with honey. The starting colonies should be rousing with bees, fat, sleek fellows that would rather build comb than sting and they must be fed 24 hours per day. They should be of such strength that they will continue to start queen cells even if a queen is given them. The finishing colonies should also be strong and fed constantly; this can be dispensed with only during the heaviest flows.

Long, plump queen cells result only from careful management; small cells usually result in poor queens. Annually thousands of queens haphazardly reared in every operation are heavily advertised and sold at "Bargain prices."

The mating yard should be located if possible where there is an even, steady flow. Mating nuclei should be well supplied with honey and bees and strong nuclei will gather plenty of honey for maintenance. Drone breeding colonies equipped with extra drone combs are located in the queen yard to supply drones for mating.

Queens are sold by the southern breeder either to the northern buyer direct or wholesale to other so-called breeders. A conservative estimate would be that 50% of the package shippers buy their queens from a professional breeder both for package and queen trade.

Showing inner core of strainer and harvest of drones in bottom.

When the queen breeder goes out to "catch up" queens to fill orders is where the greatest need for honesty enters, since often 10% or more of the queens are of inferior *quality. If he is honest he will* kill all poor individuals and send out only good stock; however, if he has advertised queens at prices 10 or 20% lower than standard you may sometimes wonder.

The queen is mailed, she makes her journey to the purchaser and her fate is in his hands for he may introduce her successfully or he may not. Let us look into the matter. If there is a honey flow on and the colony to be requeened is Italian and gentle any novice will probably have success, but if the honey flow is light and the colony hybrid and cross we have another story for the queen will often be killed unless care is taken. If possible requeen a cross colony during a fair flow. The old queen should be killed and dropped in the hive, then the queen cage should have the pasteboard removed from the candy end and a small hole punched through the candy with a match or nail so the queen will be released before any cells are built. Place the cage screen side next to the brood with the candy end up, otherwise dead nurse bees may clog the outlet, and confine the queen too long. If the colony is not examined for 9 days and then only to raise a brood nest frame enough to see if

the queen is laying, the chances of successful introduction are very good. Many queens are killed by curious beekeepers looking too soon, too much and too often.

The next matter for consideration is the package problem. Here is a real problem. We can buy 1, 2, 3, 4 and 5-pound packages, comb and combless. In one a comb of honey is used as a feeder, while in the other a can of sugar syrup is the feed. Then we have all sizes of nuclei. Primarily we are interested in the combless package since it is the most common and is popular in both North and South. Packages are advertised at varying prices ranging from high to medium and "Bargains." Let us consider the package, first the cage itself which costs 25 to 50 cents to construct depending on material and workmanship. A light cage strongly made is more expensive than a heavy cage. More expensive material must be used which makes a saving in express and is to the purchaser's advantage. The queen is the next consideration. If an inferior queen is used a lower price may be quoted on the package. Three pounds of bees should mean just that but some seem to think that one-half pound can be drones. There are always too many of them in the colony during shipping season. "Let's give the Yankee some good big bees, he wants cheap stuff anyway," is a common remark of package shippers. The honest shipper shakes all the bees through an excluder, he gives you a strong, light cage, a good queen, full measure of young worker bees and plenty of good syrup to last them to their destination. If the Express Company does not kill them by placing too near steam pipes or other mishandling, they will reach you safely.

Package introduced. Feed can in place over heavy sheet of paper with hole in it. Entrance contracted.

Have the Express Agent telephone you as soon as the packages arrive. Check up on loss and have agent make out a claim if it runs over 10 or 15%. The shipper has allowed for losses up to this amount by overweight in bees. Rush the packages home or to the outyard and place in a closed building, then feed heavily with a medium sugar syrup, half sugar and half water by measure is good.

The hives should be ready for introduction. It is well to have a frame of honey and some empty comb in the hive which will give the bees a good start. The best time for introduction is about sundown, so there can be no flight that day. Before placing in the hive feed the package all the syrup they will take, painting it on the screen with a brush or rag. Remove the lid and set package in the hive, then open the package, take out queen cage, and place as recommended in queen introduction, which in this case between two frames adjoining package. Place feeder with 4 small holes punched in lid in empty super above frames. Contract entrance and place varying identification marks for returning bees to mark their location when they take their first flight. Leave the colony alone for a week except to examine the feed can and refill if necessary.

These precautions will greatly lessen queen supercedure with package bees.

CAUCASIAN BEES

J. G. Jessup, Council Bluffs, Iowa

The Italian race of bees were the first to be introduced to this country in an effort to improve the common black bee. As the Italians were so superior to the common stock, their use became general and today they are used almost exclusively throughout the country. Here and there individuals have tried other races and it was the report from these of their preference for other races that led to the introduction of Caucasians into my own yard in 1927. Each year since that time more queens of that race have been introduced, until at the present time a yard of ninety colonies is practically all Caucasians.

The Caucasian bees are black in color with grey bands. The queens are very prolific, rearing a large amount of brood, which results in colonies of great strength. The bees are very gentle, being noticeably more so than the common Italians. This is especially desirable where bees are located close to cultivated fields, as there is less danger of those working in the fields being stung, which is an important factor in keeping out apiaries, in a country where most all land is under cultivation. The bees remain quiet on the combs while being handled and are a real pleasure to work with.

The white capping of their honey makes this race especially desirable for comb honey production, although they may be more inclined to swarm than Italians, under conditions necessary for comb honey production. My own experience has been altogether in the production of extracted honey, where plenty of drawn combs were available for storing honey. The general tendency to swarm, at least during the four years that these observations have been made, has not apparently been any greater than that of the Italians. Those colonies that do swarm, appear to be more inclined to throw after-swarms and to build more queen cells.

They winter well, coming out in the spring strong in bees. They require a great amount of honey for their extensive brood-rearing before the beginning of the honey flow. They conserve their stores well, using very little during the winter.

The dark color of the queens makes them difficult to find on the comb, which is a disadvantage. Then also the dark color of the bees makes it difficult to tell a cross with the common black. A great deal of propolis is gathered and most of this is used to restrict the size of the entrance, only a very little more being used in other parts of the hive than is used by the Italians.

It has not been possible to keep a record of the honey produced to determine the yield as compared with Italians. The general impression, however, is that the crop produced is not much different. There are so many things that enter into the amount of honey produced, that a great amount of very careful experimental work would be required to get anything like accurate information. So far as could be observed, the Caucasians produce at least as much as the Italians and possibly more.

The method of management with the Causasians is slightly different from that with the Italians, as they are so prolific that more care must be taken to see that they do not become crowded. It is a good practice to raise several frames of brood out of the brood nest, placing it above a queen excluder. If this is done every ten days in May and June, leaving only three or four frames below the excluder with the queen, there will be no swarming, unless due to supersedure.

Every beekeeper will find it of interest to have a few colonies of this gentle race. With the Italians giving such general satisfaction, it is not likely that they will soon be replaced, but some will certainly like the characteristics of the Caucasians and prefer them, after they have had an opportunity to learn just how to handle them.

HONEY PRODUCTION IN MISSOURI

Leo R. Bradford, Liberty, Missouri

Honey production in Missouri is not an extensive industry. There is no way of knowing exactly how large an industry it really is but as near as we can get at it there is an annual income of approximately one million dollars from Missouri's honey crop. There are several reasons why the honey industry in Missouri has not developed or advanced as it has in other states. The principal reason in my opinion is the wide range of soil and climatic conditions, varying from the north to the south.

You well know that the market demands a light colored, mild flavored honey, therefore, the major honey flow must be from some of the clovers. We will consider the Ozark region of Missouri from a honey producing standpoint. This region, being in the northern part of a midsummer drouth area, has a rather gravelly, open soil, which does not hold moisture and the drouth can be expected almost every year; so clovers do not thrive well on this soil. Sweet clover is not so bad but has never been extensively grown, therefore, their honey crop is all gathered late in the fall after the fall rains start. This honey is practically all gathered from heartsease, Spanish needle and golden rod, Spanish needle being the major honey plant.

This same condition holds true to practically all of Missouri south of the Missouri River and a good many places north of the river. In fact, there is only a very small portion of Missouri which is now being utilized by commercial honey producers, and that the northwestern portion. Of course, we find a few small commercial producers in practically all parts of the state but the only place where a real crop of honey or a crop of real honey is produced is in the northwestern portion. There are approximately 15,000 beekeepers in Missouri, with an average of about 8 colonies per beekeeper, so you will readily see from these figures that beekeeping in Missouri is far from being commercialized.

Another reason for Missouri's honey production being rather behind the time is that we have never had anything along educational lines in beekeeping in the state. The box hive beekeeper and the slouchy, shiftless man still holds a big space in Missouri's beekeeping. The Missouri Beekeepers' Association are planning to go before the state legislature this season and ask for an appropriation for educational work in Missouri. This appropriation will be applied in such a manner as to promote better beekeeping all over the state. We have not yet definitely laid the plans for the expenditure of such an appropriation since we are not certain of getting it. We have decided that it is better to follow the advice of the Englishman who could not repeat anything as he heard it in the American language. He heard a man giving some rather sound advice to another party and he thought he would repeat it. This is the way he repeated it, "Figuring from the poultry standpoint of view, it is better to postpone the enumeration until the incubation is thoroughly materialized." What he was actually trying to tell the fellow was, "Don't count your chickens before they are hatched," therefore, we are not spending the appropriation until we get it.

The question of wintering colonies in Missouri is, as a rule, not quite as serious as that of wintering in other states farther north. Our most serious season is in the early spring. In a large portion of Missouri, being located as it is just far enough south to get the warm days in early spring and just far enough north to get the tail-end of every squall that comes along, makes it very hazardous for colonies of bees at that season. Our few warm days will bring out some blossoms on the maple and willow and the bees will immediately start brood rearing, then the cool blustery days cause the cluster to contract and we get a large percent of the early brood chilled, which is a waste of bee energy, as well as large quantities of food, therefore colonies dwindle quite rapidly at that time of the year.

It is also being very widely discussed as to whether colonies can be

more cheaply wintered in one or two story hives. I have been doing some experimenting myself along these lines and I find that I lose fewer colonies wintered in one story than in two. This brings about the question as to whether it is cheaper to feed in the spring or to hold over honey to be set back on in the spring. I have tried a little of both, but so far, I am unable to say just which can be done with the least expense. If we have a good market for our honey and can find a large amount of sugar that has been damaged from one cause or another, feeding can be more cheaply done with sugar syrup and it also stimulates brood rearing to some extent, which sometimes is dangerous, consequently, I will not say what decision I will make in the future.

As to the kind of honey best for winter stores, I might say that I have done quite a good deal of playing along that line as well as a few other lines pertaining to the management of bees. I have wintered colonies on practically every kind of honey gathered in the northern half of Missouri and I can find little or no difference in the way the bees winter one year with another on various kinds of honey.

I also have packed in various ways and find that some packing is desirable but a large amount of packing is not to be recommended for the commercial honey producer. I have not found a method of packing that can be practiced profitably. I am speaking now with reference to management of out-apiaries. A home yard could be wrapped or packed very nicely, even though it was large in number, but out-yards which might possibly be 75 to 100 miles from home, are not always easily reached and packing material is not always at hand and if the yard can be located in some well protected place, I do not believe the packing would be worth the effort expended in applying it in the fall and removing it in the spring.

The question of races of bees has also come in a small way in Missouri. Italian bees in Missouri, as well as practically all parts of the country, have been considered the best all purpose bee, so to speak, but a few of us have been playing along for the last three or four years with Caucasian bees. *In a great many ways we find them superior* to the Italian. Some of the points we find in favor of the Caucasian are that they are extremely gentle, very prolific and winter far better than the Italian. Most ordinarily they fly in cooler weather. This quality makes them more desirable by the fruit man than Italians since they will fly in more inclement weather in the spring when used for fruit pollination. They apparently drift much less.

The market condition in Missouri is about the same as it is elsewhere or it may be a little worse. Of course it is natural that we all imagine the condition in our particular locality is worse than it could possibly be elsewhere.

Some of the things that help to make the honey market what it is is the fact that we are not organized in the way of marketing. For example, I do not produce enough honey to satisfy the demands of my trade. I attempt to buy honey from you a hundred or more miles away. I write you asking what kind of honey you have and your price. You come back saying "I have some very nice honey," either extracted or comb, whichever the case might be and that is all you can say, you cannot give me a definite answer as to what your honey it. If we were organized in a marketing organization, we would have a standard grading rule and you could tell me exactly what you have and to quote the price would be unnecessary, since the price would be established according to grade.

I have been in the habit of buying a little honey each year to supply the demand of my market, more especially comb honey, since a greater portion of my produce is extracted. I have also learned that you cannot pay the average beekeeper anywhere near what the honey should be worth, simply because he has no regard for grading rules and seems to care little about anything else except disposing of the immediate crop of honey and he will pack all kinds of honey in the same case and if for some reason he failed to dispose of his entire crop of last year's honey and he has a few cases left on hand, he will mix his old granulated sections along through the cases until he is disposing of it along with his new crop. It takes time to go through every case and handle each section, but that is the only way to buy comb honey at present unless you almost steal it from the producer. I have even found sections that appeared to have brood reared in them for two seasons, or at least 2 or 3 cycles of brood.

I happen to know one party who purchased the entire crop of another beekeeper, who I would have believed to be a pretty nice fellow. It was understood that his honey would be packed according to certain rules. When the purchaser began going through a few cases, after being delivered to his place, he found some old granulated sections that were badly discolored, had been used for bait combs. After learning this, I happened to know where the same party sold his crop last year and upon investigation I find that he could not sell his crop to that party again and of course he will be unable to sell it to the same party who purchased it this year, another season, and also a good many of the other fellows who were close friends of the last purchaser, would not consider buying his crop, therefore, it is up to him to find another sucker. Then, the producer cries around and wonders what is wrong with the honey market. The fault is all ours. No one to blame except the producers who are too thick headed to get together and stabilize the market with a product graded to standard; then the man who hangs out and will not cooperate would be the sucker.

BEEKEEPERS ARE EDUCATED

C. S. Miller, Manzanola, Colorado

We make the statement that beekeepers are now educated, and we believe that if a beekeeper is not educated in his own business, we would be safe in saying that he is not a beekeeper. Merchants are educated. This subject will lead up to what I am trying to say; no longer can a beekeeper fool a merchant; no longer can a merchant fool a real beekeeper. The time was when a man could cut some honey out of a log and take it to a store in a lard can and sell it to a merchant at the price the man would ask for it. The merchant in turn could sell that honey at a fair profit. The time has come when the merchants know the price of honey in every size container at the apiaries. They figure the cost of transportation to their place; this is all they will pay. Beekeepers know what they can get, and the merchants know what they have to pay. If either of these doesn't know these conditions neither is a merchant nor a beekeeper. Bee journals and government bulletins are regular visitors to the educated beekeepers. The uneducated people that keep bees are the ones that have brought on the present price conditions in Colorado, as well as in other states I am sure. It may be of interest to the readers of this publication to know in detail the flora conditions, as well as the present outlook for another honey failure or crop. But if you are getting an up-to-date bee journal and other bee publications you will get this. As a rule we will get a big honey crop in 1931. But honey selling at nine cents a pound in the No. 10 pails, and as low as five cents in the sixties, what would we sell it for in 1931 if we get a big crop? I believe that we as beekeepers, who claim to be educated, must use a little cooperation in selling. Twice the amount of honey could be sold if put on the market in the proper manner. A producer as a rule, is unable to sell his crop. It is two separate and distinct businesses. It is almost impossible for one to produce well and to sell well. We may think that we are tearing a bone out at both jobs, but our pocketbooks and bank accounts will show.

EXTENSION PROBLEMS WITH NEBRASKA BEEKEEPERS

O. S. Bare, Lincoln, Neb.

One of the comparatively new methods of attacking the beekeepers' problems is through the medium of Extension Apiarists or Beekeeping Specialists. While a number of states, including Iowa, have been developing this work for a considerable period, many states have neglected it entirely or have just started the work. In these states a variety of problems is at once presented to the Extension Specialist and often requires a great deal of attention and hard work before being solved satisfactorily.

In Nebraska the work was started in September, 1929. No work whatever had been undertaken along this line, no precedents were there to follow, and no strong organization existed through which the work might be carried on. The Nebraska Honey Producers Association cooperated whenever possible and although at that time it was a rather weak organization with a small membership, its assistance was of almost inestimable value. Owing to these conditions and to the late date at which the work was begun, it was not thought advisable to undertake an extensive program that fall. The remainder of the season was spent in getting acquainted with the beekeepers, studying their problems, and making plans for the next season's work. This simply furnished a foundation on which the work was to be built.

The survey made at that time indicated that the Nebraska beekeepers were facing three major problems. First of these may be placed the disease problem. American foulbrood varied much in severity in different parts of the state. In some of the older beekeeping sections it had become so widespread that many beekeepers had quit the business or were on the verge of doing so. One beekeeper stated that foulbrood had cost him $3,000 in two years, while another said that he had lost nearly 600 colonies in a three-year period. In other sections the disease was very rare or entirely absent. Little or no organized work had been done in controlling or eradicating it. While an inspection law had been in force for several years, it lacked both the teeth to accomplish anything and the funds necessary for enforcement. However, in 1929 a new law was passed. The new law had plenty of teeth, and funds were provided

The outdoor classroom for adult education where interested pupils await the help of the teacher.

by means of a ten cent colony tax. It provided for a state apiary inspector under the state department of agriculture. While this law is far from perfect, it has enabled us to lay a foundation and make a good start. Deputy inspectors have been appointed in several counties, with the result that between 4,000 and 5,000 colonies were inspected in 1930. With the present organization, it is hoped that from 15,000 to 20,000 colonies may be inspected in 1931. The work is entirely separate from that of the extension apiarist, but it has been stressed in all of the extension apiary work and the fullest cooperation has existed. As a result, sentiment for the work has been greatly strengthened, and its future is very promising.

Marketing the honey crop was a second major problem. No marketing machinery of any consequence existed in the state, and but little had been done to develop local markets. Sentiment among commercial beekeepers did not favor the formation of a marketing association, as it was felt that such an organization would merely be another agency to compete with existing organizations in neighboring states. The Sioux Honey Association at Sioux City, Iowa; the Colorado Honey Producers Association at Denver, Colorado, and the Mountain States Association are open to Nebraska beekeepers and they have many members in the state. Consequently, activities along marketing lines were limited to building up local markets and recommending that large producers affiliate with organizations which were already operating.

The third major problem rested on the methods in use by hundreds or thousands of the smaller beekeepers. Perhaps this should not be confined to the smaller producer, as some of the more extensive ones were serious offenders. In hundreds of cases the methods used were poor only because they were totally lacking. In case after case practically no care was given to the bees. These bees were not only unprofitable, but were an actual menace to others. As one beekeeper aptly said, "The greatest menace to our beekeepers today is the beekeeper who has only a few hives, and has no idea what is in those brood chambers." We are not attempting to discourage the small fellows. In fact, we are encouraging them, but we are stressing the fact that no one should try to keep bees unless he will take proper care of them.

Several methods have been used in reaching the beekeepers and meeting their problems. The first step was to compile a reasonably complete mailing list. This was made up from the State Apiary Inspector's files, which contained the name and address of every beekeeper whose bees were assessed in 1929. Approximately 5,000 names were secured in this manner and a considerable number has been added since, as the first year assessor's list was necessarily incomplete. Mimeographed circulars and circular letters are sent to these beekeepers as occasion demands, and it is our intention to send out a regular monthly sheet during 1931. Press articles and radio talks also have been used at advantageous times.

County or regional beekeepers associations have been organized in sections where interest is greatest. Nine of these were organized in 1930. These are particularly interested in beekeeping methods and in building up local markets. Campaigns have been conducted to popularize honey and an effort has been made to put a more uniform and better product on the market. Price cutting is discouraged by these associations and efforts are made to stabilize prices. The legislative program of the state association is supported and the disease control work is furthered in every way. In several cases these local associations have joined as units with the state association.

One of the most successful methods used has been the conducting of demonstration apiaries. Six of these were conducted in 1930 and it is planned to at least double the number in 1931. These are established wherever the interest seems great enough to warrant it. In establishing these, arrangements are made with a well known beekeeper to have the

demonstrations at his yard. Five colonies are turned over to the Extension Specialist who uses his own methods in caring for them. The local beekeeper cares for them according to instructions when the specialist cannot be there. Five check colonies are handled by the local beekeeper who uses his own regular methods. Four or five demonstrations are held at each yard during the season. The first is usually held in late April or early May, and takes up the problems of spring management. The specialist actually performs the necessary manipulations before the assembled beekeepers, and he asks them to help with the work. The local beekeeper also demonstrates his methods. A second demonstration is held in late May or early June. At this time problems of swarm control and manipulations for the main honey flow are taken up and demonstrated. A third demonstration in late July or in August takes up extracting, requeening, and the building up of the colonies for winter. An October demonstration closes the season. At this time we take up fall feeding and packing for winter. A checkup of the season's record is made and the results compared. These demonstration apiaries have been very successful and interest has been very strong. Requests

A good picnic is an aid to education.

have been received for many more than can be conducted. Actually doing things before the beekeepers makes a much greater impression than any amount of literature or talk could create. Many beekeepers are positively amazed by the results that can be secured. Needless to say, disease control or eradication is stressed at these meetings and demonstrations of it are given if possible.

A fourth point that has been stressed is the making of bee and honey exhibits. State fair and county exhibits are encouraged in every way, and some of these that have been made during the past year have been exceptionally good.

One problem that hampers the work and can be overcome only through experience lies in the fact that conditions vary greatly in different sections of the state. Eastern Nebraska conditions are much like those of Iowa. Rainfall, temperature, topography, soil types, and nectar producing plants are practically the same. However, this does not hold true for western Nebraska. The rainfall is only half as great, temperatures average lower, winds are much stronger, and shelter for apiaries is hard to find or is totally lacking. Soil types and nectar producing plants are

also different from those farther east. This makes it necessary to use much different methods and complicates the work greatly.

We may say that, on the whole, the work has been well received by Nebraska beekeepers. They are supporting it very enthusiastically, and we feel that it has a bright outlook.

THE GRANULATION OF HONEY

E. F. Phillips, Ithaca, New York

In the 1928 Report of the State Apiarist there appeared an article in which I tried to show the need for a better understanding of honey on the part of the beekeeper. An attempt was made in that article to show the need not only for more information about honey but also for a wider dissemination of the facts already known. The same Report contained a stimulating article giving the results of certain experiments carried out by Mr. Setek Ling at Ames, just the kind of work of which beekeeping is in so great need. The subject treated by Mr. Ling is so important that a further discussion of it may be in order.

When honey "granulates" certain portions become solid enough so that the beekeeper may refer to his honey as "solidly granulated." This is of course not literally true. A granulated honey, no difference how solid the granulation may become, consists of two phases, a solid phase and a liquid phase. This differentiation does not refer to the phenomenon sometimes observed when large crystals settle to the bottom of a jar, leaving a liquid layer at the top, but this distinction is true of all granulated honeys.

The solid phase consists, so far as known, exclusively of crystals of dextrose, more correctly of dextrose hydrate. When dextrose is transformed from a state of solution in water (as in honey) to the crystalline state, each molecule of dextrose is united with a molecule of water, making the chemical substance known as dextrose hydrate. The proportions of dextrose and water are always the same in crystallization of the type mentioned, being 180 parts of dextrose to 18 parts of water (or 9.09%, the ratio of one to eleven). This fact is important in certain other considerations regarding honey.

The dextrose content of honey varies considerably. The analyses made by Browne of American honeys shows a wide variation in the amount of this sugar, and similar variations have been recorded by chemists for honeys of other countries. Since only the one sugar, dextrose, forms crystals when honey granulates, it is a natural inference that the greater the proportion of dextrose, the more rapid the granulation. Within certain limits this is probably true, and this point was brought out by Mr. Ling in the article cited. At any rate it is well known that honeys, such as alfalfa, which have a high dextrose content granulate quickly, whereas those with a high levulose content and a correspondingly low dextrose content, such as genuine sage honey, granulate slowly or perhaps not at all for months or years. There are however, other factors than sugar ratios to be considered in this connection.

In a solution containing various sugars, such as honey, the sugars have an interaction with respect to the formation of crystals of each sugar. This was brought out in an investigation at the Federal Bureau of Standards by Richard F. Jackson and Clara G. Silsbee (Technological paper 259, 1924). Their findings will be clearer to the beekeeper by referring to something within the range of his personal experience. In making sugar syrup for winter feeding a common method is as follows: dissolve two parts of granulated sugar in one part of water. When the solution is boiling, add tartaric acid in the proportion of one ounce to forty pounds of sugar and continue boiling for at least fifteen minutes. The merit of this method of making syrup for feeding does not at all concern us at present, but rather the chemical and physical changes which occur. When boiling of the final mixture has preceded for a minute or two, a slight amber color usually appears in the solution.

This is due to the fact that the combined action of the acid and heat have converted part of the cane sugar into dextrose and levulose. The levulose, being highly sensitive to heat, becomes further split into disintegration products which are amber in color. The slight discoloration of the syrup therefore indicates that the original cane sugar has been partially broken down and that instead of having a cane sugar solution with which we started, it now contains cane sugar, dextrose and levulose in water.

The avowed purpose of adding the acid is to prevent crystallization of the sugar syrup after it is fed to the bees. If perchance any of the original cane sugar solution does not have acid added and is not fed, every beekeeper knows that coarse cane sugar crystals soon appear in it, whereas after the chemical change brought about by the acid and heat, granulation is less rapid, and when it occurs it is more probably soft and fine. This of itself suggests a change in the chemical nature of the sugar.

In the two to one sugar solution, originally made, we would have 33 1-3 per cent water. In the partial transformation of cane sugar into dextrose and levulose, water is chemically combined in the formation of the two simple sugars so that even without any loss from boiling, the water content of the solution is actually reduced in per cent. Boiling still further reduces this, so that a solution made as prescribed has a low water content, at least as low in some cases as honey itself.

It is theoretically possible, by carrying the inversion of cane sugar into dextrose and levulose to just the right point for any given temperature of later storage to obtain a solution in which no crystals would ever appear. Practically this is not so easy, for conditions of temperature change in storage. In honey which granulates quickly, we have a solution which readily throws down dextrose crystals while in a sage honey we have a solution in which dextrose crystals form slowly or sometimes not for years.

An important distinction in the granulation of honey which is too often overlooked is the nature of the crystals with respect to size. Mr. Ling in the article mentioned above distinguishes between coarse and fine granulation. It should be well known to every beekeeper that a honey with a fine granulation is excellent to eat while sometimes honey granulates so coarsely that the honey is ruined for table use. It is a striking but not adequately noted fact that the taste of a granulated honey is determined to a large extent by the size of the crystals. Since finely granulated honey is good and coarse honey is not, our task is to find a means of causing all honeys to granulate with a fine crystal. This can be done and has been done, but the work is not quite far enough along to report at this time.

When granulated honey has a fine crystal, the crystals are either minute needles or small flat plates, both of dextrose hydrate. In some honey examined microscopically which had granulated quickly and with a fine grain, the dextrose hydrate needles were found to be as thin as an ordinary bacillus and several times as long. Such crystals are flexible and do not cause any roughness to the tongue when the honey is eaten.

Coarse granulation on the contrary is formed by aggregations of plate crystals, usually in the form of many pointed stars. These cannot bend as do the needles and the aggregation of so many plates is so large that when the honey is eaten there is an actual roughness to the tongue. In some honey specially prepared so that the crystals would be unusually large, the crystal aggregates were almost an eighth of an inch across and were formed of a multitude of aggregated plate crystals.

When ordinary extracted honey which has never been heated is examined shortly after extracting, many minute crystals will be found in it, even though the honey is freshly gathered. In the heating to which so much of our honey is subjected, these minute crystals are dissolved, and this means that the later formation of crystal is retarded. It is

easier for crystals to form when there are already "seed" crystals in the honey than when the process must take place from the very beginning. This means that honey which is to be eaten in granulated form should under no conditions be heated, unless after heating it is subjected to some process which speeds up granulation. There is no such process in common use, although we here at Cornell hope to have one shortly. Many a beekeeper has put highly inferior honey on the market because he has dissolved the minute granules in it by unwise heating.

Honey that is to be sold in bottles is usually preferred in liquid form, and the well known method for keeping honey liquid is to heat it hot enough so that every crystal is dissolved and then to seal it hermetically with the bottle filled as completely as practicable. In this connection a slight objection should be made to an interpretation placed on one part of his work by Mr. Ling. He refers to the "presence of air" as influencing granulation when all that he did was to break the hermetic sealing of certain bottles. The presence of air should more properly be interpreted as the presence of minute air bubbles in the honey at the time of bottling, a common cause of poor granulation of bottled honey and always the cause of a bad appearing honey because of the opacity which the bubbles cause.

The interpretation of agitation as a factor in granulation which Mr. Ling makes is also rather unusual. He refers to the agitation caused by extracting, which is of course the cause of more rapid granulation unless the honey is subsequently heated. Agitation of a solution is well known to cause a rapid formation of crystals from the dissolved material, and this is as true of honey as of other solutions. But the agitation which speeds up granulation is not only that of the extractor but more especially that induced by the honey pump. It is well known that pumped honey granulates more speedily than honey that has not been pumped but otherwise treated in the same manner. If granulation is desired, pumping sometimes helps to induce it, but at the same time almost invariably inserts millions of minute air bubbles in the honey which cannot be removed by ordinary heating. Much of the cloudiness which is observable in extracted honeys arises from these air bubbles inserted when the honey is pumped. Both the agitation of the pump and the air bubbles cause more raipd granulation, unless the honey is heated after pumping to dissolve the crystals and to drive out the large bubbles of air. Not all of them escape even when a honey is heated to 160° F.

Much more might be written on the granulation of honey and doubtless more will be. The important thing to record here is that when a honey is properly granulated, it is actually superior to the same honey in liquid form, and that when it is improperly granulated, with coarse, gritty crystals, it is highly inferior to the liquid honey. Properly granulated honey carries as fine a flavor as the best comb honey, and every beekeeper who is honest with himself must admit that comb honey is usually just a shade better than liquid honey of the same crop. To bring out all the goodness of an extracted honey, there seems to be no method other than a control of granulation. This is the greatest problem today in the preparation of honey for the market, for the beekeeper or the bottler who does not help the consumer to get all the goodness from the honey ought not offer it for sale.

The interrelation between granulation of honey and subsequent fermentation should by this time be well known to all beekeepers, but since this seems not to be true, I shall risk repeating the story. When honey granulates, the water content of the solid phase is slightly over 9%. The original honey had more water in it than is indicated by this percentage, which means that the liquid phase has a higher water content than the original liquid honey. This means that granulation actually increased the water content of the liquid portion, and that in this liquid

portion fermentation is possible when it was impossible in the more concentrated liquid honey. While it is true that liquid honeys may ferment if they are exceptionally high in water content, it is a safe working rule that fermentation occurs almost solely in granulated honey.

The above fact is more or less well known, but it is subject to certain misinterpretations. When fermentation has progressed to a degree where the honey is ruined for table use, there is a tendency for the mass to become more liquid than it was when fermentation started. In such cases we get a settling out of a solid portion in the bottom of the jar with a liquid portion at the top. This is only a late stage of fermentation and does not indicate the condition when the action of the yeast began. It has been recorded that fermentation is more probable to occur when there is a separation of the kind indicated, but this is a symptom and not a cause. The real trouble arose when granulation was "solid" throughout the mass. We also get this separation into layers when a honey has been heated (so that all the yeasts are killed) and in which granulation has been retarded by hermetic sealing, so that a layer condition of honey is far from being a sign of fermentation.

THE EVALUATION OF BEES FOR POLLINATION

By C. L. Farrar, Massachusetts Agricultural College

New England beekeeping has not developed along commercial lines due to the fact that there is no single honey plant sufficiently widespread to give a dependable surplus. The number of colonies found here is, therefore, limited, apiaries are scattered, and methods of practice lack uniformity. The region is capable of supporting many more colonies than are at present cared for, and there is evidence that where strong colonies are maintained a creditable surplus of honey can be produced. Probable honey production alone, however, is not sufficient stimulus for the expansion of New England beekeeping.

For the past three to four seasons active interest by commercial orchardists in the pollination of their orchards has created a demand for bees beyond the present beekeeping facilities in this area. The majority of available colonies have been rented for the period of fruit bloom. One Massachusetts county in 1930 imported approximately 2,500 pounds of package bees from one shipper.

Beekeepers are divided in their opinions regarding the capacity of the "colony-unity" for honey production or the pollination of blossoms. Too often statements are based entirely upon opinion while other differences may be accounted for by the lack of a uniform standard for measuring colony efficiency. Many orchardists are now convinced that they must include bees in their program, and there is a marked tendency toward an even greater use of bees. Considerable emphasis has been placed upon the necessity of designing a "colony-unit" that the fruit grower can use without a knowledge of bees and with a minimum of handling. Upon this development rests the question of whether to stimulate practical beekeeping or to depend upon package bees.

For the honey producer, the colony-yield is a fair index of its efficiency. The work of the honeybee is only one of several important factors determining the set of fruit; also, a colony's flight can not be accepted as the standard of measure for the colony's efficiency in pollination. Pollination is purely an accidental result of the bees' activity on the blossom while collecting food. This fact must be accepted, yet the degree of pollination should be proportional to the number of bees visiting the blossoms. Their effectiveness can be insured only by the proper grouping of compatible varieties.

Interpretations of data herein reported are made upon the assumption that the colony-unit furnishing the greatest number of field bees per minute will provide visits to the greatest number of blossoms and, therefore, accomplish the greatest results in pollination. Exact determination of the number of bees in each colony was made during the

first week in May by a system of weighing. Because of the impossibility of making a direct count of the bees entering or leaving a string colony, a plan of trapping the bees for a definite time interval was employed. A box four inches square with a length equal to the width of the entrance was provided with an opening which matched the full entrance; the side resting on the approach to the entrance was scarcely more than one-sixteenth of an inch in thickness, which provided the least possible abnormal obstruction to the bees leaving the hive. The box was painted white similar to the hives. The bees leave the hive in a normal manner, and, being attracted to the light through the glass, seldom re-enter. By placing the box on the entrance for a two-minute interval and then determining the number of bees caught, the flying rate per minute can be calculated. Returning field bees will not enter the box in normal flight no matter how near its opening approximates the normal position of the hive entrance. The records were therefore made only on the bees leaving the hive. Enough boxes were used to allow counts to be made on a series of colonies at approximately the same time, when factors of light, temperature, humidity, wind, etc., were common to all the colonies under observation.

COLONY UNITS COMPARED

In 1929 the average strength of overwintered colonies on May 5th was 5 pounds of bees (maximum, 7 pounds, 3 ounces; minimum, 1 pound, 9 ounces) with an average potential increase in strength in 12 days of approximately 50 per cent, due to emerging brood although some of the original bees would have died. Apple bloom extended from May 11th until May 20th, during which period weather factors were decidedly variable. Three-frame nuclei wrapped in tar paper were set out for observation as representing one form of "minimum-attention colonies" recommended to the fruit growers. Three pounds of package bees were also wrapped in tar paper and allowed to "fly" through a queen excluder in order to prevent absconding. Each of these packages tried to swarm several times before they started combs and began brood-rearing.

In 1930 the average strength of overwintered colonies on May 1st was 5 pounds and 14 ounces of bees (maximum, 9 pounds, 1 ounce; minimum, 2 pounds, 8 ounces) with sealed brood, giving a potential increase of about 50 per cent. Apple buds developed from the pre-pink stage to full bloom within 24 to 36 hours and lasted from May 5th to 12th. The results in 1929 emphasized a possible advantage of stronger packages so that two, three, and five-pound packages were compared, both when wrapped in paper and when installed in hives. The writer felt that the efficiency of the package could be improved by heavy feeding in order to stimulate immediate comb building, thus permitting brood-rearing to begin. It had been suggested that the odor from the tar paper might possibly have caused the bees to attempt to abscond from the packages the first season. Most of the packages were, therefore wrapped with heavy building paper. The season advanced so rapidly that the packages could not be provided in suitable condition for checking some of the problems involved. Peaches, plums, cherries and apples all secreted so much nectar that strong colonies averaged a 5-pound gain for 11 days and no sign of absconding were noticed in the packages whether fed or wrapped with tar paper.

1929

The summation of data must be made only on colonies with records taken at the same time because of the influence of time of day, weather factors, and the food supply in the field. The results are, therefore, tabulated according to the period taken. Since the records in 1929 were taken at least 12 days after the colonies' strengths were determined, their strength at the fruit bloom period was estimated from the potential strength on May 5th (total bees plus sealed brood).

May 17, 4:30 to 5:10 p. m. Temp. 73° F. Bees entering per minute free flight.

3 3-frame nuclei averaged 21 bees per min. (max. 28; min. 16)
3 3-lb. packages averaged 47 bees per min. (max. 53; min. 41)

May 18, 9:45 to 10:00 a. m. Temp. 67° F. Bees leaving per min.

3 7¾-lb. colonies averaged 67 bees per min. (max. 72; min. 49)
2 3-frame nuclei averaged 11 bees per min. (max. 15; min. 7.5)

May 18, 10 to 11 a. m. Temp. 68° F. Bees leaving per min.

5 8-lb. colonies averaged 133 bees per min. (max. 155; min. 93.5)
1 3-lb. colony averaged 44 bees per min.
1 3-frame nucleus averaged 13.5 bees per min.
1 3-lb. package averaged 7 bees per min.

May 18, 3 to 4:30 p. m. Temp. 70° F. Bees leaving per min.

12 8-lb. colonies averaged 114 bees per min. (max. 170; min. 59)
4 4¼-lb. colonies averaged 58 bees per min. (max. 70; min. 53)
3 3-frame nuclei averaged 6 bees per min. (max. 9; min. 3)
3 3-lb. packages averaged 4.2 bees per min. (max. 9; min. 0)*

*1 swarming

The flying rate in the above observation on normal colonies is almost proportional to the colony strength, with a slight advantage in favor of the stronger colonies. Even the weaker of these were so much superior to the packages and nuclei under the conditions handled that there seems to be little inducement for using packages when normal colonies can be obtained. Except for the first period, the nuclei showed higher flying rates than the packages. This situation is misleading, for after the package bees started brood-rearing they flew at a much greater rate than did the nuclei. The nuclei made little or no gain in bees following the fruit bloom period. In this weakened condition one of these developed European foulbrood by the middle of June (the only case of this disease occurring in the yard during the past four years).

1930

The flying rates of three packages installed on foundation April 21st and fed continually as much sugar syrup as they would take were compared with six overwintered colonies on May 7, 11 a. m.; temperature 90° F.; relative humidity 50%. (Package strengths April 21st, colonies estimated from potential strength May 1st.)

1 package, 3 lbs., 12 oz., averaged 15 bees per minute.
*1 package, 5 lbs., 4 oz., averaged 12.5 bees per minute.
1 package, 5 lbs., 0 oz., averaged 48.5 bees per minute.
2 colonies, 3 lbs., 14 oz.,averaged 64.5 bees per minute.
4 colonies, 7 lbs., 4 oz., averaged 128.3 bees per minute.

*Queen superseded May 4

The four colonies with 1.87 times as many bees as two of medium strength furnished just twice as many bees per minute. The normal 5-pound package had a flying rate 3.2 times that of the normal 3-pound package but only .75 times that of the medium and .38 times that of the strong colonies. The number of combs drawn by these packages was proportional to the size of their clusters. The supersedure of the queen is extremely detrimental to the working efficiency of the colony as indicated by the 5-pound package in which the queen was superseded.

Average flying rates for eight 2-minute intervals for each colony of the following series were taken between May 7 and 12. The colony strengths were estimated from May 1st records. The eight strong colonies were working freely in three 10-frame hive bodies; the three medium colonies in two 10-frame hive bodies.

8 colonies, 9 lbs., averaged 132.3 bees per min. (max. 225; min. 71)
3 colonies, 5 lbs., 4 oz., averaged 81.6 bees per min. max. 140; min. 25)

The flying rates of these two groups were practically proportional to their strengths. Five of the eight stronger colonies on which flight records were taken stored four times as much honey between May 1st and June 10th as did the three medium strength colonies. An important point in explaining this relationship is the fact that the percentage of brood to the total number of bees in the colony bears an inverse relation to its strength. The flying force may bring in food proportional to the colony strength, but where brood-rearing is proportionally high the food consumption bears this same relationship.

The rapid development of the orchards into full bloom made it impossible to obtain packages in time for comparison with colonies. Ten packages containing from 2 to 6 pounds of bees (no allowance for shrinkage) were filled from local colonies on May 7th, fed and kept in the bee cellar until the evening of May 9th, when they were heavily fed, wrapped in paper, and set out for flight. There was a noticeable return of bees to their original colonies so that their strengths had to be estimated from their condition when dismantled on May 24th. Packages with 3 to 4 pounds of bees averaged 17.6 bees per minute on May 10 and 12, which was about one-sixth the efficiency of medium, and one-tenth that of strong colonies.

The following packages were planned for fruit bloom but arrived too late. They were installed on drawn combs May 13. This series gives an average of seven 2-minute flight intervals for each group taken May 23rd and 24th when the temperature ranged between 79 to 95 degrees F. The absence of nectar is indicated by the fact that a full strength colony on scales decreased 8 ounces on both days.

1 2-lb. package averaged 33.5 bees per minute.
(Cluster strength by drifting, larger than 3 lbs.)
1 2-lb. package averaged 8 bees per minute.
(Cluster weakened by drifting.)
2 3-lb. packages averaged 21 bees per minute.
(Package average: 25 and 17.)
4 5-lb packages averaged 42 bees per minute.
(Package average: 54.5; 44.3; 35.2; 33.5.)
2 5-lb. (est.) colonies averaged 62 bees per minute.
1 7¼-lb. (est.) colony averaged 82.4 bees per minute.
1 10-lb (est.) colony averaged 107.8 bees per minute.

Two and 3-pound packages here averaged 19.2 per cent as efficient as the strongest colony, while the 5-pound packages averaged 39 per cent.

SUMMARY AND CONCLUSION

During 1929 under normal seasonal conditions, strong overwintered colonies furnished approximately eight to twenty times as many field bees per minute as did either 3-pound packages or 3-frame nuclei when the bees were allowed to fly from their shipping package.

During 1930 when conditions were abnormally favorable for bee activity, normal overwintered colonies showed a decided advantage over 5-pound packages which in turn were superior to smaller packages. Where local colonies cannot be maintained or rented, it seems advisable to secure strong packages at least a week in advance of the expected fruit bloom. These should be installed in hives, preferably on drawn combs, and fed freely in order to insure an immediate establishment of the brood nest. Normal overwintered colonies requiring from 10 to 30 combs will easily be worth from $5 to $15 during the pollination period in competition with packages at their present cost.

SELLING HONEY LOCALLY

A. D. Worthington, Ames, Iowa

With the increased honey produced in the United States, the business depression and Germany's tariff on honey that is shutting out 5,000,000 or 6,000,000 pounds of honey annually, it is very important that we use every effort to increase the consumption of honey in the United States. With the consumption only 2 pounds per capita whereas in Germany the consumption is 40 pounds per person we should easily increase the

use of honey. The public is not supplied with honey in Iowa where there is honey produced by the carload in nearly every county. Honey cannot be secured in hotels or restaurants in ninety-nine per cent of the cases. It is a common thing to call for honey in a grocery store and find that they have none. The local market is not being sufficiently supplied with honey.

We realize the importance of advertising honey. Do you think the advertising of a product through billboards, magazines and radio stations would meet with real success if the product were not placed where the public had easy access to it? Honey is being advertised through magazines, newspapers and radio. However, honey is not being thoroughly placed where the public has easy access to it.

Being especially interested in increasing honey consumption, with the assistance of a local beekeeper, the city of Ames was used to market our honey crop of 5,000 pounds. My object being to get first hand information on, first, why so many grocermen found that honey was a slow mover in the store; second, why stores do not like to handle honey, and third, to see if honey consumption could be increased in Ames.

The first step was to put our honey in an assortment of neat and attractive packages, and to be certain our honey was properly bottled, well packed and not heated enough to spoil the delicious clover flavor. We were also careful that no early spring honey or fall honey was sold for table use. The honey was packed in 1-pound tall jars, 3-pound E. Z. Carry quart jars, 5-pound tin pails, 5-pound lithographed pails, 10-pound pails and 60-pound tins. Cellophane wrappers were used on the comb honey.

The honey was sold to 20 Ames stores. The honey retailed for: comb honey 23 and 25 cents per section, 1-pound jars 25 cents, quart jars 65 cents, 5-pound pails 85 and 90 cents, 10-pound pails $1.40 and $1.50 and 60-pound tins for $6.50. The groceryman sold the honey with the guarantee that they would be kept well supplied; honey would be removed refunding money for same if it failed to sell. Honey that granulated would be replaced. If any other large beekeepers offered him honey for a better price the competition would be met. However, the small beekeepers and cut price fellow that offered his honey cheap to get rid of it would not govern your price. Right here let me say that the groceryman does not appreciate the fellow who will cut his price any more than you do.

In most cases the groceryman agreed to place the honey in a conspicuous place and was willing to keep well stocked. A large volume of honey well displayed in a conspicuous place is the secret that does much to move the honey for the groceryman. An ideal place to display the honey is near the bread as nearly every customer buys bread and could see the honey. It is also a great advanntage if a small amount of honey is kept near the cash register where the customer will bump into it when he pays for his purchase. It is important to keep the stores supplied, therefore, if you are selling to stores you will have to produce comb honey as well as extracted honey. Cellophane wrappers are wonders for selling comb honey. Two reasons makes this a fact, first, it makes a sanitary and neat package that appeals to the public, and second, it can be easily displayed and handled by the groceryman. They had 6 sections of honey in one store which had been there 2 or 3 months, these were removed and a dozen sections in cellophane wrappers were sold the groceryman. In one week these were sold and the groceryman was easily sold a case of comb and a case of 1-pound jars. The clerks usually hate to handle honey as it is often sticky. This is caused by the containers being too full and the honey oozes out causing the clerks undue work in keeping the containers and shelves clean. Nearly all the stores have sold more honey in 3 months than they did during the entire season of 1929-30. One store has sold over $100 worth of honey, double what he did last year. The clerks in this store are interested in selling my honey and they have all been given honey. The groceryman becomes interested when he finds honey will move and does not merely handle it to accommodate a customer.

In selling to a groceryman never tell him what he should sell the honey for. Never knock the honey he has in his store. If it is good, compliment it and if it is bad keep your mouth shut, but try and sell him yours so he can place it next to the poor honey. Yours will outsell it and you have a real customer. The groceryman is interested in a product that will move and not be a dead item on his shelf. Be certain to keep your stores well stocked. Don't call too often as sometimes it will make them think it is not selling, but be certain he never gets low on honey.

Any bottles of honey that granulated or the labels on containers get ragged these should be replaced with fresh bottles of honey. Remember that success is not gained when you sell the groceryman but when the honey is sold to the consumer and he calls for more honey. When a customer walks into a store and says, "I want a jar of that good honey" and then before he leaves the store buys $5.00 worth of other groceries you have made a real friend out of the groceryman and you can bet your last nickel that he will sell your honey and lots of it.

The results are conclusive that there is no better way to advertise honey than to display it in the grocery stores. In August, September and October I have sold 3,500 pounds of extracted honey, 1,500 pounds of comb honey which has netted me 12½ cents per pound for extracted and 16 cents for comb honey. There are three other beekeepers in Ames who have sold 3,000 pounds of honey and ten others who have sold at least 3,000 pounds making above 10,000 pounds of honey being sold in Ames in the last three months. Ames is a town of some 10 or 12,000 population.

In conclusion it might be said that:

1. Honey will sell locally if it is properly marketed.
2. It will move fast if it is given a fair chance.
3. Beekeepers can increase honey consumption, find a place for some of the surplus in the home market and receive a good profit for doing his duty in advertising honey.

MEETING MARKETING NEEDS

Ed G. Brown, Sioux City, Iowa

A few years ago or at the time the Mountain States Cooperative was started, the exporting of honey was a comparatively minor item in the American honey market and was handled by a few exporters who were interested in a nominal movement at a large profit rather than the moving of the surplus American production. The Mountain States' people went after the export work in earnest and cleared the American market in excellent shape until the foreign countries took a slap at the American tariff and practically barred Yankee honey from their markets. This has resulted in our being forced to create a market in our own country for our own production.

The honey industry is not alone in this situation as there are many examples and also well-founded opinions that America, in both manufactured and agricultural products, will have to confine its production activities to the requirements of domestic consumption. Discouraging as this may sound to some, there are angles to the honey situation which if properly met by the producers, and they are the ones who must complete the wonderful work already started, that will make the solution of our problem much simpler than those of many other agricultural lines.

Our first great advantage is in the recent low per capita consumption of honey in the United States. Our per capita consumption of honey compared with that of many foreign countries would indicate that we can increase our consumption ten to fifteen times its present figure.

The per cent of difference between our present production and our domestic consumption is not large and yet our natural resources will permit of an increased production to meet any increased consumption that can be developed but production must be controlled to prevent periodical breaks in the market by producing a surplus. This control can be accomplished only by the loyal action of well organized producers' associations.

The revolutionized condition of the European people since the war, will require a readjustment of the American production and marketing policies and as much as we may dislike to do so, we may have to do our thinking in terms of domestic consumption. If the producer expects to get his just share of the consumers' dollars, he must own and control his marketing machinery and this is practical only through cooperatives functioning the year around and operating over a large territory. We have a number of cooperatives in the country at the present time that are operating with various degrees of success. It takes years to build a successful business and establish business policies and prestige and this is as true with a cooperative as with any other form of business.

Cooperation with good business management does not fail but many cooperatives fail because of the lack of cooperation of its members. Cooperation will be a slow process of relief but the beekeepers already have organized for them an agency which can give very efficient and immediate results if they will give it the support it should have instead of treating it as of little value just because someone else gave it to them.

The American Honey Institute is the most far-reaching and effective means of presenting honey to the American people that we have ever had. Through the president of the Institute, with his interest in honey, we have ways opened for us that we would otherwise be entirely unable to approach and there is probably no one who knows better where to go and how to get before the people we need to reach than our good friend Dr. Barnard. Miss Fischer with her enthusiasm, her wonderful personality, her pleasing ability to approach people of all classes, coupled with her ingenious, inventive mind, makes her of value beyond estimation.

The Bee Industries of America are responsible for creation of the Institute and for the securing of the able executives for it but the enlarging scope of work is creating a financial burden too great for them to carry and it is necessary that the beekeepers give the needed financial support if this work is to be continued and honey is to retain and increase its place as an article of food with the American people.

The modern trend in advertising is a mass effort to popularize a certain kind of food rather than a certain brand, thus letting the various brands reap results in accordance with their ability to give quality and service. Today it is not a contest of brands but a contest of various kinds of foods. The public can eat only so much food and we will have to fight for our share of the American appetite.

If it had not been for the work of the American Honey Institute, our honey market today would be completely demoralized. The financing of the Institute can be put over without placing a burden on anyone if the beekeepers will get back of the Michigan plan of contributing $1.00 per ton or one-twentieth of a cent per pound from their crop. We cannot hope to get the support of absolutely all the producers to this program but the support of 50% of the production of Iowa will go a long way toward helping out and if this can be a well-supported nationwide move, the work will go over big and repay us many times. I entreat every one of you to meet this call and to use your best efforts to see that your neighbors do likewise.

BEEKEEPING OBSERVATIONS EN ROUTE, CALIFORNIA TO KENTUCKY

G. H. Vansell, Davis, California

Travel by automobile lends itself beautifully to the study of conditions where honey is produced. It permits actual visits into the scattered apiaries in full swing of operations. The great variation in location is a most striking feature brought to my attention.

The states of California, Nevada, Utah, Wyoming, Nebraska, Iowa, Kansas, Missouri, Illinois, Indiana, and Kentucky were traversed by one or more routes during the summer of 1930. Not only were beekeeping conditions and men under observation, but a definite attempt was made to learn something of methods of cooperative marketing in use. Also the research programs at the several institutions received special attention from a critical viewpoint in hopes that suggestions for improving our own program in California might be gleaned.

The idea that increase in production, either by more beekeepers or more extensive operations, is to be discouraged seems well crystalized. On the other hand, a reduction in expense of present production was held as one of the most feasible moves toward prosperity. Cooperative marketing is looked upon by many as the magic wand combination through which honey producers should get more favorable returns. However, ideas are very vague concerning a workable plan of such marketing. The Colorado Honey Producers Association, a stock company, appeared to the writer to be the only honey selling cooperative in the territory, which was giving satisfaction to the producers. They have specialized on a high quality comb honey under severe supervision. In general, producers are apt to think of a cooperative as a thing to which they are simply to sign their names, then leave all the rest to someone else.

Of all the places visited, southeastern Nebraska offered greatest opportunity for those in crowded territory. Sweet clover is being used extensively there in regular farming operations. The small number of bees found indicates that beekeeping is not yet far developed. The use of yellow sweet clover, in particular for pasturage and green manure, was sufficient to give color to the whole area. This luxuriant rain watered growth was a most welcome sight after so many miles of dry land further west where practically nothing grew except in spots which could be irrigated.

The great drought became evident only a short distance east of Kansas City. Northern Kansas had received too much rain during the season up to July 1st when she too suffered shortage which ruined much of the corn crop. There were sections in Kentucky that had received practically no rain after March—such areas were indeed very dry and totally lacking in crops of any kind. Bees suffered greatly in many places from a scarcity of blossoms. The blue grass pastures, which are normally knee deep with blue grass and white clover, were about as bare as a swept floor.

Iowa presented a picture of a perfect farming area. Her land is level or rolling and practically all tillable. Most of it is very fertile. The agricultural college at Ames is a most progressive institution. More research and other beekeeping work was in progress here than at any other place visited, with the possible exception of Wyoming with the University and the United States Department of Agriculture, Apicultural Field Station both at Laramie. Agricultural unrest was sensed even in Iowa.

It took no financial expert to see evidences of agricultural depression everywhere. Prices on farm produce were extremely low—No. 1 wheat sold during my visit in Kansas at 69 cents a bushel. Some farmers were stacking their wheat without going to the expense of shocking it after the binder. The stacking crew at times consisted entirely of the family or a neighbor or two swapping labor. Eggs retailed at times for 15 cents a dozen or even less in the Middle West. Upon returning to California

in August, pears, peaches, and grapes were rotting in the fields for lack of buyers, quite in contrast to the scarcity of fruits and vegetables east of the mountains. Honey prices were so low that much of this product was still in the producer's or his agent's hands from the previous season. This was particularly noticeable in the heavy producing intermountain region with the handicap of great distance from market in any direction. History shows that depressions like the present one, occur in cycles between periods of inflation when the dollar is not worth so much. Such fluctuations are often closely associated with war conditions, during and following which men are taken from and returned to productive pursuits. Experts tell us that the present depression is to be short lived. One thing is sure, it was not due this time to our democratic administration. It is as always a result of world factors.

Cooperative associations often are unable to survive periods of falling commodity prices. Those formed in self-defense when conditions are bad are quite likely to carry on through the years of increasing prices only to meet disaster after the top of the cycle is past. It is only those dealing with special restricted locality crops that have been able, with the help of tariff measures, etc., to make much of a showing. Let's see someone take hold of a commodity like wheat and make a strictly cooperative organization function to satisfaction. The above statement may make it appear that the writer is opposed to cooperative marketing—he is not opposed, but simply skeptical to our ability to get permanent results. Cooperative regulation of production in proportion to the consuming demand might be more effective and perhaps just as workable. Even with wheat the largest production we ever had prior to the World War was about sufficient to meet the domestic consumption of today. It is the sharp increase each year since then that has piled up our surplus. Production in proportion to our needs would be feasible both from the monitary return to the present farmer and the conservation of our soil fertility for those to come.

Impressions gained from field observations and personal contacts are certainly well worth while. I can now better appreciate the numerous reasons for Frank Pellett's frequent rambles which are written up so interestingly in the American Bee Journal.

BEE CLUB WORK

Bee Club work with boys was conducted in three counties during the season of 1930. There were three exhibits by clubs in the Junior Department of the Mid-West Horticultural Exposition held in Shenandoah, November 11 to 16, 1930. These demonstration teams were present for the competition in the Junior team's work and both of the teams appeared on the radio of a local station. The team from Ringgold county, coached by County Agent J. A. Bliss, was composed of Aubrey Kirkpatrick and Richard Saltzman, who presented "How to Start with Bees." The team from Adair county, coached by County Agent W. M. Zellars, composed of J. C. Pemberton and Lyle Gatch, presented "How to Winter Bees." Copy of the radio talk and the demonstration dialogue of the Ringgold team is presented and it is a matter of great regret that the request for the same material of the Adair team could not be presented also, but request was made too late of the coach who indicated that no permanent record was kept of the work of that team.

CECIL HOLLEN'S RADIO TALK

Hello Radio Folks! I am glad of the opportunity to bring you a greeting this morning from the 4-H boys' and girls' clubs of Ringgold county.

We have an enrolled membership of 189 and we sure appreciate the opportunities that come to us through the club work. The girls in our county are taking home furnishing work in their regularly organized groups but a few of the girls are doing the same kind of work as the boys.

The Ringgold county boys are organized in neighborhood groups and each boy can choose his own type of work. Four of us chose work with bees and three of us are here at the Mid-West Horticultural Exposition. We have an exhibit and a demonstration.

We chose bees for our work because they are such interesting things to learn about and are such a good illustration of a well organized community. They furnish us with a good supply of a most healthful sweet for our tables and it only costs about $15.00 to get started with plenty of supplies for the first season.

Our demonstration here at the Mid-West shows how to make a start with bees. We chose this demonstration because of the interest fruit growers are taking in securing bees for their orchards. They have to have bees to carry pollen from one tree to another to fertilize the blooms and make a good set of fruit possible.

To you folks who do not have bees we want to say you are missing a lot of fun. We get lots of kick out of studying their funny ways and the splendid way they do their work. I want to tell you a few of the things we have learned.

The queen is the mother of the entire colony. She lays all the eggs and the success of the colony depends on her being a good worker with lots of vitality. In the busy season a worker bee only lives about six weeks and a good strong colony will have as high as 90,000 bees at a time so you see the queen has to lay eggs at a great rate. Some of the best ones lay more than 3,000 eggs a day.

When a bee goes out to gather honey it only works on one kind of flower on a trip. I guess the bee thinks that when the flower furnishes it with its food it in turn will have to be fair to the flower and be careful not to get the grains of pollen into the wrong kinds of flowers.

Dr. Park of Iowa State College tells us that a single pound of honey represents the life work of about 300 bees and if one bee could gather nectar enough to make a pound of honey it would have to work all day every day for more than eight years and travel about 75,000 miles or three times around the earth.

Last year Iowa produced more honey than any other state but Dr. Pammel of Iowa State College thinks that the bees only gathered about one-tenth of the nectar the flowers produced.

Bees that are not well protected from the cold during the winter just about work themselves to death eating honey and exercising to keep warm. If you want the bees to do lots of good work for you you need to give them a good, big hive to work in. Be sure they have a good, vigorous queen, are free from disease, are protected through the winter and have plenty of honey to live on.

Well, I have talked long enough but I want to add that we are sure glad the Farm Bureau gives us the opportunity to do club work and we want to thank the Mid-West for inviting us here to Shenandoah. We also think it is nice of Mr. May to let us talk to all you folks. We wish we could see how many are listening in.

DEMONSTRATION "BEGINNING WITH BEES"

Given by Aubrey Kirkpatrick and Richard Saltzman, Ringgold County, at the Mid-West Horticultural Exposition, 1930

We, Aubrey Kirkpatrick and myself, Richard Saltzman, are members of the boys' and girls' 4-H clubs of Ringgold county in which the enrollment this year was 189.

In our county the regularly organized girls' clubs study the same project throughout the county any one year. However, some girls are following the same line of work as the boys. In the boys' clubs we are organized in neighborhood groups and each boy may take a different line of work if he wishes. Four of us are taking Bee Club work and our demonstration is to show a good method of getting started with bees.

We chose bees for our project in club work because bees are such interesting things to learn about, it does not take very much money to

start with them, and they furnish the most healthful sweet that we have on our tables. Instead of being at an expense all the time to feed them, they gather their own feed and pay us for the privilege by carrying pollen from one flower to another, thus aiding nature in fertilizing the plants and insuring a set of seed and fruit.

We have chosen this demonstration for the Mid-West Horticultural meeting because of the great interest fruit growers are taking in placing bees in their orchards to carry pollen. Careful investigations have shown that bees are necessary to a good set of fruit on many varieties of fruit and nut trees.

The beginner with bees will need to have a proper hive, bee veil, smoker, and hive tool. There are several sources from which bees can be secured.

My team mate will now show you the type of hive we have chosen and the method of putting it together.

Aubrey:

If one is to have success with bees, it is necessary that they be in movable frame hives so the caretaker can know what attention they need. We have chosen the 10-frame Langstroth hive with movable top and bottom. We buy the hive knocked down and the first thing is to put it together. To save time, we have already nailed the side walls together. We will now put some of the frames together. We are using spacing staples and will drive them first, one in each end piece of the frame to provide bee space and protect the bees in handling the frames. Now we will nail to the top bar driving nails from three directions to insure strength. One nail at each end holds the bottom bar.

To insure straight combs, we provide the bees with foundation or starter comb. Another advantage in using full sheets of foundation is that these sheets are stamped for worker brood comb and lessens the number of drones that will be reared.

To carry the weight of brood and honey and insure a long life of usefulness, we are using foundation with wire imbedded in it. We remove the wedge in top bar, place the foundation *in place, then nail the wedge firmly* to prevent any slipping of the wires. We will not take time to build other frames.

To provide sufficient room for brood rearing and storage of honey to carry the bees through our long winters, we use a double hive body. This gives the queen room to lay eggs to her full capacity which under best conditions may reach 3,000 or 3,500 per day.

We are producing honey for home use only and selected shallow extracting frames for surplus honey. This seems to suit the bees better as it is their nature to cluster over fairly large surfaces when secreting wax and building comb. We supply full sheets of thin foundation without wires and cut the honey from the frames for use making it possible to use the frames many seasons.

We are using a metal covered roof to protect against outside dampness. To insure better insulation, we use three or four old copies of Wallaces' Farmer, Hoards' Dairyman or some other similar sized paper between the boards and the metal. This protects from heat in summer and cold in winter. To protect the wood from decay and add to the appearance, the hives should be painted. We use white paint to prevent excessive heating when placed in the sunshine.

Here we have a completed double story hive with one super all ready for the introduction of the bees. Richard will tell you about installing them.

Richard:

Bees can be secured from a local beekeeper at swarming time or can be purchased in two or three pound packages from southern bee breeders. We bought package bees because we could get them started earlier in the spring and were sure of having young, vigorous queens. The bees came by express in a screen wire cage. An inverted tin can with a nail hole in the lid was filled with sugar syrup made by dissolving

granulated sugar in an equal quantity of water to feed the bees in their journey.

To introduce the bees into the hive, the first thing to do is to check over the equipment and see that everything is ready. Here we have the single body hive all ready with movable frames and full sheets of wired foundation, a second hive body without any frames, a two-pound honey pail filled with syrup made from equal quantities of granulated sugar and water, there are five holes in the lid of the can punched by a six-penny nail driven from the inside out. Here is the smoker ready to quiet the bees if they become agitated. Here are the bees in the package. We have previously painted the screen of the cage with sugar syrup to quiet the bees. Now we will remove four or five frames from the hive and set the cage in. Remove the queen cage and tear off the paper covering the candy plus so the bees can release the queen and place the queen cage between two of the frames. Now remove the syrup can from the cage leaving this opening for the bees to leave the cage. Cover the hive with the inner cover and invert the 10-pound pail of feed over the small hole in the inner cover and set the empty hive body in place, then put the top cover on. Be sure to reduce the opening of the hive to protect against cold and robber bees. In two or three days we will open the hive and remove the cage which should then be empty. We will also look at the queen cage to be sure the queen has been released and remove the empty cage. If the syrup has all been removed from the feed pail we will remove it and the extra hive body.

Some springs the honey flow is so light through May that it is necessary to refill the feed pail.

We will watch the bees carefully and when all the frames in the lower body are drawn out will give the bees the second body filled with frames and wired foundation. When this is all filled with drawn cells we will begin to add supers for surplus honey as needed.

In this latitude it is usually best to have the bees arrive about the 20th or 25th of April to take advantage of the honey flow in the fruit bloom.

Aubrey will now summarize our demonstration.

Aubrey:

In our demonstration we have tried to show that honey bees are necessary to good fruit production, that it pays to have good equipment fashioned with the needs of the bees in mind. We have shown how to build the hive, secure the bees and introduce them to their new home. The main points in bee care are about as follows: Provide a good, roomy hive to hold plenty of stores for winter use and for brood production. Be sure to have a good, vigorous young queen. Protect the hives from severely cold weather. Watch the bees carefully and always provide extra supers when needed. This concludes our demonstration. If there are any questions we will try to answer them.

A CATALOG LIST OF AMERICAN BEE JOURNALS INCLUDING CANADA AND THE UNITED STATES, WITH A LIST OF THE NUMBERS AND VOLUMES IN THE MILLER MEMORIAL LIBRARY, JULY 1, 1930

CANADA

L'Abeille—Revue Apicole, Organe des Apiculteurs de la Province Quebec. Title amended June issue, 1928. "L'Abeille et L'Erable." Two sections "L'Abeille et L'Erable." Discontinued with the December, 1929, issue, and the same items published in "Le Bulletin de la Ferme," official organ of the cooperative Federation of Quebec, which see. Quebec. Monthly. M. C. Vaillancourt, Ed.

M. L. v. 1-11, 1919-1929, Jan. to Dec.

The Beekeeper—Peterboro, Ontario. The "Union Serial List" lists this publication as having started in 1892 and having consolidated with the "Canadian Horticulturist and Canadian Bee Journal" in May, 1913. We

do not have this volume, and I have not yet traced it. In 1914, vol. 23, given as "Canadian Horticulturist and Beekeeper," the "Beekeeper" having a separate section. The June issue of that year, printed vol. 24, July issue, given vol. 22, no. 6, Sept. no. 8, 1915—numbered vol. 23. In Sept., 1915, beekeeping material run with other matter under title of "Canadian Horticulturist and Beekeeper." Feb., 1516, no. numbered vol. 26, continued to June and then changed to vol. 24. June, 1921—vol. 29. "The Beekeeper" made a separate publication through vol. 33, 1925, six numbers only. Vol. 34, 1926, 11 numbers only. Vol. 35, pp. 12 numbers per volume.

M. L. contains v. 23, 1914, v. 23, 1915, nos. 5-12, v. 24, nos. 1-8, Jan. to Aug. v. 25—11-12 only; v. 26, 1918; v. 28, v. 29, 1921 lacks no. 6 for June; v. 30-34, 1922-1926, v. 35, 1927, lacks nos. 3 and 12. v. 36 plus.

Bulletin De La Ferme—Organe Official de la Cooperative Federee de Quebec, de la Societe des Jardiniers-Maraichers, de la Societe d'Industrie Laitiere de Province de Quebec et de l'Association des Eleveurs de betail Holstein-Friesian (section de la Province de Quebec). Quebec. 1 p., 1913 pub. weekly. The Feb. 13 no., vol. 18, no 6, 1930, contains the announcement of the Federated Societies of Quebec, which leads up to an editorial in Feb. 20th issue, on the "La Sucrerie-Le Rucher," et "Le Bulletin de la Ferme"; in this issue on page 167, "L'Abeille et L'Erable" is continued as a regular part of the journal.

M. L. contains v. 18, no. 6 Feb. 13, 1930 plus.

The Canadian Bee Journal—Founded by D. A. Jones, at Boeton, Canada; later pub. at Brantford, Canada, and edited by R. F. Holterman. Began with v. 1, April, 1885, and was issued weekly for 5 vols. In April, 1891, changed to semi-monthly and continued to June, v. 9, no. 6, 1893. Only six numbers being printed for that volume. A new series, (monthly) started in Aug., 1893, and continued to Feb., 1913, vol. 21, after which it was incorporated with the "Canadian Horticulturist and Beekeeper"—date?

M. L. contains v. 2-4; v. 8, nos. 19-24; v. 9 complete, 6 numbers only, April to June, 1893; v. 1, n. s. 1893, v. 2: v. 3, 1-10; v. 5-9, 1896-1901; v. 10, 1-2, 4-12; v. 11-12; v. 13, 1-8, 10-12; v. 14-16; 17, 1-8; v. 18, 4, 6, 11-12; v. 19; v. 20, 2-10, 12; v. 21, 1913, nos. 1-2.

The Canadian Beekeeper and Gardener—100 Adelardo St., Winnipeg, Canada—W. Berry, Business Manager, Vol. 1, no. 1, 1927.

The Canadian Honey Producer—Brantford, Ontario. E. L. Goold & Co. Pub. 1-? 1887-?

M. L. contains v. 1, no. 11, Jan., 1888.

Pasika (Apiary)—N. Pankova and D. M. Eichyshyn. Ed. and Pub., Winnipeg, Canada. Monthly illustrated paper, printed in Ukranian for the Ukranian beekeepers in Canada and the United States. V. 1, nos. 1-6, Feb.-July, 1924. After a double number, 2-3, changed to the "Agriculturist" which ended with no. 6 for July.

M. L.—v. 1, nos. 1-6.

The Practical Beekeeper—Tillbury Center, Ont., Canada. T. N. Leigh, Ed. Began with v. 1, Nov., 1893, and ran to when?

M. L. contains v. 1, no. 1, 1893, and n. s. v. 1, no. 7, Dec., 1894; n. s. v. 2, no. 1, Jan., 1895.

Western Canadian Beekeeper—Lynn Browne, Ed. Vancouver, B. C. vol. 1, 1920—at least 4 nos. printed. (Univ. of California.)

The Western Gardener and Beekeeper—"The Poultryman." Winnipeg, Canada.

M. L. contains scattered numbers from v. 2, 1921, to v. 5, 1925.

UNITED STATES

The American Apiculturist—A journal devoted to scientific and practical beekeeping (monthly). Salem and Wenham, Mass. Founded by

S. M. Loche. Later edited by Henry Alley. V. 1-13, no. 5, May, 1883-May, 1895.

M. L. contains v. 1-3; v. 4, nos. 1-6, 8, 10-11; v. 5; v. 6, nos. 4-6, 8-12; v. 9, 3-5, 8, 11-12; v. 10, 2-7; v. 11, 1-2, 5; v. 12, 1-2, 9; v. 13, 1.

American Bee Gazette—(Monthly) U. S. D. A. v. 1, no. 1-3, June-Aug., 1866. (Absorbed Feb., 1867, by "American Bee Journal.")

The American Bee Journal—v. 1, 1861 plus. Philadelphia, Pa. Samuel Wagner, Ed. Interrupted by Civil War and started again by Wagner—vol. 2, 1866, Washington, D. C. Beginning v. 8, no. 8, edited by W. F. Clarke at Chicago, Ill. Vol. 11, no. 11, 1875, consolidated with "National Bee Journal." W. F. Clarke and E. S. Tupper, Editors. T. C. Newman, Manager. Vol. 15, 1879, T. C. Newman, Ed. In 1883 and 1885, both a weekly and monthly ed. were published. Beginning with v. 29, no. 23, July 2, 1892, Geo. W. York, Ed. and Pub., Chicago. He published two vols. per year from 1892 to 1894 to make the vol. number correspond with the year of the journal's foundation. Vol. 52, no. 5, 1912, C. P. Dadant, Ed. Pub. at Hamilton, Ill., where it is now published. F. C. Pellett and G. H. Cale, Associate Editors.

M. L. contains v. 1 plus, except vols. for 1883 and 1884 (monthly) which were mostly abstracts from the weekly editions. (A. B. J. office has only set of monthly issues for 1883-1884 known to me.)

American Beekeeper—Lebanon, Mo. E. M. Harrison, Ed. Began with vol. 2, no. 9, Sept., 1880, as a continuation of the "Western Honey Bee" by the same editor, and ran to vol. 5, no. 10, at least. Oct., 1883.

M. L. contains v. 2, nos. 9-12; v. 3; v. 4, no. 9 (p. 203 of no. 9 writes that Nov. issue will be printed next to be followed by the Oct., Nov.—Too busy). V. 5, nos. 1-10, Oct., 1883.

American Beekeeper—Falconer, N. Y. Pub. by W. T. Falconer Mfg. Co. v. 1, 1891, to 18, no. 8, Aug., 1908. H. E. Hill, Ed. from v. 10 to 18.

M. L. contains v. 1, nos. 1-2, 4, 7-12; v. 2, nos. 2-12; v. 3; v. 4, nos. 2-6; v. 5, nos. 1, 3, 5-10, 12; v. 6, nos. 2-5, 7, 8; v. 7, nos. 1, 4, 9; v. 8-18, no. 8 for Aug.

American Honey Producer—Official organ of the American Honey Producers' League, Laramie, Wyo. (Successor to "The League Bulletin," vol. 6, no. 1). v. 1, March, 1927, plus. H. F. Wilson and C. L. Corkins. J. A. Munro became editor in July, 1929, and publication changed to Fargo, N. Dakota.

M. L. contains v. 1 plus.

Amerikai Mehcszet (American Beekeeping)—Elso es egyedull-Magyar Mehesz-Szaklap Amerika-Ban S. Canadaban (First and only Hungarian bee journal in the U. S. and Canada). South Bend, Ind. (Only one number printed.)

M. L. contains v. 1, no. 1, July, 1926.

Annals of Bee Culture—A beekeepers' year book, with communications from the best American Apiarians and Naturalists. Pub. monthly. Louisville, Ky. Adair, 1869 to 1872. This is really a new book, but Adair considered it a magazine and states that the volume for 1872 was vol. 4.

M. L. 1869, 1870, 1872.

The Apiarist (Waco, Texas)—C. S. Phillips, Ed. 1905-06. Only twelve numbers pub. Nov., 1905, to Nov., 1906. John Bradley became the editor Oct., 1906.

The Apiculturist and Floral Guide (Mexico, Mo.)—1872, v. 3, no. 1, successor to "The Apiculturist and Home Circle," Jan. 1872, and continued to vol. 4, no. 2, Feb., 1873?

M. L. v. 3, nos. 3-6. (Only six nos. issued) v. 4, nos. 1-2.

The Apiculturist and Home Circle—Mexico, Mo. W. G. Church, Ed. Preceded "The Apiculturist and Floral Guide," ran from vol. 1, Jan., 1870, to vol. 2, Dec., 1871, and then changed title?

M. L. v. 1, nos. 2-3, v. 2, no. 2.

Bee Bulletin—Pub. monthly by the Anderson County Beekeepers' Ass'n. of Anderson, S. C.
M. L. contains v. 1, nos. 1-9; Jan.-Nov., 1925, and v. 1, nos. 7-8, 1926. (Duplicate numbering.)

Beecause—House organ for G. B. Lewis Co., Watertown, Wis. Kennith Hawkins and E. W. Atkins, Ed. V. 1, 1922, plus. 4 to 6 issues per year.
M. L. contains 1, plus.

The Bee Hive—Pub. Andover, Conn. (bimonthly, after vol. 1, monthly.) E. H. Cook, Ed. v. 1-4, 1886-1890. Ceased publication when? Bought by Falconer and merged with "American Beekeeper," v. 1, no. 1, Jan., 1891.
M. L. contains v. 1-3; v. 4, 1, 9-12; v. 5, nos. 2-6.

Bee Hive—House organ for A. I. Root Co., Medina, Ohio. v. 1, 1923, plus? (issued at irregular intervals.)

The Beekeepers' Advance and Poultrymen's Journal—Mechanics Falls, Maine. Jas. B. Mason & Sons, Eds. (Monthly.) Began as "The Beekeepers' Advance," vol. 1, no. 1, Jan., 1887, v. 2, title amended to include "Poultrymans Journal." In Jan., 1889, bought and consolidated the "Beekeepers' Magazine," Feb., 1889. Vol. 1889 and 1890—numbered v. 17 and v. 18, being the vol. nos. for the "Beekeepers' Magazine." Ceased with Nov. issue, 1890, then united with "American Beekeeper," v. 1, no. 2, 1891.
M. L. contains v. 1, nos. 1-2, 4-6, 9-12; v. 2, nos. 1-3, 8; v. 17, n. s. v. 3, nos. 2, 5, 11, 12; v. 18, 1890, n. s. v. 4, nos. 1, 3-5, 7-9.

The Beekeepers' Enterprise—Ed. by Burton L. Sage, New Haven, Conn. V. 1-1893, May-Aug. After four nos. changed to "Success in Bee Culture," see v. 1, no. 1, p. 9, Oct., 1893.
M. L. contains vol. 1, nos. 1-2, 4.

The Beekeepers' Exchange—A magazine devoted exclusively to the best interests of producers and consumers of honey. (Monthly.) Canapohrie, N. Y. J. H. Nollis. Dec. No. 12-1881, by Houck & Peet. The last two nos. vol. 5, nos. 6-7. Edited by Colgrove and Ullery, who took over the paper following the illness of Mr. Houck. In v. 5, no. 6, p. 162, the new editors proposed to change the number of pages to 20 and publish the paper semi-monthly, beginning Jan., 1884. I have seen no record to prove that this was done. One of the best bee journals of the time, with a wide variety of articles. Vol. 1-Vol. 5, no. 7?, Jan., 1879-July, 1883.
M. L. contains vol. 1-vol. 5, No. 7. A complete file? ('th Ed. J. H. Nellis, circular and price list bound with vol. 2, 1880.)

The Beekeepers' Forum—Columbus, Ohio, Florence Naile, Ed. 1 no. only.

The Beekeepers' Guide—Kendallville, Ind. Pub. by A. G. Hill. V. 1, 1877-v. 17, no. 4, 1893. First six volumes in newspaper form.
M. L. contains vol. 1, nos. 1-4; vol. 4, nos. 9-11; vol. 5, nos. 1-5, 11-12; vol. 6; vol. 7, nos. 1-8, 10-12; vol. 8-12; v. 13, 1, 3; vol. 14-16; vol. 17, nos. 1-4.

The Beekeepers' Instructor—Adelphi, Ohio, Ed. S. D. Riegel. Vol. 1, Jan., 1879, to v. 4, no. 9, 1882. V. 3, 1181, Webster Thomas, Ed. Journal moved to Somersett, Ky., in 1882.
M. L. contains v. 2, nos. 3, 11-12; v. 3-4; 1881-1882, comp. Absorbed by the "Beekeepers' Guide" after v. 4, no. 9, 1882.

The Beekeepers' Item—First Pub. and Ed. by Louis Scholl, New Braunfels, Tex. In 1926, E. G. LeStourgeon became editor and paper moved to San Antonio, Tex. V. 1, 1916 plus. First 4 vols. in newspaper form.
M. L. contains vol. 1, plus.

Beekeepers' Journal and Agricultural Repository—Nevada, Ohio, H. A. King, Ed. Vol. 1, 8 nos. Jan.-Aug., 1869. United with "The National Agriculturist" to form "Beekeepers' Journal and National Agriculturist," New York, with no. 9, became vol. 10 of "Beekeepers' Journal and National Agriculturist," Cleveland, Ohio. United with the "National Agriculturist" to form "Beekeepers' Journal and National Agriculturist," Sept., 1869.
M. L. contains nos. 1 to 8, but no. 1 lacks first 4 pages.

Beekeepers' Journal and National Agriculturist, for the Apiary, Farm and Fireside—New York. H. A. King, Ed. Successor to "Beekeepers' Journal and Agricultural Repository," which see. The vol. no. of the "National Agriculturist" was adopted and the first number of the new combined journal was Vol. X, no. 9.
M. L. contains Vol. X, nos. 9-12; Vol. 11, nos. 1-12; Vol. 12, nos. 2-9, 12; Vol. 13, nos. 1-3, 5, 7.

The Beekeepers' Magazine—H. A. King & Co., Pub., New York. V. 1, Jan., 1872—Vol. 16, Dec., 1888. In Jan., 1889, absorbed by "Beekeepers' Advance"; 1883, title, "Bee and Poultry Magazine."
M. L. contains vols. 2-12; Vol. 13, 1-3, 5-12; Vol. 15.

Beekeepers' Quarterly—Dowagiac, Mich. James Heddon, Ed. Was to be issued quarterly. Vol. 1, no. 1, April, 1894. A fourth number, under title of the "Dowagiac Times" (Beekeepers' Edition) appeared in Jan., 1895. Four nos. at least must have been published.
M. L. contains Vol. 1, nos. 1, 4.

The Beekeepers' Review—Founded by W. Z. Hutchison, Flint, Mich. Vol. 1, 1888, plus. E. B. Tyrell became editor following the death of Mr. Hutchison in May. Detroit, Mich., with vol. 26, no. 12, Dec., 1913. E. D. Townsend, North Star, Michigan, became editor and in 1917, vol. 30, name changed to "Domestic Beekeeper." E. A. Little, Lansing, Michigan, became editor with vol. 35, 1922, and the name was then changed back to "Beekeepers' Review." Vol. 37, Arthur Rattray, Ed., Almont, Michigan.
M. L. contains Vol. 1, plus.

Bee Pep—Pub. by Iowa Beekeepers' Ass'n., Marshalltown, Iowa.
M. L. contains Vol. 1-3, 3 nos.—all that was printed?

Bees and Honey—Established by Alameda Co. Beekeepers' Ass'n., Oakland, Cal. Vol. 1, 1920, plus. Cary W. Hartman, Ed. Began with Vol. 1, no. 1, Nov. ?, 1920, and first vol. ran to June, 1921; 3rd vol. March, 1922, to Dec. In Nov., 1922, Geo. W. York became editor and moved the paper to Spokane, Wash. He moved to Seattle, Wash., Dec., 1924, and to Alhambra, Cal., in Feb., 1930, where paper is now published.
M. L. contains Vol. 3, nos. 1-2, 4, 7-12; vol. 4 plus.

The Bee World—Waynesburg, Pa. W. S. Vandruft, Ed. Vol. 1, 1891. Run for five nos., Feb. to July and sold to "American Beekeeper"?
M. L. contains Vol. 1, nos. 2 to 5. June no. not printed.

The Booster—Redkey, Ind. Geo. W. Williams, Ed. Pub. consecutively from June, 1915, to August, 1917, and one more number, the last, March?, 1918. Issues badly numbered and difficult to tell just what was issued.
M. L. contains June, 1915-March, 1918. (The first 5 nos. in newspaper form.)

The Busy Bee—An illustrated manual of scientific and practical bee culture. Edited by H. Herman Flick, Lavarsville, Pa.
M. L. contains 1 no. only—Spring, 1873.

The Busy Bee—St. Joseph, Mo. Emerson Taylor Abbott, Ed. (Monthly.) Successor to "Nebraska Beekeeper"—Vol. 8, no. 4, 1897. Ran from Vol. 8, no. 5, May, 1897, to vol. 9, no. 9, 1898, and continued as "Modern Farmer and Busy Bee."

The Busy Bee—Kansas City, Mo. J. F. Diemer, Ed. (Quarterly.) Vol. 1, 1923-24, nos. 1-4, Jan., 1924.
M. L. contains nos. 1, 2, 4.

The California Apiculturist—Oakland and Los Angeles, Ed. N. Levering. 10 no. pub. Feb. to Nov., 1882. W. A. Pryal became associate editor and manager with Vol. 1, no. 5, June, 1882.
M. L. contains vol. 1, nos. 1 to 10.

The California Beekeeper—A journal for the novice and expert in beekeeping. Wm. Styan, Ed. Only four nos. published? Vol. 1, no. 1,

Feb., and followed in March, April and June, 1891—published at San Francisco, California, changed to San Mateo, Cal., with no. 4.
M. L. contains volume 1, nos. 1-4.

The California Honey Bowl—Riverside, California. E. J. Atchley, Ed. (Quarterly.) Only 5 nos. pub.? Vol. 1, nos. 1-3, April, July and Oct., 1919; Vol. 2, nos. 4 ? and 5, Jan. ? and May, 1920. Vol. 1, no. 2 contains a fairly complete reprint of Vol. 1, No. 1. Univ. of Cal. contains nos. 1-3 and 5.
M. L. contains 1-3, 5.

The Dixie Beekeeper—Waycross, Ga. J. J. Wilder, Ed. (Monthly.) Vol. 1-11, 1919—March, 1930. Numbering irregular.
M. L. contains Vols. 1-11. Ended with March, 1930.

The Domestic Beekeeper—See "Beekeepers' Review."

The Dowagiac Times—Dowagiac, Mich. James Heddon, Ed. In large newspaper form—see "Beekeepers' Quarterly."

The Far Western Beekeeper—Riverside, California. Henry E. Horn, Ed. Vol. 1, 1907. Only 4 nos. pub. March to June-July.
M. L. contains Vol. 1, nos. 1-4.

The Gleaner—Dalton, Pa. G. H. Calvin, Ed.
M. L. contains V. 1, no. 2, 1885?; Vol. 2, no. 1, 1886.

Gleanings in Bee Culture—Medina, Ohio. Founded by the A. I. Root Co. Jan. 1, 1873, vol. 1, plus. (There is no question but what Mr. Root had much fun and enjoyment in the starting of his little journal, for the correct title of the first volume is "Novices Gleanings in Bee Culture." The word "Novices" was dropped after the first year. Following Mr. A. I. Root, his sons, Ernest and Huber, carried the burden of the editorial work until 1920, when Mr. G. S. Demuth became the chief editor.)
M. L. contains 1 plus.

The Honey Marketer—Medina, Ohio. Geo. M. Gray, Ed. The only number known to me an advertisement of labels from a printer—4 pp. one of text and three of labels. Shows label of Geo. Adelle, Vernon, N. Y., and G. M. Doolittle, Borodino, N. Y.
M. L. summer number for 1885.

The Honey Producers' Cooperator—Published by California Honey Producers' Cooperative Exchange, Los Angeles, Cal. Vol. 1, Oct., 1919, to Dec., 1920—12 nos.; Vol. 2, Jan.-June, 1921, 4 nos.
M. L. V. 1, 1-12; v. 2, no. 3.

The Illinois State Beekeepers' Association Bulletin—Vol. 1, 1923, plus. Began as mimeographed sheets.
M. L. contains 1 plus.

The Illinois State Beekeepers' Association Annual Reports—No. 1, 1892; No. 2, 1894; No. 3, 1904. Then issued regularly one volume each year to date.
M. L. contains 1 plus.

The Illustrated Bee Journal—Indianapolis, Indiana. N. C. Mitchell, Ed. and Pub. One volume printed containing 14 numbers, Dec., 1869, to Nov., 1870, and then became the "National Bee Journal," after Nov., 15, 1870. (Probably Jan., 1871.) (A. B. J. has a complete file.)
M. L. contains Vol. 1, nos. 4, 8, 9, 11-14.

The Indiana Beekeepers' Magazine—Logansport, Ind. R. T. Van Valkenburg, Ed. Devoted exclusively to apiculture.
M. L. has July 1, 1877, no.—no volume no. Quite likely, no other number was published.

Inter-Mountain Horticulturist—A monthly journal devoted to fruit growing, flowers, gardening, bees, etc. Salt Lake City, Utah. John C. Swaner, Ed.
M. L. contains vol. 2, 1891, nos. 4-8, Mar.-Dec. Changed to quarterly with no. 7, Sept.; Vol. 3, nos. 1-2, March and June, 1892.

The Iowa Beekeepers' Bulletin—Ames, Iowa. F. B. Paddock, Ed. (Quarterly.) Vol. 1, 1923, plus.
M. L. contains 1 plus.

The Juvenile Gleanings—Pub. as a part of "Gleanings in Bee Culture" from April, 1882, to Dec., 1888.

The Kansas Bee Journal—Topeka, Kansas. Edith Miller, Ed. (Monthly.) Vol. 1, 1895—10 nos.? Jan.-Oct.
M. L. contains vol. 1, nos. 3-4, 6-10.

The Kansas Beekeeper—Scovell & Anderson, Pub. Columbus, Kansas. Vol. 1, no. 1, Feb., 1881, to Vol. 4, no. 11, 1884? First vol. in small newspaper form.
M. L. contains Vol. 1, nos. 1, 4-10; vol. 2; vol. 3, nos. 1-4; vol. 4, nos. 5-11.

The League Bulletin—Official organ of the American Honey Producers' League. Vol. 1, no. 1, Jan., 1920. A report of the Kansas City Convention, pub. at Los Angeles, Jan., 1920, by Chas. B. Justice, Sec. Nothing else issued until vol. 2, no. 1, March, 1921. H. B. Parks, Sec. In November, 1922, monthly issues were started and continued to Dec., 1923. As vol. 3, followed by 4, 1924, to vol. 7, no. 1, Jan., 1927. Continuous but not regular. Succeeded in March, 1927, by "American Honey Producer."
M. L. contains vol. 1-7, no. 1.

The Lone Star Apiarist—Floresville, Texas. Louis Scholl, Ed. Only 5 mos. pub. Jan. to April, 1902. Merged with "Southland Queen" before the first number was off the press. See A. B. J. for Feb. 27, 1902.
M. L. contains vol. 1, nos. 1-5.

Maine Bee Journal—J. S. Hodgson, Ed. No copies known. Taken over by the "Beekeepers' Advance" in Jan., 1887. See page 3 of the first issue of the "Beekeepers' Advance" for 1887.

Mid West Farm Beekeeper—Bellesville, Kansas. J. W. Kuhn, Ed.
M. L. contains vol. 1, nos. 1-2; 1924, Jan.-Feb. (all that was published?).

The Missouri Beekeeper—(Monthly.) Unionville, Mo. E. F. Quigley, Ed. Vol. 1, nos. 1-10, pub. Mar. to Dec., 1891.
M. L. contains vol. 1, nos. 1-10, March-Nov., 1891.
Succeeded by the "Progressive Beekeeper" in Jan., 1892, as vol. 2, no. 1.

Modern Farmer and Busy Bee—Successor to "The Busy Bee" of St. Joseph, Mo. Aug., 1902? Continued at least to vol. 17, 1906. (Also see "Nebraska Beekeeper.")
M. L. contains vol. 15, 1904, no. 11; vol. 16-17, 1905-1906.

Moon's Bee World—Rome, Ga. A. F. Moon, Ed. Successor to "North American Bee Journal." Began with vol. 1, no. 1, Nov., 1873. Followed by no. 2, Jan., 1874, and run to vol. 4, no. 1, 1877.
M. L. contains Vol. 1-4, no. 1.

National Agriculturist and Bee Journal—New York. Homer A. King and Ellen S. Tupper, conducting editors. M. E. Williams, I. W. Mapes and H. Waldron, Jr., associate editors. This is simply a rearrangement of the name of the "Beekeepers' Journal and National Agriculturist." Vol. XIV, no. 1, Jan., 1873.

National Bee Gazette—St. Louis, Mo. G. W. Penn, Ed. A journal devoted to the production of honey, bee culture, home and farm interests.
M. L. contains vol. 1, nos. 1 and 3, May and July, 1892.

The National Bee Journal—Indianapolis, Indiana. Moon & Schofield, Publishers. Began as "Illustrated Bee Journal," in Dec., 1869, and continued to Nov. 15, 1870, when it changed to "National Bee Journal." First two numbers in newspaper form. Jan. and Feb., 1871. Continued to vol. 5, no. 7, 1874, and then was absorbed by the "American Bee Journal" (see page 191). Mrs. Ellen Tupper became Ed. and Pub. in 1873, Des Moines, Iowa.
M. L. contains vol. 1, see "Illustrated Bee Journal"; vol. 3; vol. 4;

vol. 5, nos. 1-7. First 5 nos. monthly, then semi-monthly to vol. 3, no. 5, when it again became a monthly. Dec. 15 number for vol. 2, not issued. Not pub. for Aug. and Sept., 1873.

National Beekeeper—Dinero, Texas. C. B. Bankston, Ed. No copies known to me. Pub. about 1902.

The Nebraska Bee Journal—Fairbury, Neb. O. G. Collier, Pub. (Devoted to the interests of the "Western Beekeeper.") Only one number known.

M. L. contains vol. 1, no. 1, Jan., 1893.

The Nebraska Beekeeper—York, Neb. L. D. Stilson, Ed. Vol. 1, 1890? to vol. 8, no. 4, 1897, and then succeeded by "The Busy Bee."

M. L. contains vol. 3, no. 5; vol. 7, no. 9; vol. 8, nos. 1, 3-4. Vol. 7 title reads: "Nebraska Beekeeper and Irrigator," a monthly journal devoted to apiculture and irrigation.

Nebraska Bee Tidings—Minden, Neb. V. W. Binderup, Ed. Vol. 1, 1927.

M. L. contains nos. 1-7, beginning with March.

The Nebraska Queen—(Devoted to Bees and Horticulture; monthly.) Auburn, Nebraska. L. L. Alspaugh, Ed. vols. 1, no. 1, July, 1893, to vol.), 1895?

M. L. contains vol. 2, nos. 5-12; vol. 3, no. 2, Sept., 1895.

The New England Apiarium—Mechanics Falls, Maine. W. W. Merrill, Pub. Only 7 nos. known. Vol. 1, nos. 1-7, 1883, Jan.-July.

M. L. contains vol. 1, nos. 1-5, 7.

The New England Bee Journal—Nothing known about it.

New England Bee Journal and Home Gazette—Nothing known about it.

New Jersey Bee Culture—Pennington, N. J. Elmer Carr, Ed. Began as "Hints for Beekeepers"; 1 no. only, Mar. 1, 1922. May, 1922, changed to above name. 5 nos. per year, vol. 1, 1922, plus.

M. L. contains vol. 1, plus.

The North American Bee Journal—Indianapolis, Ind. Moon and King, Eds. A monthly periodical devoted to bee culture. Began Aug., 1872, vol. 1, no. 1 and continued to July, 1873; only 10 nos. printed; no issues for Dec., 1872, and June, 1873. Succeeded by "Moon's Bee World."

M. L. contains nos. 1 and 3.

Our Apiary—Shelbyville, Ill. By Johnson and Homrighous (monthly).

M. L. contains vol. 1, no. 3, 1879.

The Pacific Bee Journal—Los Angeles, Cal. The Bennet Beehive Co. (Vol. 1 quarterly; vol. 2, on, monthly.) 5 vols. issued. Vol. 1, no. 1, Jan., 1896, to Dec., 1902?

M. L. contains vol. 1 quarterly, 1896, nos. 1, 3-4; vol. 2; vol. 3, nos. 1-4; vol. 4, no. 3, Aug., no. 7, Dec., 1901; vol. 5, nos. 1-11, Jan.-Dec., 1902.

The Pacific Journal of Apiculture and American Bee Producers' Record—Los Angeles, Cal. Ralph Benton, Ed. Only known copy is a special convention number, undated. It contains the program of the 23rd convention of California State Beekeepers, L. A., Dec. 12-14, 1912. In Univer. Cal. Library.

Pacific States Bee Journal—Tulare, Calif. P. F. Adelsbach, Ed. Published monthly in the interest of honey producers. Began as Vol. 1, no. 1, Nov., 1903, and ran to vol. 1, no. 8, June, 1904, and then continued as the "Western Bee Journal." In May, 1904, absorbed the "Rocky Mountain Bee Journal."

M. L. contains vol. 1, no. 8.

The Poultry and Bee Journal—Auburn, Nebraska. O. H. Kent, Ed.

M. L. contains vol. 1, no. 1, June, 1903.

Poultry Bee and Fruit Journal—Nothing known about it.

The Progressive Beekeeper (monthly)—Unionville, Mo. (Higginsville, 1893.) Succeeded "Missouri Beekeeper" in 1892. Vol. 2-16, Jan., 1892.

April, 1906; vol. 9 and 10, repeated in numbering. Absorbed "Success in Bee Culture" in 1893.

M. L. contains a complete file except vol. 3, nos. 3, 6, 9, 10.

The Queen Breeders' Journal—Marlboro, Mass. E. L. Pratt, Ed. Vol. 1, 1889, nos. 1-6, Jan.-June.

M. L. contains vol. 1, nos. 1-6.

Rays of Light—North Manchester, Indiana. (Devoted to Beekeeping and Poultry Raising.) J. J. Martin & Co., Pub. Vol. 1, 1886?

M. L. contains Vol. 1, nos. 2-6, Feb.-June, 1886; Vol. 2, no. 6, June, 1887.

Rocky Mountain Bee Journal—Boulder, Colo. Ran from no. 1, Feb., 1901, to No. 38, March, 1904, 12 nos. per year. Merged with "Pacific States Bee Journal," May 1, 1904. Afterwards "Western Bee Journal."

M. L. contains nos. 1 and 3, 1901, and 12-38, 1902-1904.

The Rural Beekeeper—River Falls, Wis. Putnam, Ed. (Monthly.) Began Mar. 1, 1904, missed April and ran continuously to vol. 3, no. 5, Aug., 1906.

M. L. contains vol. 1-3, no. 5.

The Southland Queen—Beeville, Texas. Jennie Atchley, Ed. Vol. 1, no. 1, May, 1895, to vol. 7, no. 8, Dec., 1901. Then merged with the "Lone Star Apiarist" Jan., 1902, which ran only for 5 numbers. Started with a new series, vol. 1, no. 1, April, 1903, and continued to No. 11 for Feb. and was then issued as Vol. 9, no. 1, in March, 1904. Ceased publication July, 1904. Sept., 1904, merged with "Western Bee Journal."

M. L. contains v.

Success in Bee Culture—Vol. 1, no. 1-8, Oct. 15, 1893, June 15, 1894? Highwood, Conn. Burton L. Sage, Ed. Ran from Oct., 1893, to June, 1894? Absorbed by "Progressive Beekeeper" in July, 1894.

M. L. contains nos. 1-8.

"Thebestobee"—"Published when the spirit moves for our members and for western beekeepers, by the Colorado Honey Producers' Association, at 1424 Market St., Denver, Colo. Frank Rauchfuss, Mgr."

The Texas Bee Journal—Waco, Texas. Barton, Forsgard & Barnes. In 5th no. first page notice to the effect that journal had been sold and would be the "Texas Bee Journal Co.," composed of same people.

M. L. contains vol. 1, nos. 5-7, 9-12, 1885-1886. Oct., 1885, no. 5.

Weekly Beekeeper—Note from Oct., 1883, issue of "American Beekeeper" of Harrison that weekly is printed Friday of each week; devoted to the apiary, farm and fireside. Price $1.50 per year. No copies known.

The Western Apiary—Monthly. Boulder, Colo. C. H. Gordon, Ed.

M. L. contains Vol. 1, No. 2, Oct., 1900.

The Western Apiaries—Placerville, Cal. S. L. Walkins and F. E. McCallum, Eds. U. of Cal. has vol. 1, no. 1, 1889.

The Western Bee Journal—Published monthly in the interest of beekeepers. Hanford, Cal., later at Kingsbury. P. T. Adolsbach, Ed. Continuous "Pacific States Bee Journal" after vol. 1, no. 8, which was combined with the "Rocky Mountain Bee Journal" after the March issue, 1904? Vol. 1, no. 1 never published? Ran from vol. 1, no. 2, July, 1904, to no. 9, or 10, August, 1905, and was merged with? Although the editor states in vol. 1, no. 2, that no. 1 was printed, it is entirely possible that it was not, as the second number follows immediately after the last number of the "Pacific States Bee Journal," and the editor was busy moving from Tulare to Hanford, Cal.

M. L. contains vol. 1, nos. 2-5, July to Oct., 1904; vol. 2, nos. 1-9, Nov., 1904-July, 1905.

The Western Beekeeper—Denver and Boulder, Colorado. First published at Denver by Gordon and Bailey. It was to appear semi-monthly; vol. 1, no. 1, Dec., 1898; vol. 1, no. 2 appeared in Feb., 1899, and was continued monthly to June. The next number that I have seen is vol. 2,

no. 3, October, 1900, and was published by the Labor Publishing Co., at Boulder. Succeeded by the "Western Apiary," vol. 1, no. 1, Sept., 1900, of which I have seen vol. 1, no. 2 for Oct., 1900, only.

M. L. contains vol. 1, nos. 1-2, 6; vol. 2, no. 3, Oct., 1900.

The Western Beekeeper (Quarterly)—Des Moines, Iowa. Jos. Nyswander, Ed. Pub. Jan., April, July and Oct., 1887-1893?

M. L. contains vol. 3, 1889-1890, nos. 1-2; vol. 4, nos. 1-2; vol. 5, nos. 1-4; vol. 6, 1893, no. 1.

Western Honey Bee—Lebanon, Mo. E. M. Harrison & Co., Pub. Succeeded by "American Beekeeper," old vol. 2, no. 9, 1880. Ran from vol. 1, Jan., 1879, to vol. 2, no. 8, 1880?

M. L. contains v. 2, nos. 6-7.

Western Honey Bee—Started by the California State Beekeepers' Ass'n. Los Angeles, Cal., April, 1913. Geo. L. Emerson, Ed. Now edited by Helen Weightman. Vol. 1, no. 1, April, 1914, plus. Vol. 3 has only 9 nos. April to Dec., 1915. Vol. 4 began in Jan., 1916.

M. L. contains vol. 1, plus.

White's Beehive News—Dublin, Ga. 1921. U. S. D. A. vol. 1, 2-8.

M. L. contains vol. 1, no. 2, March.

White Mountain Apiarist (The Circle at Home and the Honey Bee)—Berlin Falls, New Hampshire. Aked D. Ellingwood, Pub. A section "The Circle at Home" conducted by Mrs. A. D. Ellingwood, Sept., 1891, moved to Groveton, N. H. Absorbed a magazine called "Special Crops" reported p. 3 of "White Mountain Apiarist." Vol. 1, no. 2, March, 1891. Ed. by C. M. Goodspeed at Skaneateles, N. Y. He was engaged in the queen-rearing business. Absorbed by the "White Mountain Apiarist," vol. 1, no. 4, May, 1891.

M. L. contains vol. 1, no. 1, Jan., No. 3, March, No. 4, May, No. 5, June, No. 7, Aug., and 3 other numbers, dated Jan.-June, 1892, but unnumbered.

Wisconsin Beekeeping—Madison, Wis., H. F. Wilson, Ed. Began as a record of the Wis. State Beekeepers' Ass'n., in the March, 1919, issue of "Wisconsin Horticulturist," under title "Among Wisconsin Beekeepers." In Jan., 1922, a special supplement was issued and continued until Dec., 1923. First no. with title "Wisconsin Beekeeping," supplement for April, 1922. First published as a separate journal by the Association Jan., 1924, and monthly edition continued without interruption to date.

M. L. contains Vol. 1, plus.

Wyoming Bee Line—Laramie, Wyoming, C. L. Corkins, Ed. Official organ of Wyoming State Beekeepers' Ass'n. Vol. 1, 1925 to Vol. 5, no. 1, Jan., 1929. First 3 vols. in mimeographed form.

M. L. contains first 3 vols. in mimeographed form. Vol. 4, 1928, lacks no. 5; vol. 5, 1929, no. 1.

State of Iowa

1930

REPORT OF THE

STATE LIBRARIAN

FOR THE

BIENNIAL PERIOD ENDING JUNE 30, 1930

JOHNSON BRIGHAM
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